AJSLP

Research Article

Evolution of Telehealth Technology, Evaluations, and Therapy: Effects of the COVID-19 Pandemic on Pediatric Speech-Language Pathology Services

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Purpose: Telehealth services experienced exponential growth during the COVID-19 pandemic. This survey examined the resulting evolution in the technology, connectivity, implementation of services, and attitudes of pediatric speech-language pathology clinicians using synchronous videoconferencing.
Method: The *Telehealth Services: Pediatric Provider Survey* participants were 259 speech-language clinicians in a variety of employment settings from across the country and abroad. Analyses identified telehealth barriers eliminated and those that persisted during the pandemic, advantages, and disadvantages of remote delivery of evaluation and treatment services, the most common telehealth technology used by clinicians and their clients to access care, and clinicians' predictions about the optimization and future of telehealth.
Results: Elimination of regulatory and insurance hurdles allowed children from varying socioeconomic backgrounds living in rural, suburban, and urban areas access to telehealth. Telehealth technology shifted from computers with external hardware and specialized software to commercially available equipment, such as handheld portable devices with built-in audiovisual components and publicly available videoconferencing platforms. However, connectivity of these devices continued to be problematic, and lack of technology prevented some children from accessing care. Judgments about the appropriateness and effectiveness of evaluations and treatments varied based on the age and communication disorder of a child. Although some participants expressed uncertainty about the effectiveness of telehealth compared with in-person care, telehealth was widely recognized as a viable delivery method.
Conclusions: Although clinicians reported many advantages of telehealth, some barriers identified reported prior to COVID-19 still persist. Clinicians anticipate that new developments have the potential to continue improving telehealth service delivery, bolstering the viability of telehealth long after the COVID-19 pandemic is gone.
Supplemental Material: https://doi.org/10.23641/asha.16959361

In December 2019, the first reported case of the coronavirus disease (COVID-19) was announced in Wuhan City, China (Rothan & Byrareddy, 2020; Tohidast et al., 2020; Zhu et al., 2020). By March 2020, the disease was classified as a pandemic and had spread worldwide (Cucinotta & Vanelli, 2020). For several service-based occupations, such as speech-language pathology, most client care was paused, interrupted, or pivoted to other service delivery models (Tohidast et al., 2020). Even though speech-language pathologists (SLPs) were classified as "essential critical infrastructure workers" (Silver et al., 2020), the shortage of personal protective equipment, coupled with the highly contagious nature of the virus forced a vast majority of speech-language pathology providers to switch to synchronous videoconferencing (i.e., telehealth, telepractice, telerehabilitation, and telespeech) if they wanted to continue providing direct patient care (Tohidast et al., 2020).

Although the concept of telehealth was not new, many speech-language pathology providers were using this delivery method for the first time in their career (Aggarwal et al., 2020; American Speech-Language-Hearing Association [ASHA], 2020b; Fong et al., 2020; Silver et al., 2020). Prior to the COVID-19 shutdowns in March 2020, research investigating the prevalence of its use by pediatric SLPs ranged from 1.6% to 9% (ASHA, 2002, 2011; Fong et al., 2020; Hill &

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Correspondence to Deborah R. Campbell: drcampbell1@usf.edu
Editor-in-Chief: Erinn H. Finke
Editor: Lynne E. Hewitt
Received March 2, 2021
Revision received May 4, 2021
Accepted August 13, 2021
https://doi.org/10.1044/2021_AJSLP-21-00069

Disclosure: *The authors have declared that no competing financial or nonfinancial interests existed at the time of publication.*

Miller, 2012; Lam et al., 2021; Mohan et al., 2017; Taylor et al., 2014; Tucker, 2012). Acceptance of telehealth into mainstream, clinical practice was hindered by barriers to care, including limited insurance compensation, strict regulations, and lack of adequate technology, as well as SLPs' negative attitudes toward telehealth (Lustig & Institute of Medicine (U.S.), 2012; McClellan et al., 2020; Palomares et al., 2016). However, immediately after the pandemic began, government agencies waived the hurdles of interstate licensing, regulatory restrictions, and, most importantly, limited reimbursement. Thus, the potential long-term viability of widespread use of telehealth became evident (Bashshur et al., 2020).

Although some barriers were eliminated, many remained. Most notably, concerns remained about the resources needed to provide adequate Internet connectivity for a clinical session (i.e., affordable broadband, hardware, and software) and about the skepticism of SLPs toward telehealth use (Smith et al., 2020; Tohidast et al., 2020). Surveys administered after the onset of the coronavirus pandemic confirm many of these ongoing limitations. Based on a May 2020 survey, ASHA reported that 84.8% of SLPs were delivering therapy services via telehealth and 55.6% considered the experience challenging. Tenforde et al. (2020) investigated the feasibility and satisfaction of adult and pediatric clients receiving telehealth services. Although they reported high patient and parent satisfaction, lack of hands-on care and limitations of technology remained a concern. Aggarwal et al. (2020) examined the attitudes of SLPs toward this sudden increase in telepractice. Although survey findings revealed greater acceptance of this delivery model, SLPs reported that sessions were more stressful than in-person care. They identified inadequate Internet connectivity as an ongoing barrier to providing therapy services remotely.

An estimated one out of four Americans still do not have devices or broadband Internet to participate in remote care (Benda et al., 2020). However, ongoing state initiatives, such as Maine's ConnectME, are working to eliminate these disparities (Benda et al., 2020; The Pew Charitable Trusts, 2020). As a result, traditional high-speed Internet access as well as expansion of mobile broadband connections are allowing more communities (rural to urban) access to digital services. Grants, such as those offered through the Veterans Affairs Offices of Rural Health, Connected Care, and the CARES Act funding to support Remote Learning, have provided hardware and software to individuals who may otherwise have been unable to afford the technology vital for telehealth speech and language services (Office of Educational Technology, 2020; Zulman et al., 2019).

Researchers are aware of the role technology and connectivity play in providing effective therapy evaluations and treatments via synchronous videoconferencing (Bashshur et al., 2020; Benda et al., 2020; Rauwerdink et al., 2019). Taylor et al. (2014) noted that studying telehealth under ideal research conditions in contrast to real-world scenarios is a limitation to this line of research. Using costly, custom-built equipment designed for research purposes makes the results of many investigations largely inapplicable to typical therapy practices (Sutherland et al., 2017). Fortunately, advancements in mobile technology (i.e., tablets and smartphones), the availability of a wide variety Health Insurance Portability and Accountability Act (HIPAA)– or Family Educational and Privacy Act (FERPA)–compliant videoconferencing platforms, and improvements in high-speed broadband connections have changed the landscape of telecommunication. SLPs and clients are no longer tethered to high-end, desktop computers with direct cable connections and external hardware to benefit from quality, synchronous videoconferencing (Coufal et al., 2018; Dekhtyar et al., 2020; Mohapatra et al., 2015). Reasonably priced, consumer-grade, commercially available, and school-issued hardware and software have allowed audio and visual conferencing to be widely available (Isaki & Farrell, 2015; Sutherland et al., 2017).

Research investigating the effectiveness of telehealth evaluation or intervention services needs to mirror current, real-world conditions to reevaluate prior findings and apply them to everyday use (Benda et al., 2020; Sutherland et al., 2016; Taylor et al., 2014). For example, Grogan-Johnson et al. (2013) used laptop computers with specialized software for videoconferencing to compare remote delivery of therapy services to in-person intervention for children with speech sound disorders. Although their study found no differences in the two methods of services delivery, the technology used reflected a research laboratory rather than a typical clinical setting. Coufal et al. (2018) compared traditional delivery of speech therapy with telepractice. They used desktop and laptop computers but had a custom-built platform used for videoconferencing and high-speed Internet access. Similar to Grogan-Johnson et al.'s results, they found no significant differences between the two delivery methods for children with speech sound disorders. Although studies like these support the remote delivery of speech therapy services, researchers' use of advanced technology may restrict potential application to present-day teletherapy practices.

Investigators have begun to recognize this deficiency and are beginning to fulfill this need by shifting to commercial-grade technology use. Isaki and Farrell (2015) provided intervention services via synchronous videoconferencing using Wi-Fi-enabled second generation Apple iPads and the devices' built-in FaceTime software. They investigated the effects of their remotely delivered pediatric speech and language therapy services over two academic semesters. Results indicated that participants met their speech goals and the majority of their language goals, consistent with previous studies that had used different technology (i.e., desktop and laptop computers). Similarly, Langbecker et al. (2019) performed a 2-year study investigating the impact of remotely delivered speech and language therapy services on education outcomes. They used iPad Airs with commercially available rehabilitation software (i.e., NeoRehab) or the school's own room-based videoconferencing software. Results revealed a sustained positive change for children over multiple semesters. Both studies were significant for their treatment outcomes and the ability of SLPs to replicate the telehealth hardware and software used. Despite a

lack of experimental rigor, these studies illustrate the potential of using readily available technology for the remote delivery of speech-language therapy services.

SLPs' attitudes and perceptions about providing effective care remotely may continue to be an obstacle to widespread acceptance (Sutherland et al., 2017). This could not be truer than in the area of diagnostics, specifically pediatric standardized assessments (Farmer et al., 2020). Concern has been expressed about the appropriateness of remote administration of evaluation tools (Kaplan, 2020). Although some studies have compared speech-language therapy services delivered via telehealth and in-person (e.g., Clinical Evaluation of Language Fundamentals–Fourth Edition; Waite, 2010), the literature on telehealth evaluations is sparse. Sutherland et al. (2018, 2019) and Wright (2018, 2020) stressed the need to compare telehealth to in-person diagnostics for children of different ages and disabilities. This lack of research is disconcerting to many SLPs, in light of ASHA's position that telepractice "must be equivalent to the quality of services provided in person" (ASHA, 2020c). The current volume and range of care being provided through telecommunication is unprecedented, and although ASHA acknowledged that the COVID-19 pandemic created unique and less-than-ideal circumstances, the need to evaluate the quality of speech and language evaluation services using this delivery model continues to be imperative (ASHA, 2020a, 2020c).

ASHA acknowledges this deficiency, noting that several pediatric assessments lack the evidence of validity and reliability for remote administration (ASHA, 2020c; Farmer et al., 2020). Standardized evaluations conducted with deviations, such as prompting or modifications to delivery, may impact interpretation of scores or require the child be reassessed in the future through in-person administration to acquire valid results. Therefore, for the future viability of telehealth to be considered after COVID-19 restrictions are gone, research is needed to address this gap.

The technology available to provide remote speech and language services has evolved dramatically since the inception of telehealth (Houston et al., 2012). When the COVID-19 pandemic caused the worldwide conversion from in-person care to telehealth, SLPs began delivering therapy services to a whole new generation of Internet -connected children (Tohidast et al., 2020). The implementation of remote services on such a vast scale resulted in both provider and client using a broad range of equipment and software variations, creating questions about the effectiveness of services provided using current, real-world technology (Snodgrass et al., 2017). Furthermore, with limited research in the area of standardized assessments administered via telehealth, SLPs lacked the procedural infrastructure to provide diagnostic assessments to children of different ages and for certain conditions, increasing the level of complexity when providing evaluation services (ASHA, 2020c; Farmer et al., 2020). Thus, additional questions arise as to the perceptions and opinions of SLPs as to the level of difficulty to administer standardized assessments for tests previously only validated through in-person administration.

Surveys developed at the onset of the COVID-19 pandemic attempted to answer some of these questions. The Silver et al. (2020) questionnaire inquired about the risk of exposure to COVID-19 for health care workers, such as SLPs, as critical infrastructure workers. The *Everything SLP* website and closed Facebook group run by Bill Connors (2020) administered an online survey completed in mid-2020 that described the typical telepractice SLP as well as employment-related findings, such as salaries, benefits, and productivity. Aggarwal et al.'s (2020) study discussed the uptick of SLPs in India using telepractice after COVID-19, and the Fong et al. (2020) survey reported on increased telehealth use in Hong Kong during the pandemic. Campbell and Goldstein's (2021) questionnaire reported the dramatic increase of telehealth use during the pandemic across a broad range of speech-language pathology provider types (e.g., SLPs, graduate speech-language pathology students, speech-language pathology assistants, and school-based clinicians). Survey respondents reported the increase in use was mostly a result of employer mandates or lowering infection risk for both client and speech-language clinicians. Clinicians also noted that they increased their telehealth proficiency and discovered the benefits of telehealth.

Even though these surveys were informative, critical questions pertinent to the delivery of speech-language services remain unanswered. Most surveys were SLP-centric, collecting limited data about the clients receiving therapy services remotely. For example, studies inquired about the SLPs' setting (i.e., school and private practice), but not the child's location where the telehealth services were being performed (i.e., home and car). Survey results reported on software platforms (i.e., Zoom) being used to deliver services remotely; however, data were not collected on the hardware being used by the client to receive those therapy services. SLPs reported difficulty delivering therapy services remotely; yet the questionnaires did not delve into the possible reasons for this difficulty. Surveys asked providers about their overall experiences in providing telehealth evaluation and intervention services in contrast to inquiring about the specific areas of pediatric services (e.g., dual language learners and social aspects of communication). Therefore, a survey was developed with the aim to further investigate the impact of the sudden widespread use of remote therapy services on the provision of speech-language services using a telehealth delivery model.

The purpose of this research is to identify the factors influencing the use of telehealth services delivered before and after March 2020 (COVID-19). In particular, a survey was constructed to identify barriers pediatric speech-language clinicians (e.g., SLPs, graduate speech-language pathology students, speech-language pathology assistants, and school-based clinicians) experienced upon their conversion to telehealth and to assess whether attitudes about telehealth changed as a result of providing speech, language, and literacy-based therapy services. These perceptions may vary based on the particular evaluation and intervention services administered via synchronous videoconferencing.

The survey also sought to determine the real-world technology being used in therapy practice (i.e., hardware and software) and their perceived adequacy when providing telehealth services.

The data obtained have the potential to expand our knowledge about the future of telehealth use among pediatric speech-language clinicians. The results of this study may identify barriers that continue to limit access to these vital services and inform future research on the effectiveness of using current, telehealth infrastructure when providing remote therapy services. The following questions were addressed.

1. What are the perceived technological barriers that may limit access to speech and language telehealth services?
2. What are speech-language clinicians' perceptions and opinions of the appropriateness and effectiveness of speech-language evaluations and treatments delivered via synchronous videoconferencing and do they differ when considering children of different ages and communication disorders?
3. What common hardware and software technologies do pediatric speech-language clinicians currently use to provide telehealth speech and language services?
4. What common hardware technologies do clients receiving telehealth speech and language services currently use?
5. What are the perceived advantages, disadvantages, and predictions about the future of pediatric speech-language telehealth services?

Method

Survey Development

The *Telehealth Services: Pediatric Provider Survey* was constructed in stages using the process and standards recommended for questionnaire development (American Educational Research Association et al., 2014; Plake & Wise, 2014; Presser et al., 2004; Willis, 1999). First, the content validity was investigated to assess the appropriateness of the tool for making decisions and interpretations about the involvement of a broad range of pediatric speech-language clinicians in performing therapy services via a telehealth model (Cook & Hatala, 2016). A literature review as well as an examination of current surveys (i.e., March–July 2020) confirmed that this content was relevant and not previously studied.

The survey was validated through the following five steps of the development process: (1) generate a blueprint of survey items; (2) create an initial pool of survey questions; (3) test the presentation functioning of question items (continued throughout the validation process); (4) review of survey questions by at least five telepractice experts in the field of pediatric speech-language pathology; revise questions for content, clarity, and relevance based on feedback; (5) implement cognitive interviews with at least five practicing pediatric clinicians currently using telepractice; revise questions for clarity and relevance based on feedback.

Step 1: Survey Blueprint

The first step was to refine the purpose of the proposed tool. Questionnaires disseminated during the period of March 2020 to July 2020 were reviewed. Based on the review of available surveys at the time of tool development, it was determined that none adequately represented the content of the identified need. Subsequently, a review of the literature on telehealth, as well as alternative terms used, such as telepractice, telespeech, teletherapy, teleassessment, and telerehabilitation, was conducted to investigate the history of synchronous videoconferencing to provide pediatric speech and language services (ASHA, 2016a, 2016b; Cason & Cohn, 2014; Freckmann et al., 2017; Keck & Doarn, 2014). After reviewing the recent surveys, extant literature, and input from telepractitioners currently providing speech and language therapy, an initial blueprint of items was produced. This consisted of ideas such as how reliability is maintained when providing standardized assessments via telehealth and does a child's age, disability, or behavior affect a clinician's attitude toward providing evaluations and treatment via a remote delivery model.

Step 2: Creation of Survey Questions

Question development followed Dillman's (2000) "Principles of Writing Survey Questions." Survey items asked questions with a single idea per question, stated both sides of an attitude question in the stem (i.e., agree or disagree), used simple language, and included precise estimates to avoid vague quantifiers (i.e., rarely). During this step of the development process, 61 questions were initially created. Among those 61 questions, 34 were deemed relevant to the research questions for this study. Based on the literature review and feedback from practicing clinicians, questions were grouped into seven topics. Each topic contained an item pool of one to 14 questions.

The questions about employment and experience contained items about provider's location, practice setting, and education. Questions about clients contained items about a child's location, socioeconomic status, and telehealth setting. The questions about technology contained items about telehealth platforms and clinician's and client's hardware used for telehealth. The questions about teleassessment and telehealth therapy services contained items about a clinician's perceived effectiveness of providing speech-language evaluations and interventions via remote delivery based on a child's age or condition. Finally, questions contained items about the clinicians' perceived advantages and disadvantages of remote delivery of speech and language services as well as their opinion about the future of telehealth services.

The survey questions were entered into REDCap (Research Electronic Data Capture), allowing the survey to be administered electronically. REDCap is an electronic data capture tool hosted at the University of South Florida.

REDCap is a secure, web-based software platform designed to support data capture and analysis for research studies (Harris et al., 2009).

Step 3: Expert Panel Review

Sixteen SLPs with expertise in telehealth were asked to review the survey items. These individuals had published in the area of telehealth, business owners of telepractices, or were leaders of the ASHA Special Interest Group on Telepractice. The 16 SLPs were contacted by e-mail and asked to participate in an expert review of the proposed survey. Nine of them chose to participate. The REDCap online version of the questionnaire as well as a PDF copy of the survey was e-mailed to each clinician. They were asked to provide feedback on the relevance and the clarity of each item. The ratings used a 5-point scale. An additional, open-ended question option was available for each item, allowing experts to provide further information about their response, such as suggestions for modifying the questionnaire content, proposing wording for greater clarity or opinions about relevance of questions to the proposed research. Any items that 75% of the experts rated as somewhat or not relevant or somewhat or not clear were considered candidates for elimination or major revision. Experts' suggestions were reviewed and considered for possible question and content revisions.

The survey was revised based on the expert feedback. Eight irrelevant questions were eliminated, six vague questions were reworded for clarity, and seven new content questions were added. More significantly, the questionnaire was reorganized. In the original version of the survey, questions were grouped by topics that concurrently inquired about the clinician's and their client's experiences (e.g., asking clinicians about the client's and their reasons for possible telehealth use in the future). The experts suggested grouping the questions into more specific domains and separating questions pertaining to clinicians versus their clients. Survey questions were structured to focus on clinician and client demographics, their telehealth technology, clinicians' telehealth evaluation and intervention experiences, and clinicians' opinions about telehealth use. Prior to the next step, all survey changes and revisions were made, and the revised online questionnaire items were tested for accurate functioning in REDCap.

Step 4: Cognitive Interview

The last step, prior to disseminating the final version of the instrument, was a cognitive interview with five seasoned pediatric SLPs. The interviews followed Willis's guide to cognitive interviewing. SLPs completed the survey using a think-aloud procedure (Willis, 1999). Two SLPs had prior experience with telehealth, and three were new to this service delivery model. One was interviewed in person, and the other four were interviewed via FaceTime. An online version of the questionnaire as well as a PDF copy of the survey was e-mailed to each SLP prior to initiating the cognitive interview. During the cognitive interviews, SLPs were asked to verbalize their answer choices, telling the survey developer everything that came to mind about how they arrived at their answers. Feedback was requested for every survey item. Anytime an SLP was unsure of the content presented, such as concerns about clarity or meaning, they were engaged in a discussion to discern possible alternative wording or to make suggestions about ways to revise the survey item.

Upon completion of the cognitive interviews, additional revisions to the survey instrument were made. This included reformatting questions to improve ease of response, eliminating more questions, rewording questions for clarity, changing questions to emphasize the focus on the child's technology use and telehealth setting, emphasizing whether a question was collecting information about the clinician or client, adding additional options for topic items (e.g., platform and additional hardware used), and defining terms used for clarity (i.e., suburban, rural, and urban; socioeconomic status). The finalized questionnaire can be found in Supplemental Material S1.

The final survey was composed of seven topics.

1. The employment and experience topic consisted of seven questions, one of which branched to one additional question if answered yes. This established the clinician's years of experience and practice location as well as training in the area of telehealth.
2. The client/student topic consisted of three questions. This established the client's location, telehealth setting, and socioeconomic status.
3. The telehealth hardware and software topic consisted of four questions. This established the clinician's hardware and software use.
4. The perceptions and use of technology topic consisted of seven questions about their clients' accessibility of technology and connectivity to participate in telehealth.
5. The teleassessment topic contained one question and, if answered yes, branched to three additional questions about the clinician's opinions about the appropriateness and effectiveness of telehealth evaluations for children of different ages and disorders.
6. The telehealth therapy services topic contained two questions, one of which branched to collect additional information about the level of effectiveness in the area in which the clinician had experience treating via remote delivery.
7. The views on telehealth contained 14 survey items requiring ratings, eight related to telehealth infrastructure, four related to teleassessments, and two related to telehealth use, as well as four open-ended questions about clinician's overall views on teleassessments and direct therapy services administered via telehealth.

Step 5: Survey Dissemination

In September of 2020, after receiving institutional review board approval, the survey, *Telehealth Services: Pediatric*

Provider Survey, was disseminated online and by e-mail. A one-paragraph overview explaining the purpose of the questionnaire was used to invite participants to complete the survey. To reflect real-world contemporary practices, eligibility for inclusion was broadly defined as "pediatric speech-language clinicians": SLPs (i.e., master's, doctorate, and professional) and bachelor-level speech-language therapy providers (e.g., graduate speech-language pathology students, speech-language pathology assistants, and school-based clinicians with a professional certificate or teaching certification). This broad definition allows for the inclusion of all respondents providing pediatric speech-language services via telehealth. The exclusion criteria for survey participation were speech-language clinicians who do not provide pediatric therapy services or pediatric speech-language clinicians that never provided telehealth therapy services. The survey invitation was e-mailed to the directors of pediatric practices, district speech-language pathology administrators, members of state and national organizations (i.e., ASHA, Florida Speech-Language Hearing Association, Learning Disabilities Association, and Florida Learning Disabilities Association), West Central Early Steps early intervention providers, and posted on social media sites (i.e., closed and public Facebook groups with pertinent interests, such as pediatric speech-language pathology and telepractice). Additionally, this survey was shared on ASHA's State Advocates for Reimbursement committee message board as well as the Special Interest Groups 1 (Language, Learning and Education), 11 (Administration and Supervision), and 18 (Telepractice). Follow-up reminders were sent and posted weekly until the survey closed on October 31, 2020.

Survey participation was voluntary. Participants provided informed consent prior to proceeding with the questionnaire. The survey was designed to be completed in one administration; however, participants were provided the option to return later if they were unable to finish in one sitting. During the survey, each respondent was asked to answer questions about past, recent, and future experiences.

Data Analysis

Demographics of Telehealth Provider and Client

JMP Version 15.2.0 was used for all data analysis (SAS Institute Inc., 2020). Descriptive statistics were used to summarize the diversity of the speech-language clinicians, including where they currently reside, their level of education, pediatric experience, telehealth experience, and employment setting. Descriptive statistics were used to summarize the pediatric clients, including where they currently reside, reported socio-economic status, and telehealth setting. Due to each question's response being independent of the others, partial data were included.

Telehealth Technology and Barriers to Care

Descriptive statistics were used to summarize the speech-language clinicians' and clients' hardware and software used during telehealth therapy sessions. Descriptive statistics also summarized telehealth barriers experienced by the speech-language clinicians' clients.

Telehealth Evaluative and Treatment Services

Descriptive statistics were used to summarize the self-reported ratings of level of difficulty and level of effectiveness by client condition. Descriptive statistics also summarized how the pediatric clients accessed their therapy materials.

Views on Telehealth

Descriptive statistics were used to summarize speech-language clinicians' responses to 14 questions. In addition, content analysis was used to analyze open-ended questions about telehealth: advantages, disadvantages, the future of telehealth, and optimization.

Results

Participant Demographics

A total of 259 speech-language pathology clinicians completed the survey. None of the respondents were omitted, as they all met the broadly defined "pediatric speech-language clinician" inclusion criteria. Because participants were able to choose the items they completed, 10% of the 259 participants did not answer all the questions presented.

Demographic information is presented in Table 1. The clinicians practiced in 38 states, the District of Columbia, as well as outside the United States. Florida was overrepresented, and the southwest was somewhat underrepresented in the sample. The majority of participants were from suburban areas (n = 145). The most common primary employment settings were schools (n = 70) and private practices (n = 58). Most respondents (93%) held at least a master's degree. We do not have a breakdown of bachelor's degree respondents, who could include graduate speech-language pathology students, speech-language pathology assistants, and school-based clinicians with a professional certificate or teaching certification. Results were analyzed to determine if responses varied by level of education. With the exception of speech-language evaluations, distributions for survey responses did not vary significantly by clinicians' earned degree.

The participants' experience in the profession of speech-language pathology ranged from less than 1 year to 55 years with a mean of 16.6 years of experience (SD = 11.6). The participants' telehealth experience ranged from less than 1 year to 34 years with a mean of 1.9 years of experience (SD = 3.0), with the majority of clinicians (79%) reporting telehealth experience of 1 year or less.

Demographics of Telehealth Clients

Demographic information for clients is presented in Table 2. Participants reported that 36% had clients in rural areas, 69.4% had clients in suburban areas, and 35.7% had clients in urban areas. To further understand the demographic makeup of the respondents' clients, the clinicians were asked what percentage of the children on their

Table 1. Participant demographic information.

Region	*n*	%	Location	*n*	%	Setting	*n*	%	Education	*n*	%
Northeast	59	25%	Rural	41	16%	Clinic	37	14%	Bachelor	18	7%
Southeast	80	33%	Suburban	145	56%	Clinician's home	5	2%	Masters	210	81%
Midwest	41	17%	Urban	72	28%	Early intervention	39	15%	Doctorate	23	9%
Southwest	14	6%				Homecare	2	1%	Professional	5	2%
West	28	12%				Hospital	4	2%	Other	2	1%
Outside of U.S.	18	7%				Indep. contractor	20	8%			
						Private practice	58	22%			
						School	70	27%			
						University	21	8%			
						Other	2	1%			
	240	100%		258	100%		258	100%		258	100%

Note. The regions are as follows: Northeast (ME, MA, RI, CT, NH, VT, NY, PA, NJ, DE, MD); Midwest (OH, MI, IN, IA, WI, IL, MN, MO, ND, SD, NE, KS); Southeast (VA, WV, KY, NC, SC, TN, GA, FL, AL, MS, AR, LA); Southwest (AZ, TX, OK, NM); and West (ID, CO, NM, AZ, UT, NV, CA, OR, WA, AK, WY). U.S. = United States of America; Indep. = independent.

caseloads resided in the reported locations: rural, suburban, and urban. The majority of clinicians reported spending 74.4% (*SD* = 25.7) of their day working with children from suburban areas.

Participants reported the socioeconomic status of their clients; 57% had clients classified as low income, 67% had clients classified as middle income, and 18% had clients classified as high income. The socioeconomic status of clients was unknown by 14% of participants.

Participants reported their clients' location when telehealth therapy services were provided. Most children were seen in their own homes (97%), followed by a family member's residences (32%), daycare (14%), school (13%), car (13%), parents' workplaces (5%), and public places (4%), such as a library.

Barriers to Telehealth Access

The reasons reported for why families had reservations about participating in telehealth therapy services are summarized in Table 3. Clinicians reported families having concerns about the child's lack of willingness to participate in sessions (77%), families' lack of comfort with videoconferencing (61%), and families' lack of affordable access to Internet connectivity (58%).

Survey participants estimated the mean percentage of willing clients who did not have the resources to participate as 19% (*SD* = 19.3). When asked what resources interfered with telehealth services, clinicians reported families having a lack of available Internet access (62%), a lack of a technology device (58%), and a lack of affordable Internet access (49%) as major barriers. Additional barriers reported were financial limitations (22%), lack of data plan (16%), lack of access to software (10%), and other factors (e.g., inconsistent and poor connectivity; 9%). Only 15% of respondents reported no barriers for those clients willing to do telehealth. When asked what percentage of families required instructional assistance to learn how to videoconference for the first time, the mean percentage was 54% (*SD* = 35.3).

Opinions About Telehealth Evaluations and Treatments

Only 52% (*n* = 135) of survey participants had performed standardized assessments and evaluations via telehealth. The respondents reported evaluating children ages 6–8 years old most frequently (62%), followed by 3–5 years old (58%), and 9–11 years old (52%). Their level of agreement as to whether evaluations were more difficult to administer remotely compared with in-person for each age category was reported on a 0–100 analog scale, ranging from *strongly disagree* to *strongly agree*. Clinicians reported the three most difficult ages in which to administer standardized assessments were ages 3–5 years (68%, *SD* = 25.1), ages birth to 2 years (60%, *SD* = 29.0), and 6–8 years (54%, *SD* = 28.1).

Table 2. Client demographic information.

Client location	%	Client's telehealth setting	%	Socioeconomic	%
Rural	36	Client's home	97.3	Low	57
Suburban	69.4	Family member's home	32	Middle	67
Urban	35.7	Daycare	13.5	High	17.8
		School	13.1	Unknown	13.6
		Car	12.7		
		Parent's workplace	5		
		Other (i.e., shelter)	1.9		

Table 3. Families' reservations about the use of telehealth.

Family reservations	*n* = 246
Willingness of child to participate in sessions via telehealth	77.0%
Comfort level with videoconferencing	61.0%
Access to connectivity (i.e., affordable and available access to Internet)	58.1%
Age of the client	55.7%
Access to technology (i.e., hardware)	53.3%
Client's diagnosis	39.0%
Home environment can be distracting/interfering with compliance	39.0%
Care for siblings during therapy session	34.1%
Use of a computer or tablet is distracting	26.0%
Level of caregiver education	22.4%
Socioeconomic status	16.7%
Language barriers	14.6%
Cultural background	7.7%
Other (e.g., not as effective as if seen in person)	6.9%
Cost/reimbursement of services	6.5%
Age of the caregiver	5.7%
Religious beliefs	0.4%

Survey participants' ratings of whether evaluations were more difficult to administer remotely compared with in-person based on the child's communication disorder are summarized in Table 4. Three conditions had less than 20 survey responses: voice and resonance, hearing, and swallowing/feeding. However, these evaluation areas tend to make up a smaller portion of a typical pediatric SLP's caseload. For many conditions, clinicians reported similar amount of difficulty ranging from 52% (for cognitive assessments) to 64% (for speech sound production evaluation). Clinicians reported the three most difficult conditions in which to administer standardized assessments were speech sound production (64%, *SD* = 29.9), communication modalities or augmentative and alternative communication (AAC; 62%, *SD* = 33.3), and the social aspects of communication (59%, *SD* = 27.5, *n* = 63). In contrast, fluency evaluations (39%) were noticeably less difficult to accomplish.

Respondents (*n* = 133) were asked to indicate how their clients accessed telehealth evaluation materials. The five most common ways reported were screen sharing (81%), holding materials up to the camera for the child to view (50%), using materials in the child's natural environment (44%), providing materials to client in advance (28%), and using a document camera (26%).

Survey participants reported the ages of the children to which they were providing direct therapy services via telehealth. Respondents reported treating children ages 3–5 years old (65%) and 6–8 years old (65%) most frequently and 9–11 years old slightly less (63%).

Table 4 presents a summary of the conditions treated via telehealth. The five most common were expressive and receptive language disorders (96%), speech sound production (86%), social aspects of communication (i.e., challenging behaviors and ineffective social skills; 74%), cognitive aspects of communication (i.e., executive functioning, memory, and problem solving; 56%), and fluency (42%). A follow-up question asked respondents to rate the level of effectiveness of services provided remotely based on the child's communication disorder using a 0–100 analog scale. For many conditions, clinicians reported similar amounts of effectiveness ranging from 83% (literacy and written expression) to 74% (speech sound production). Communication modalities (i.e., AAC) was reported to be least effective (66%) when taught remotely.

Respondents were asked to indicate how clients accessed telehealth therapy materials. Similar to evaluations, the three most common were screensharing (84%), holding materials up to the camera for the client to view (66%), and using materials in the client's natural environment (65%). In addition, clients accessed online materials during sessions (56%), used therapy applications (43%), were provided materials in advance (40%), accessed shared files (28%), and viewed materials via a document camera (22%).

Clinicians' Hardware and Software Use

Respondents reported the devices used for telehealth. Most clinicians used a computer or laptop (93%), followed

Table 4. Telehealth evaluations and treatment: self-reported ratings of level of difficulty and level of effectiveness by condition.

	Evaluation: level of difficulty		Treatment: level of effectiveness	
Condition	***n***	***M* (*SD*)**	***n***	***M* (*SD*)**
Receptive/expressive language	111	55.3% (29.93)	219	81.8% (19.93)
Speech sound production	99	63.5% (29.93)	198	74.3% (24.04)
Social aspects of communication	63	58.7% (27.46)	166	68.7% (25.97)
Cognitive aspects of communication	37	51.7% (29.14)	129	79.5% (21.52)
Fluency	35	38.6% (29.11)	96	80.4% (20.92)
Literacy, written language	33	53.1% (32.55)	94	83.2% (19.60)
Communication modalities (i.e., AAC)	24	62.3% (33.34)	93	66.2% (25.78)
Dual language learners			52	80.5% (18.05)
Swallowing, feeding	17	74.6% (23.28)	40	75.7% (22.68)
Voice and resonance	14	52.4% (25.96)	36	76.3% (24.83)
Hearing	9	60.6% (35.98)	21	74.6% (26.23)

Note. AAC = augmentative and alternative communication.

by a tablet (23%) and cellphone (23%). One quarter of respondents reported using multiple devices at one time. Clinicians were asked the percentage of time they used various devices to provide telehealth services. The mean percentage of use was 94% (*SD* = 15.2) for computers, 36% (*SD* = 31.2) for tablets, and 15% (*SD* = 20.7) for cellphones. The audio components used for the audiovisual connection when providing synchronous videoconferencing included the device's own speakers (65%), headphones (57%), and external speakers (11%).

Respondents were asked to identify additional hardware used for the audiovisual connection when providing synchronous videoconferencing. The most common was headphones (over-the-ears = 40%, earbuds = 37%), followed by an additional device, such as another computer or tablet (41%) or cellphone (36%). Clinicians reported using additional computer screens (28%), external webcams (24%), document cameras (22%), augmentative alternative communication devices (15%), external microphones (15%), external speakers (12%), and other hardware (i.e., smartboard; 8%). Only 9% of participants reported that they did not use any additional hardware to provide telehealth services.

Survey participants reported the telehealth platforms used when providing synchronous videoconferencing. The majority of clinicians used Zoom (78%), followed by FaceTime (21%), and other (20%) platforms, such as WebEx, Google Meet, and Go to Meeting. Other common platforms included Microsoft Teams (15%), Doxy (15%), Google Hangouts (13%), Google Classroom (11%), Theraplatform (10%), What's App (5%), Skype (4%), Presence Learning (3%), Facebook Messenger (3%), and Blink Session (2%).

Clients' Hardware

Respondents identified the devices used by their clients when receiving telehealth services. Clinicians reported clients using a computer/laptop (87%) the most, followed by a tablet (79%) and cellphone (67%). Almost half of the respondents (44%) reported using combination of devices (varied from session to session). Only 3% of survey participants did not know which devices their clients were using. Clinicians estimated the frequency of use averaging 55% (*SD* = 25.5) for computers, 35% (*SD* = 22.3) for tablets, 26% (*SD* = 21.3) for cellphones, and 41% (*SD* = 33.4) for multiple devices.

Participants reported the audio components clients used. The most common was the device's own speakers (79%) followed by headphones (42%), external speakers (7%), and unknown (11%). The mean percentage of use was 83% (*SD* = 23.1) for device's speakers, 34% (*SD* = 25.4) for headphones, and 59% (*SD* = 36.9) for external speakers.

Views on Telehealth

Speech-language clinicians were asked 14 questions about their overall views of speech-language services provided via telehealth. The means and standard deviations of responses to the questions are presented in Figure 1. The *telehealth infrastructure* questions covered audiovisual and connectivity quality and hardware and software connectivity choices. Three questions pertaining to audiovisual and connectivity quality were highly rated, ranging from mean scores of 85.3%–90.9%. Five questions pertaining to hardware and software connectivity choices ranged from mean scores of 63.7%–81.2%; the choice of videoconferencing platforms and clients' hardware questions received the lower ratings (i.e., means ranging from 63.7%–70.1%). The two *teleassessment* questions pertaining to reliability and validity of telehealth assessments received lower ratings, ranging from mean scores 60.0%–71.7%, and the two questions pertaining to ease of telehealth test administration raised even more concern, with ratings ranging from mean scores of 44.8%–57.1%. The two *telehealth use* questions inquired about comparisons of telehealth to in-person care; the rating means of 59% and 61% represent a fair amount of concern about telehealth use in comparison to in-person care.

Views on Telehealth: Content Analysis

The final survey items consisted of four open-ended questions. Answers to the questions were subjected to content analysis, with responses identified by themes that were grouped into response categories (Miller, 2014). Results of the analyses are summarized in Table 5.

The advantages of telehealth question (n = 190) were determined to have eight major content themes. At least 25% of respondents identified a client's ability to access services (44%), family involvement (40%), safety (33%), convenience (31%), and scheduling flexibility (31%) as the most common advantages to telehealth speech and language therapy services.

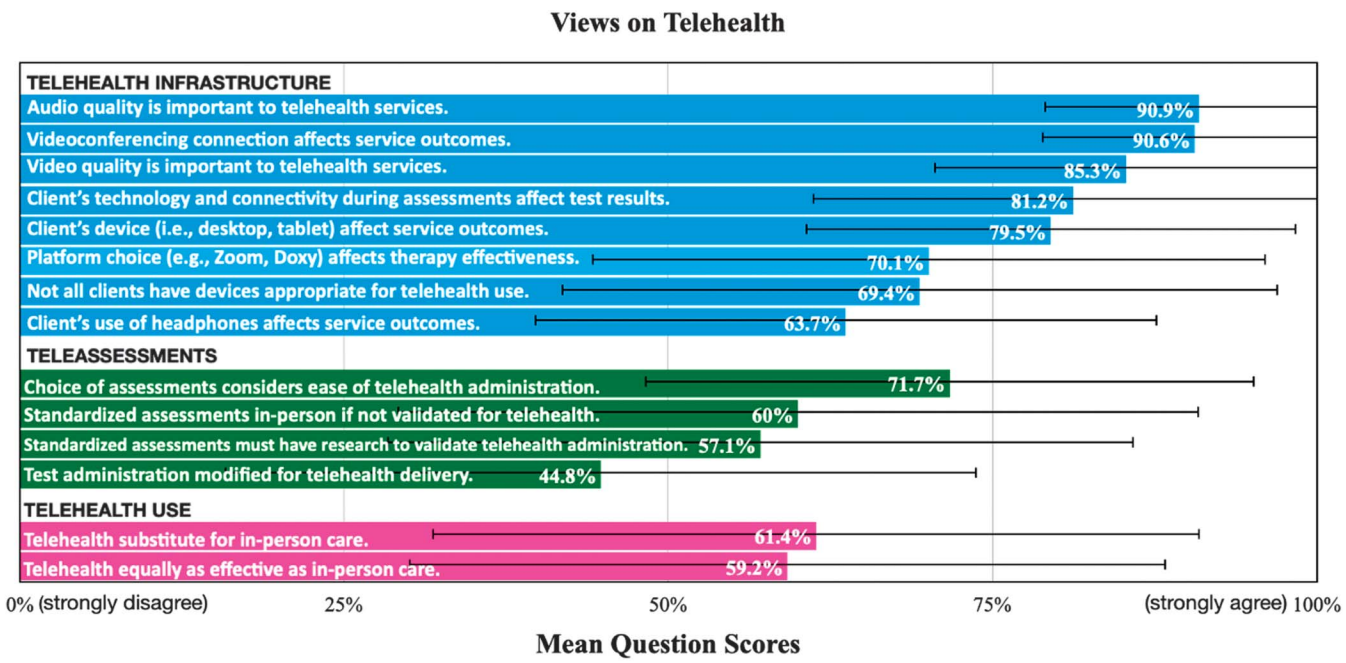
The disadvantages of telehealth question (n = 194) were determined to have nine major content themes. At least 25% of respondents identified a client's lack of connectivity (42%), lack of family involvement or appropriate environment in which to receive therapy services (37%), client behaviors (35%), and unsuitable substitution for in-person care (33%) as the most common disadvantages to telehealth speech and language therapy services.

The future of telehealth question (n = 172) was determined to have eight major content themes. Most respondents reported that telehealth services will persist or increase (86%), and at least 25% of respondents identified that telehealth will be a permanent delivery option and widely accepted (44%). Clinicians (n = 172) identified a number of recommendations for optimizing telehealth speech and language services, including improved access and funding for telehealth connectivity (47% of respondents), improved access and funding for telehealth technology (35%), and improved access to training for clinicians (26%).

Discussion

Prior to March 2020, the use of telehealth by pediatric SLPs was minimal due in part to regulatory, reimbursement, and technology hurdles as well as barriers to care such as

Figure 1. Views on telehealth.



limited connectivity and negative clinician attitudes toward telehealth (ASHA, 2002, 2011; Fong et al., 2020; Hill & Miller, 2012; Lam et al., 2021; Lustig & Institute of Medicine (U.S.), 2012; McClellan et al., 2020; Mohan et al., 2017; Taylor et al., 2014; Tucker, 2012). Although some aspects of telehealth have remained the same, many others have changed. The results of this study reveal how remote delivery of speech-language pathology services has evolved because of the exponential growth in telehealth use caused by the pandemic.

Before COVID-19, the use of telehealth often was perceived to have a narrow application, such as providing services to children who resided in rural locations (Edwards et al., 2012; Fairweather et al., 2016; Jessiman, 2002). This survey revealed that providers of all education levels and families in all locations (i.e., rural, suburban, and urban) experienced telehealth therapy services during the pandemic. For example, children were able to receive vital therapy services in the safety of their own home, staying with a caregiver, or visiting a family member. For many families, it was the only option they had if they were going to continue services during the pandemic. Fortunately, changes in regulation and medical insurance coverage allowed children from varying socioeconomic backgrounds access to telehealth who previously may have not been granted access.

Survey respondents reported that families had reservations about telehealth, even if it meant their child might go without services. Speech-language clinicians indicated that the most common concerns families had were their child's lack of willingness to participate in therapy sessions and the parent's comfort level with videoconferencing. To exacerbate the problem, respondents reported that even when parents wanted to participate in telehealth, there were families who did not have the resources to do so. Therefore, common telehealth barriers identified prior to March 2020 (COVID-19) continue to persist, such as lack of Internet access in rural areas or lack of funding to provide children with technology (i.e., appropriate devices) or affordable Internet access (Benda et al., 2020). These ongoing technology and connectivity barriers are continuing to prevent willing families and children from accessing vital speech and language services.

Clinicians' attitudes toward telehealth that existed prior to the pandemic, such as questioning the efficacy of telehealth services and concerns about client comfort and willingness to participate in remote services, continued even with the widespread use (Freckmann et al., 2017; Keck & Doarn, 2014; Lustig & Institute of Medicine (U.S.), 2012). SLPs perceived their professional organizations' expressed hesitancy about supporting remote delivery of evaluation or diagnostic services of particular concern (ASHA, 2020c). ASHA has acknowledged that several pediatric assessments lack validity and reliability for administration remotely (ASHA, 2020c; Farmer et al., 2020). Aligning with ASHA, the clinicians' lower ratings on questions about reliability and validity of telehealth assessments revealed the uncertainty many speech-language pathology providers had about the administration of teleassessments. Likewise, clinicians' responses about the ease of telehealth test administration indicated that speech-language clinicians opted to choose an assessment that was easily administered remotely in contrast to modifying test administration. Consequently, it was not surprising that only half of the survey participants reported they had performed teleassessments.

Survey participants who performed remote evaluations reported that they typically evaluated children between the

Table 5. Content analysis: speech-language pathology clinicians' views on telehealth.

Advantages of telehealth (*n* = 190 respondents)	**% of respondents**
accessibility (for client to services, experts)	44.2
family involvement	40.0
safety (for client, clinician)	32.6
convenience (for client, clinician)	30.5
flexibility (scheduling for client and clinician, for attendance)	30.5
reduced travel (for client, clinician)	22.6
efficiency (clinician)	13.2
cost effectiveness (for telehealth services)	3.7
Disadvantages of telehealth (*n* = 194)	**% of respondents**
connectivity	41.8
lack of family support or appropriate environment	36.6
client behaviors	35.1
not substitute for in-person/services needs in-person	32.5
reliability, validity, accuracy of responses	24.2
lack of hardware/software	20.6
audiovisual quality	16.5
lack of infrastructure clinician	9.8
client access to materials	6.2
Future of telehealth (*n* = 172)	**% of respondents**
use will continue, increase	86.1
become a permanent delivery option, widely accepted	44.2
will not replace in-person services	15.1
needs more research	8.1
regulation, insurance coverage continues	7.0
will continue to improve over time	7.0
unknown, questionable, to be determined	2.9
may negatively impact our field	2.3
Optimization of telehealth (*n* = 172)	**% of respondents**
improvement, access, and funding for connectivity	46.5
improvement, access, and funding for technology	34.9
speech-language clinician training	25.6
more telehealth research	15.7
increase in telehealth materials, affordability	15.1
parent involvement and education	13.4
HIPAA–compliant, speech pathology–specific platform	12.2
Improvement in regulation, reimbursement, and standards of practice	12.2
clinician's attitudes toward telehealth	1.0

Note. HIPAA = Health Insurance Portability and Accountability Act.

ages 3 and 11 years, but expressed most difficulty evaluating younger children remotely. Additionally, clinicians reported the most difficulty when performing evaluations of speech sound production and swallowing/feeding. As expected, bachelor-level participants ($n = 12$) responded with similar ratings to evaluation questions in areas, such as speech sounds and receptive and expressive language, but did not respond to questions in other areas, such as swallowing and hearing, for which they likely lacked competency. In general, speech-language clinicians of all education levels judged conditions, such as the social aspects of communication, communication modalities (i.e., AAC training), and speech sound production, as more challenging when taught remotely. Considering the prevalence of children with speech sound disorders and children with autism on a typical pediatric SLP's caseload, it is not surprising that ASHA's May 2020 survey reported that 56% of SLPs considered the telehealth experience challenging (ASHA, 2020b).

Addressing interpersonal skills through a computer screen or determining the accuracy of speech production over a device's speaker may not be optimal to achieve effective outcomes. Clinicians' responses comparing telehealth use to in-person care reveal the uncertainty that some clinicians have about the effectiveness of telehealth when compared with in-person care. Yet, for many children, the benefit of having access to services far outweighs the option of no services at all. Therefore, research will need to be conducted to investigate the future viability of telehealth long after COVID-19 restrictions are gone. Researchers will need to investigate technology that mirrors current, real-world conditions to assess their application in everyday practice (Benda et al., 2020; Sutherland et al., 2016; Taylor et al., 2014).

Historically, speech-language clinicians most often used desktop computers during research studies and to provide telehealth therapy services (e.g., Coufal et al., 2018; Grogan-Johnson et al., 2013). However, one quarter of survey participants reported using multiple devices during therapy sessions. Children, in contrast to clinicians, used more portable devices, such as tablets and cellphones, with almost half of the children using multiple devices (i.e., a computer for one session and a cell phone for another). Researchers such as Isaki and Farrell (2015) and Langbecker et al. (2019) already began to recognize this transition to portable, commercial-grade hardware (i.e., iPads) when investigating telehealth therapy services. However, data on the use of cell phones to provide telehealth services is limited, which is significant considering the number of clients and clinicians who used cell phones for telehealth. Elevated ratings for hardware and software connectivity choices acknowledge the importance of technology choices and their ability to affect therapy outcomes positively or negatively.

The high ratings for audiovisual and connectivity quality indicate an awareness that the audiovisual signal can affect the quality of a therapy session. Considering the importance of the audio signal clinicians receive from their clients, the use of device speakers, in contrast to headphones or external speakers, may not be sufficient. The importance of a clinician's ability to hear and understand a child's speech and articulation compels clinicians and researchers to consider their choice of hardware, as it could positively or negatively affect the reliability of evaluations, the outcomes of treatment, or the validity of a study. Although portable and affordable technology is used by many families, allowing them access to telehealth services in varied environments, the effectiveness of services provided to clients with less-than-optimal technology is unknown. If future research determines that consumer-grade enhancements result in significant improvements, it could be that modestly priced ancillary hardware may be recommended (e.g., gaming headphones with microphones).

In the past, many researchers have used custom-built videoconferencing platforms or specialized software to investigate the remote delivery of therapy services in comparison to in-person intervention (Coufal et al., 2018; Grogan-Johnson et al., 2013). During the pandemic, participants identified a vast array of consumer-grade, videoconferencing options available. Some platforms' unique features, such as screensharing, make providing remote services easier. Not all software options meet HIPAA or FERPA privacy standards, however. For regulations such as HIPAA, a client's personal identifiable information would need to have a Business Associate's Agreement (BAA) in place by the organization or company responsible for storing the data (Bhate et al., 2020). Yet, platforms such as Apple's FaceTime will not enter into such an agreement. Zoom Healthcare and Zoom for Education have a BAA in place; however, the free and regular paid versions of Zoom do not. This is disconcerting considering that four out of five clinicians reported using Zoom. Although the Office of Civil Rights allowed flexibility during the Public Health Emergency, providers were encouraged to avoid several applications due to privacy risks (Severino & Director, 2020). Therefore, clinicians must consider the privacy and security of children receiving remote services as they continue to provide therapy via telehealth postpandemic.

Speech-language clinicians reported many advantages and disadvantages of speech-language services delivered remotely. Benefits of telehealth include improving access to services, involving families in children's therapy, providing safety from the COVID-19 virus, and greater convenience and flexibility. Most clinicians across all levels of education were supportive of this delivery model, with over 86% of survey respondents predicting it will continue into the future. As noted in the Campbell and Goldstein (2021) study, clinicians stated telehealth would become a permanent delivery option, even increasing in use as it becomes more widely accepted. However, some clinicians reported struggling to provide remote therapy services to children during this unprecedented time, with children lacking family support, lacking an environment conducive to telehealth services, or demonstrating behaviors that were difficult to manage remotely. Despite the barriers clinicians identified and struggles clinicians reported, the future of telehealth therapy services still appears bright. Speech-language clinicians do not see the remote delivery of their services replacing in-person care altogether. They recognize it as a viable option, and now, to more children than ever before.

Implications

The current state of telehealth is no longer reflective of its pre-COVID-19 use. Therefore, the results of this study reflect current, real-world practices and help speech-language pathology providers understand how telehealth has evolved, informing clinical practice and future telehealth research and development. For example, survey respondents admitted to providing care to children in settings that were not always conducive to therapy. Some clinicians experienced increased parental involvement, and others stated that parent support was lacking or even nonexistent. Although clinicians may have tolerated less than ideal telehealth environments during the pandemic, these findings demonstrate the need for a baseline requirement for children to participate in postpandemic telehealth services. This threshold may include a quiet setting with limited distractions and adult participation as a requirement.

The range of hardware and software options used by both clinician and client revealed the varying combinations of technology that can potentially be used during a telehealth session. Currently, there is no standard telehealth infrastructure required for therapy services to be rendered. However, respondents recognized that choice of technology can affect the outcome of service delivery and lack of technology was an often-reported barrier to even accessing care. Therefore, a conventional telehealth framework that maintains ecological validity should be established for providing essential services. For example, providers could adopt a minimum device standard (i.e., at least a 10-in.

device screen) and bandwidth as well as external hardware requirement (i.e., headphones) for a child to participate in their services.

Survey respondents noted materials needed to provide therapy services remotely were lacking. Clinicians would hold up testing manuals to a device's camera or retrofit paper materials to adapt to virtual instruction. There is potential for growth in the development of telehealth-based tools that would enable therapy delivered remotely to be easier and more efficient. Clinicians preferred platforms with screensharing capabilities and that were easy for families to use. Advancements in telehealth-based technology could include cost-effective platforms with features clinicians find essential to providing services remotely.

Survey participants' concerns over the lack of telehealth research were prominent throughout the survey. For example, clinicians reported difficulty remotely evaluating younger children and clients with speech sound disorders. AAC interventions were reported to be the least effective when using telehealth. However, it is unknown if the difficulties clinicians experienced or the perceived lack of effectiveness they reported are correlated to a child's condition, age, or services type. Therefore, the results of this survey support the urgent need for telehealth research.

Limitations

Limitations should be considered when interpreting the results of this study. The sample size of 259 is relatively small in relation to the population of pediatric speech-language providers. Additionally, due to the nature of distributing the survey through social media and ASHA's special interest groups, a rate of return could not be calculated. Finally, 33% of the respondents came from the Southeast, which could bias results.

Unfortunately, information on the type of certification or licensure for each survey participant was not collected, but the vast majority (93%) of survey participants had at least a master's degree. Consequently, it is unknown whether views may differ as a function of educational level. However, Campbell and Goldstein (2021) found no differences in current and predicted future use of telehealth as a function of years of experience or education level. Nevertheless, future studies could investigate telehealth use and impressions from the perspective of bachelor degreed clinicians, such as speech-language assistants, to gain further insight into the full spectrum of pediatric speech-language therapy providers.

Finally, the responses to this survey were taken at a single timepoint and thus may not be reflective of the evolving nature of this topic. Moreover, we do not know how well this self-report survey reflects actual practices. Although clinicians' perceptions allow us to generate practical implications, such as the need for minimal standards for telehealth, those implications require empirical investigation.

Conclusions

The unprecedented challenges brought on by the COVID-19 pandemic forced many providers in health care and education settings to immediately consider and implement teleassessments and the delivery of their pediatric speech-language therapy services through synchronous videoconferencing. This survey helps us understand the effect of this sudden, widespread use of remote therapy services on the provision of speech-language services using a telehealth delivery model.

Many survey respondents expressed the opinion that telehealth services were not going to replace in-person care. Yet, they acknowledged the benefits of having the option of remote delivery of services. However, the ability of some children to participate in telehealth services continues to be limited due to persistent barriers, many of which existed before the dramatic increase in telehealth services associated with a pandemic. Future studies should address ways to overcome identified barriers to telehealth, such as limited connectivity, access to technology, and families' comfort level with videoconferencing. Research could investigate and analyze the characteristics of successful telehealth therapy sessions postpandemic, both from the provider and client perspective, to inform future development of a successful telehealth framework.

Perceptions of the effectiveness of evaluation and intervention services administered via synchronous videoconferencing were nuanced. For example, speech-language clinicians had less reservations about providing therapy treatment via synchronous videoconferencing than they did performing evaluations; their reluctance to do teleassessments was notable. Many clinicians reported that future research on telehealth, especially the reliability of standardized assessments, is needed to optimize future telehealth use. Clinicians expressed the need for studies comparing face-to-face and remote delivery of services, including what factors are responsible for differences between the two delivery models. Additionally, speech-language therapy intervention studies should investigate the efficacy of other forms of telehealth content, such as online stimulus materials or asynchronous treatment programs. Both evaluation and treatment research using current telehealth infrastructure is needed to judge its adequacy and sustainability in delivering services remotely beyond the COVID-19 pandemic. The future of regulation and reimbursement is likely to be heavily influenced by the availability of research in this area.

Survey respondents reported the current, real-world technology being used in therapy practice (i.e., hardware and software) and their perceived adequacy when providing telehealth services. Even though speech-language clinicians continue to mainly use computers to deliver remote therapy services, the use of portable devices (i.e., tablets and cellphones) was prevalent among both providers and pediatric clients. Zoom was the most used platform to deliver services in both medical and education settings. This a potentially viable platform if using the HIPAA- and

FERPA-compliant version of Zoom software. Furthermore, both the speech-language clinicians and their clients frequently used the device's built-in microphones and speakers in contrast to external hardware (e.g., headphones). These findings should be taken into consideration as researchers design studies and establish the ecological validity to make research outcomes applicable to daily therapy practice.

Results of this study provide a glimpse of how speech-language pathology services have evolved because of the increase in services being provided remotely. As clinicians were forced to reconsider the scope and utility of telehealth, they have discovered unanticipated benefits of its use, and plan to continue providing care using synchronous videoconferencing. Speech-language clinicians are optimistic that therapy services via telehealth are here to stay (Campbell & Goldstein, 2021; Tohidast et al., 2020). The COVID-19 pandemic most likely has changed the landscape of health care and education forever.

Acknowledgments

The authors would like to thank the telehealth experts who participated in the development of the *Telehealth Services: Pediatric Provider Survey* as well as the individual survey participants who so graciously volunteered their time to respond to the questionnaire.

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