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

Sue Olsen, M.Ed.; Barbara Fiechtl, M.S.; and Sarah Rule, Ph.D.

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

Use of Telecommunications in Human Services

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

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

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

Rationale for Use in Serving Children with Disabilities

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

Potential to Resolve Challenges

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

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

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

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

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

**Feasibility of Virtual Home Visits**

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

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

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

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

**Technology Requirements**

The video and audio quality of the VHV was dependent on the speed of the Internet connection (standard, high quality, or high definition). DSL Internet service is typically slower than cable; however, both systems were rated satisfactory by parents and providers. The performance of a WiFi network connection partially depended on the strength of the radio signal between devices. The USB wireless had frequent video buffering, audio delay, and echo. The satellite IP was twice the cost and was less reliable (signal latency, line of sight issues) than cable or DSL. Internet provider costs in 2010 ranged from
$35/month for dish and cable services, $59/month for wireless cards, and $75/month for satellite service. Installation charges and contracts were negotiated to reduce rates and avoid mandatory contracts.

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

Project Outcomes

Cost Savings

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

Participant Comfort with Technical Skill Requirements

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

Parental Ratings

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

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

Providers' Ratings

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

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

<table>
<thead>
<tr>
<th>Month</th>
<th>VHV* better (%)</th>
<th>VHV same (%)</th>
<th>VHV worse (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January (n = 15)</td>
<td>13</td>
<td>60</td>
<td>27</td>
</tr>
<tr>
<td>February (n = 12)</td>
<td>17</td>
<td>67</td>
<td>17</td>
</tr>
<tr>
<td>March (n = 12)</td>
<td>17</td>
<td>75</td>
<td>17</td>
</tr>
<tr>
<td>April (n = 11)</td>
<td>27</td>
<td>46</td>
<td>27</td>
</tr>
<tr>
<td>May (n = 12)</td>
<td>17</td>
<td>67</td>
<td>17</td>
</tr>
<tr>
<td>June (n = 13)</td>
<td>15</td>
<td>62</td>
<td>23</td>
</tr>
</tbody>
</table>

* VHV = virtual home visit

Parental Satisfaction with Service Delivery

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

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

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

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

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

* VHV = virtual home visit
Virtual Home Visits

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

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

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

Provider Satisfaction with Service Delivery

Information collected from an initial project survey indicated that service providers had varying levels of computer use. Use ranged from occasional use for email, to daily use both personally and professionally. Like parents, service providers were asked to complete surveys about their experience after each VHV and after a sample of three F2F visits (while it was intended that visits occur once a month, some visits had to be rescheduled so the number of visits and therefore surveys completed varied from month to month). During the first year, according to post visit surveys, the 6 responding providers collectively served 12 to 13 families per month over the last 3 months during which VHVs were surveyed. Their mean ratings of satisfaction across these three visits were: very satisfied—32%; somewhat satisfied—47%; somewhat dissatisfied—10%; and very dissatisfied—11%. During Year 2, the 7-9 providers who responded to each survey collectively served 11 to 15 families across the last three consecutive surveyed VHVs. The mean ratings of their satisfaction were: very satisfied—
52%; somewhat satisfied–38%; somewhat dissatisfied–5%; and very dissatisfied–5%.

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

Observed Adult-Child Interactions during F2F and VHV

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

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

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

Observer Training and Interobserver Agreement

Five observers completed training to learn to collect data from recorded F2F visits and VHV s. During training they practiced analyzing recorded visits other than those they later observed. Training continued until they achieved a criterion of 80% agreement or higher across three recordings of different service providers and families. Two observers independently recorded data from 16 of the 81 recorded visits in Year 1 and 22 of the 103 sessions during the Year 2. The
mean percentage of agreement between observers was 82% and 89% in Years 1 and 2, respectively.

Results

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

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

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

There were differences between VHV and F2F visits in several categories of interaction that occurred infrequently. During F2F visits, parents and providers talked more about non-programmatic topics than they did during VHV.
Table 3. Comparison of percentage of intervals of occurrence of various participant behaviors during F2F visits and VHVs

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

* Statistically significant
† GEE = generalized estimating equations
** F2F = face-to-face visit
*** VHV = virtual home visit
‡EI = early intervention
During VHVs they talked more about early intervention program topics, not including discussion of specific strategies to promote development, but about other matters such as children's health and technology. Providers chatted more with children during virtual than F2F visits, generally to engage a child when a parent's attention was diverted to other children or to fetching materials for use in implementing a strategy. Finally, consistent with coaching results, parents talked more with providers about strategies during virtual than F2F visits.

Conclusion

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

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

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

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


280 Olsen, Fiechtl, & Rule


