



OPERATIONAL ASSESSMENT OF STORE-AND-FORWARD TELE-CONSULTATION FOR SUPERVISION OF BEHAVIORAL THERAPY IN AUTISTIC SPECTRUM DISORDERS

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Behavior Imaging
SOLUTIONS
Technology for Behavioral Health



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Abstract

This study assessed the ability of commercially-available Behavior Imaging® technology to assist clinicians in the supervision of remotely-delivered ABA (applied behavior analysis) services.

The Behavior Imaging system consists of a video capture system (“B.I. Capture”) and a remote-controlled camera connected to a HIPAA (Health Information Portability and Accountability Act)-compliant web server hosting a teleconsultation platform (“B.I. CARE”).

The 33 recruited families each had at least one child with autism and a TRICARE beneficiary (TCB), and were receiving ABA services at home or in a clinical environment. Family and tutors, under the direction of ABA therapists, used the Behavior Imaging technology in the home to videoconference, record, or annotate and share sessions on video via B.I. CARE (Consultation and Records Environment). The sessions were then reviewed and annotated remotely by certified ABA therapy supervisors at four autism service agencies. Supervision was provided to designated tutors and family members who delivered ABA therapy when tutors were not available. Pre- and post-assessment questionnaires were administered to clients and therapists to evaluate system utility, usage, perceived effectiveness, strengths, and limitations.

Introduction

Caring Technologies, Inc., (now known as Behavior Imaging Solutions, behaviorimaging.com), in response to Solicitation # F1ATD49141A002, conducted an assessment of the value of an online consultation platform to facilitate delivery of remote Applied Behavior Analysis (ABA) services for autistic children of service members. Caring Technologies recruited families who were already going to receive ABA services with non-certified professionals supervised by certified ABA therapists, and provided them with new technology to facilitate this supervision. This technology is designed to provide an affordable and effective method for uncertified professionals to provide care. Caring Technologies provides Behavior Imaging technology to facilitate the capture and secure web sharing of natural-environment behavior on video with a designated professional who can be anywhere in the world. Doctors and caregivers can spontaneously record, annotate, and communicate patients’ behaviors with selective video clips, including a period of time before and

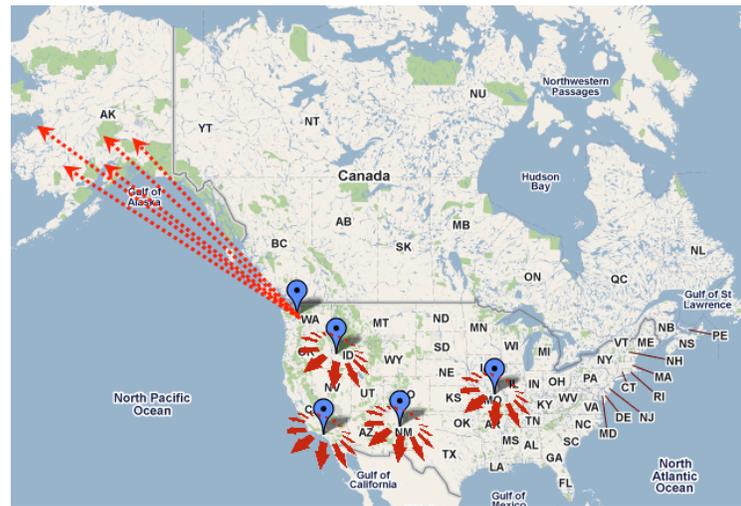
after activation of the capture via a small remote control (akin to “TiVo”). Caregivers can also use consumer-grade “Flip Video®” cameras to capture other exercises that may not be? in convenient view of B.I. Capture.

The rising number of children in military families diagnosed with autism is a significant challenge and makes providing appropriate health care difficult because of the limited number of local expert resources. This lack of access to health care can be partially alleviated through ABA therapy, particularly when delivered remotely through telehealth. Professional certified practitioners – who typically deliver services in person - are in extremely short supply, and benefit from TRICARE reimbursement. Furthermore, TRICARE is exploring whether technology is useful in allowing uncertified professionals to provide care.

Trained paraprofessionals and families were introduced and when appropriate, trained in person by Caring Technologies to use these new tools to either capture the exercises of ABA treatment, or to capture the child’s behavior at any time of day with B.I. Capture (a proprietary , patent-pending tool applied in home and classroom settings). In addition to capturing the video clips, B.I. Capture allows video to be annotated in a uniquely useful manner . The Behavior Imaging store-and-forward technology helps families obtain necessary support and guidance during times of crisis or during an autistic child’s behavior therapy. It also allows tutors and family members (frequently referred to as caregivers) access to supervisors’ and/or specialists’ expertise, even if they are not at a PC at the time that treatment is being administered. Caregivers in this study were also given access to video chat (Skype) to share video and other health data remotely and confidentially with their autism consultants, who supervised them in the management of the child’s condition in a special, secure online environment called B.I. CARE

Caring Technologies assessed the usefulness of this technology for the families and paraprofessionals or uncertified therapists (tutors) working with the child directly, as well as the certified autism consultant(s) who used this technology to consult remotely.

Methodology



Six autism center sites providing ABA therapy to children with autism initially opted to participate in the assessment. Two sites were removed from the assessment, either because they were unable to include TRICARE beneficiaries as clients, or due to administrative constraints that prevented them from providing the required deliverables.

The families and tutors all received pre-configured, laptop-based systems which included:

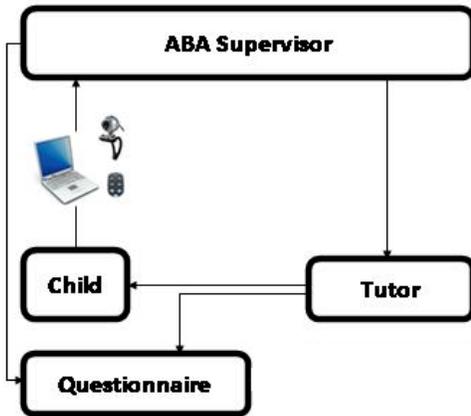
- Digital video camera
- Wireless remote
- B.I. Capture Standard software
- Flip Video® video camera
- Access to Skype video chat & B.I. CARE (online health record and consultation system).

Via select in-person trainings and subsequent webinars, ABA supervisors and tutors were trained on the technologies. Families were mainly introduced and trained by the ABA therapist, and parents were instructed on how to capture structured therapy sessions and behavior incidents with B.I. Capture and Flip Video in the child's home environment, as well as how to auto-upload those video captures to an B.I. CARE online environment account and send/receive messages to/from ABA Specialist.

ABA Specialists were instructed in a similar manner, and were also trained to review therapy/behavior video and how to annotate and organize this data into a client account. Optional

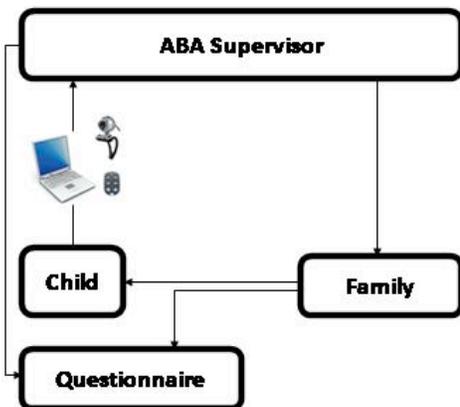
activity was also reviewed with specialists, allowing them to create training/modeling videos to send to tutors/parents, as well as how to upload other data types such as slides, documents and images that could be used as attachments to messages as tools; thereby helping to instruct or clarify when communicating to tutors or parents.

The clinical workflow supported the manner in which ABA Therapists were currently delivering therapy at the sites.



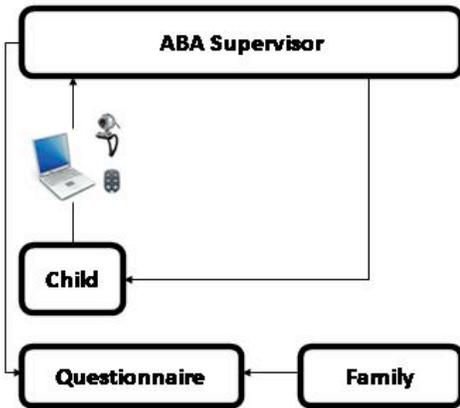
Tutor Supervision:

1. ABA supervisor specifies activities / events to be recorded
2. Tutor interacts with child; sends recording to supervisor
3. ABA supervisor evaluates recording and instructs tutor accordingly



Family Supervision:

1. ABA supervisor specifies activities / events to be recorded
2. Family interacts with child; sends recording to supervisor
3. ABA supervisor evaluates recording and instructs family accordingly



Direct Client Support:

1. ABA supervisor instructs child to record select activities and events
2. Child records selected events and sends to ABA supervisor
3. ABA supervisor monitors behavioral progress

Participants / Usage

Of the families and tutors who agreed to use the technology during the assessment period, the following table illustrates how far they were traveling to access ABA therapy.

QUESTION: How far do you currently travel to receive or provide therapy?

Do not need to travel	19
About 25 miles	8
25 - 50 miles	7
50 - 100 miles	5
More than 100 miles*	3

* furthest distance was 2290 miles (Seattle to Anchorage)

See Appendix B for further information.

In a pre-assessment survey, all 5 ABA supervisors responded that they have current, unrestricted, state-issued licenses to provide ABA services; currently serve TRICARE beneficiaries; and that they provide certified ABA therapy; and supervise non-certified therapists.

Clinical Sites / ABA Supervisors

	<i>ABA Supervisors</i>	<i>Tutors / Families with TCB</i>
Pacific Child and Family Associates	2	2 (tutors)
Intermountain Center for Autism	1	12
Thompson Center for Autism	1	2 (tutors)
Advantage Learning Group Inc	1	15 (5 tutors)

See Appendix A for further information.

Usage

B.I. CARE calculated the number of times ABA therapists used the online tool to review or interact with their tutors / families / clients for up to three months of the assessment period. Qualitative statements on questionnaires and quantitative records of calls to the company’s technical support staff produced the B.I. Capture equipment usage estimates. No sites used the video chat functionality (Skype) during the assessment period.

	Product Use During Assessment Period	
	ABA Supervisor	Families & Tutors
	# of B.I. CARE visits	est. % who used B.I Capture or Flip V.
Pacific Child and Family Associates	63	100
Intermountain Center for Autism	35	60
Thompson Center for Autism	15	100
Advantage Learning Group Inc	13	70

Results

ABA supervisors (n=5) responded in the following manner to questions relating to their experience with the technology

- Clinically sound methods 100%
- Effective delivery of services 80%
- High value 100%
- Maintain good client relations 100%
- Ease of use 100%

See Appendix C for detailed information, and additional qualitative statements.

Families / tutors (n=33) responded in the following manner to questions relating to their experience with the technology and their intentions to use it in the future:

- o Good therapy support 75%
- o Good clinical support 76%
- o Ease of use 73%
- o Want to continue with technology 85%

See Appendix D for detailed information, and additional qualitative statements.

Strengths and weaknesses

The ABA supervisors identified the following strengths, based on an open-ended, unprompted question:

- Can see Behavior data otherwise difficult or impossible to observe
- Supervisors were able to access Behavior data otherwise difficult or impossible to observe
- Used to improve in-house staff learning on client needs
- Used to provide parent training in which parents could learn from video captures of therapist working with child
- Quality online support - questions/concerns were addressed in a timely and effective manner.

See Appendix C for further information and additional qualitative statements.

The families / tutors identified the following strengths, based on an open-ended, unprompted question:

- This should quicken diagnosis, access to intervention
- Easy to use
- Improved diagnosis: tutors & supervisors access more evidence of what occurs at home
- Significantly increased the volume of interaction between family and tutor and/or therapist.
- Reduced the burden of trying to explain the issues that occur in the home by giving families the chance to both show and tell, rather than just tell.
- Families were able to share behavioral data with other professionals that were participating in the care of the patient.
- Families and tutors expressed a desire to continue leveraging the technology as a result of participating in the pilot and the advantages gained through improved interactions.

See Appendix D for further information and additional qualitative statements.

The ABA supervisors identified the following weaknesses, based on an open-ended, unprompted question :

- Need more time to adopt into practice
- Online communication environment can be more intuitive to use

See Appendix C for further information and additional qualitative statements.

The families/tutors identified the following weaknesses, based on an open-ended, unprompted question :

- Slow video uploads
- Requires better training for families

See Appendix D for further information and additional qualitative statements.

Analysis

The results of the study demonstrate that the use of Behavior Imaging by therapists as well as by the families is best accomplished through personal attention, training, and on-going technology support for the users. Families expect their therapists to take an active role in the use of the Behavior Imaging technology. Conversely, therapists expect their clients to be active partners in the utilization of this technology. If either the family or the therapist is unable to make such a commitment to this technology, the benefits to the clients and the families are diminished. However, when both parties are engaged, several benefits are achieved, including:

- Significant times savings for the therapist and the family
- More relevant information communicated to the caregiver and therapist
- Better understanding by the therapist supervisor of the child's complex behaviors
- More accurate assessments of a child's progress
- More effective supervision of therapist in the field
- More complete and more concise documentation of a child's progress over time

Based on this assessment, military families with autistic children appear to be “ideal” candidates for adopting such Behavior Imaging technology. Because military families often have limited access to certified healthcare providers and therapists, this technology can provide those families with an important tool that will provide access to the services of trained therapists remotely and cost effectively. TRICARE-affiliated autism centers could serve as initial providers of these services through their extensive network of military families and certified therapists.

Conclusion

The study identified tangible benefits in the use of Behavior Imaging technology to remotely monitor the effectiveness of ABA services. Both providers and families embraced the new technology and found it to be effective in understanding and supporting the therapy provided to their autistic child. The shortcomings of the technology were limited to issues related to the training provided to the therapists and families. Nevertheless, the technology is functional and beneficial and will be optimally suited for deployment when the minor enhancements identified in this study have been incorporated.

Additional Considerations

Based on the findings of this operational assessment, and recognizing the unbiased nature of our role as the technology developer / provider, we respectfully pose the following issues for consideration:

- If the viability and potential benefits of this methodology are accepted, should TRICARE be approached regarding reimbursement for beneficiaries, in order to facilitate broader deployment?
- Based on expressed interest from providers and families – including families being relocated and those in remote locations without access to therapists – should the assessment be extended in scope and duration, in order to identify longer-term and other appropriate benefits?
- Should the assessment be extended to explore the technology’s other potential applications, including referrals and access to primary care physicians and / or special education professionals?
- Should a separate assessment be considered, involving the application of the technology for sites involved in medical training, PTSD treatment and other programs that may benefit?

APPENDIX A: Pre-assessment ABA Supervisors' survey:

Note: all ABA supervisors responded that they have current, unrestricted, state-issued licenses to provide ABA services; currently serve TRICARE beneficiaries; provide certified ABA therapy; and supervise non-certified therapists.

Do you currently provide any distance-based therapy to clients?		
Yes	2	40%
No	3	60%

Have you ever used telecommunications equipment to provide service to your clients?		
Yes	2	40%
No	3	60%
Qualitative responses		

	<i>Skype for supervision for individual and family sessions</i>	

Assessment Sites

Cara Entz
 Pacific Child and Family Associates
 410 Arden Avenue, Suite 201
 Glendale, CA 91203

Sheri Kingsdorf
 Pacific Child and Family Associates
 1420 Carlisle Blvd NE #100
 Albuquerque, NM 87110

Tyler Whitney
 Intermountain Center for Autism & Child Development
 2273 E. Gala St. Suite 120
 Meridian Idaho, 83642

Anna Neises

Thompson Center for Autism & Neurodevelopmental Disorders

300 Portland Street, Suite 110

Columbia, MO

Neil Dorn

Advantage Learning Group

9326 185th Drive SE

Snohomish, WA 98290-6386

APPENDIX B: Pre-Assessment Family / Tutor Survey

42 (tutors / family members) caregivers complete a pre-assessment survey. 41 confirmed that they were caregivers for children with autism as either parents (32) or tutors who work for the remote Certified ABA therapist (9).

In response to “How long has your child (or children) in your care received individualized, one-on-one, instruction / ABA therapy at home or in the classroom?”

Never	6
Less than 1 year	18
Between 1 - 2 years	7
Between 2 - 3 years	1
More than 3 years	9

How far do you currently travel to receive or provide therapy?

Do not need to travel	19
About 25 miles	8
25 - 50 miles	7
50 - 100 miles	5
More than 100 miles*	3

* furthest distance was 2,469 miles (Seattle to Anchorage)

How often do you receive therapy?

Have not received therapy yet	5
Once a week	13
Twice a week	3
Three times a week	6
Four times a week	3
Five times a week	6
Seven times a week	3
Other	2

What is your child's current diagnosis? Of those who responded...

mild autism	1
autism	14
PDD-NOS	2
autism, comorbid	3
Not specified	22
Total:	42

Note: 12 did not state current diagnosis.

10 caregivers either dropped out or did not complete the post-assessment survey as of October 1, 2010.

APPENDIX C: Post-assessment ABA Supervisors' survey:

6. Were you able to deliver/supervise therapy in a clinically sound manner? Actions ▾			
Yes		5	100%
No		0	0%

7. Did the BI Capture / BI Care systems help you in preparing for therapy and / or help you in delivering therapy? Actions ▾			
Yes		4	80%
No		0	0%
Not able to determine		1	20%
Please elaborate		0	0%
Total		5	100%

8. Do you believe your client obtained adequate value from the sessions? Actions ▾			
Yes		5	100%
No		0	0%
Not able to determine		0	0%

Qualitative Comments:

- My clients were able to go back to the video of therapy sessions to review and learn from how the therapist worked with their child.

9. Were you able to maintain an adequate patient/therapist relationship? Actions ▾			
Yes		5	100%
No		0	0%
Please elaborate: View Responses		1	20%

Qualitative Comments:

- I was able to see things with the system that I would have never been able to see before. This made it much better for communication and training.

10. Was the software supportive for the process? Actions ▾			
Yes		5	100%
No		0	0%
Please elaborate: View Responses		1	20%

11. Were you able to view the videos and use the tagging, keyword and comment functionality? Actions ▾			
Yes		5	100%
No		0	0%
Please elaborate: View Responses		1	20%

Qualitative Comments:

- Need to use system more to blend into my workflow, but I see the potential to more in less time.

12. Was the communication functionality valuable to clients?		Actions ▼	
Yes		5	100%
No		0	0%
Unable to determine		0	0%
Please elaborate		0	0%
Total		5	100%

13. Was the communication functionality valuable to fellow professionals?		Actions ▼	
Yes		4	80%
No		0	0%
Not able to determine		0	0%
Please elaborate View Responses		1	20%
Total		5	100%

Qualitative Comments:

- Only used it briefly with inhouse staff so far (to teach them faster about client needs), but I can imagine sharing with medical professionals re pharmacological responses would be extremely helpful

14. What recommendations do you have for improvement?		Actions ▼	
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Qualitative Comments:

- i wish the uploading would be faster, especially using the flip video. And I would see benefit in finding easier ways to view the videos that have been sent via the BI system from computers without Internet connections.
- Mainly in the way we and our clients get introduced and trained; I underestimated this to some degree. It took us the assessment period (which summertime was not our clinic's best time to do this) to start realizing how to use the technology to effectively interact and efficiently supervise ongoing treatment, and THEN the clinical value became apparent.
- It would be easier if the B.I. CARE and B.I. Capture were one product. I would also like to be able to fast forward by 2x, 8x, 16x as I watch the video to scan through the data faster.
- I would better qualify the family. This would help us to better understand the families restraints.
- I liked the system but a little complex for our team. We might need even more training than what we got.
- i wish the uploading would be faster, especially using the flip video.

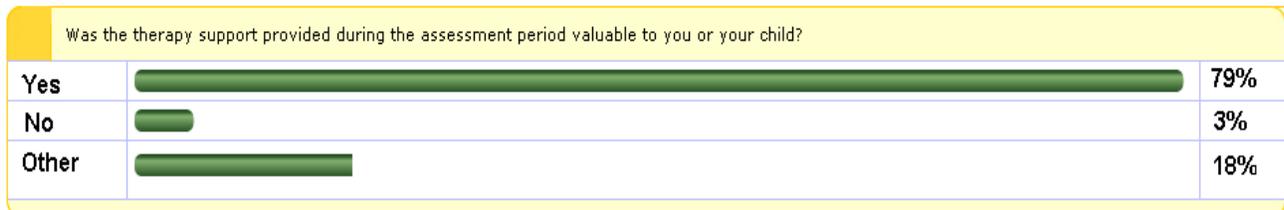
15. Any comments you would like to share:		Actions ▼	
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Qualitative Comments:

- I would see benefit in finding easier ways to view the videos that have been sent via the BI system from computers without Internet connections. We found the Behavior Imaging technology especially helpful when we had a change in tutors working with a family, to accelerate their training to maintain proper ABA therapy. Found technology to be helpful in training new tutors entering our agency and being assigned to any cases
- I have several clients who after being part of this assessment, I will insist that we continue to use the technology to maintain progress. Another family is insisting to keep using this online communication vehicle, because they will soon be relocated across the country, and know their son's transition will necessitate consistency that our clinical services will provide through this technology. I also see other applications in forensics, academic and community programs that should be investigated to improve behavior health services.
- This was especially helpful for my clients who are in rural Alaska.

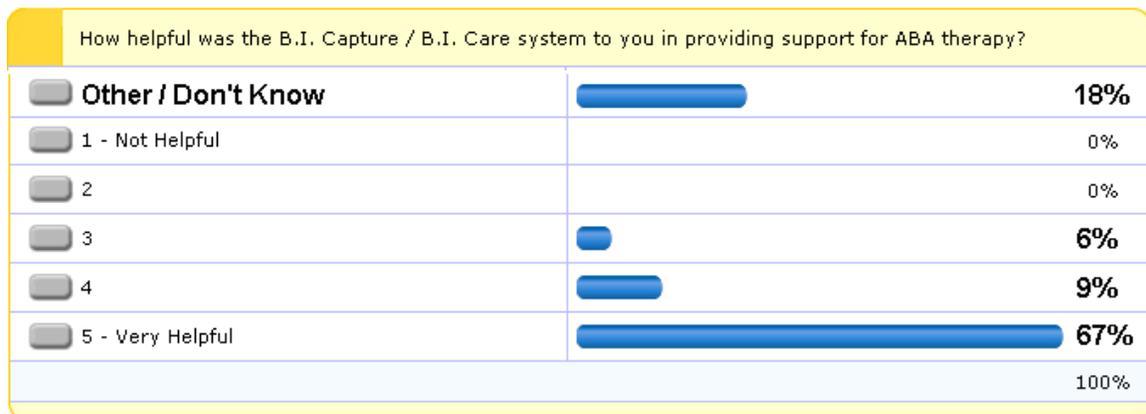
APPENDIX D: Post-assessment Family / Tutor survey:

From pre-assessment questionnaires, ten respondents were discarded due to either due to duplication, multiple family members, or clients not qualifying for the assessment. Of the remaining 33, post-assessment questionnaire responses are summarized below. "Other" refers to respondents who did not answer the question, or indicated that they did not know the answer.



Qualitative Comments:

- We learned a lot about our child's behavior!
- My BCBA is able to observe tantrums, their antecedents, as well as my parenting behavior using this technology! That is great!
- Yes, you can train someone else and show someone else what happened.
- It was a huge help for my tutors and the BCBA to share videos and discuss their therapy techniques!
- I got to see videos after the sessions, and share them with my BCBA supervisor.
- Technology was not helpful because we have in-person access.
- allows physician to see behavior outside class
- My son is 17 and not severe on the autism scale. This system would have been wonderful for Joey when he was younger.
- If my daughter were trained in this, she would really benefit from communicating with her therapist.
- Capture behavior moments to discuss appropriate plan of care with therapist
- This is the kind of product which could have saved our child and family so much pain and confusion. Just to be able to "capture" moments in time, what is around him during the time of trouble or stress. For our child to be able to show in "real time" what is happening to him is extremely valuable. We look at this as an opportunity to "see into" our child's world. Especially when our child is able to capture the moments when he is out of our direct supervision. Our child's need to understand the "social" world around him as he enters adulthood is imperative.
- Yes, I was able to communicate with my supervisor about specific behaviors. He could watch the videos from Washington even though I am in Alaska! Amazing!



Did the therapy support provided to you or your child assist in progress of the child?		
Yes		85%
No		0%
Other		15%

Qualitative Comments:

- It helps the whole family to change our behavior, including my son with Autism.
- The software helps the people who help him, and it helps him to view his own behavior.
- If we can get it figured out better, then it will be great.
- The BCBA is in WA and we are in Alaska. This was a cool way to solve the problem of video sharing.
- it allows the doctor to communicate and get visual input on the patient outside of the doctor's office
- This won't replace the inperson sessions, but it is a good add-on
- allow quicker return time of suggestion on how to modify behavior instead of waiting till next appt.
- As I'm an early childhood special education teacher, this system would be great for many of my preschoolers.
- So many moments of concern never come out during office visits. Doctors can get a better (full rounded) picture of child's abilities - weaknesses.

Do you think that Behavior Imaging did or could improve the way the ABA therapist is able to provide support?		
Yes		79%
No		3%
Other		18%

Qualitative Comments:

- This allows the BCBA to observe his tantrums even though we live in Alaska, and he lives in Washington.
- Yes, so my therapists can all watch each other's style of doing ABA.
- In so far that it helps the therapists communicate, and helping other therapists learn from each other.
- If they could make it so you did not have to type in the BCBA's email address everytime - just automatically upload and email it to him.
- I wish it was all set up together in one system. Like if there was a camcorder that could do all of this instead of a computer.
- Absolutely
- see behavior outside clinic and no longer describing
- The recipient needs more training on the system.
- Visual strategies of treatment can be stored and visited over and over

How easy / hard was the system for you to use?		
1 1- Hard		0%
2 2		3%
3 3		9%
4 4		21%
5 5 - Easy		52%
Other / Don't Know		15%
		100%

Was the therapist able to address your questions or concerns adequately?		
Yes		82%
No		0%
Other		18%

Qualitative Comments:

- He was able to view sessions even though he lives far away.
- again - the therapist could view video of the child - really see the child in action.

Would you like to continue therapy in this way?		
Yes		85%
No		0%
Other		15%

Qualitative Comments:

- It is really helpful because there are always things that happen when the supervisor is not around.
- Especially for the students who don't understand that a camera is recording them.
- I would want to continue but my wife is not technical and doesn't feel as comfortable using the product.
- I would but my wife might not. She is not technical.
- Yes, if it is in addition to inperson appointments. Or to keep therapist from changing our appointment because he needed to travel to handle another client's crisis (and may have been able to address this thru B.I. CARE)
- PSC'ing in Dec.- would like to use system with move to stay in contact with provider
- I shared video with other care providers as well.
- Our son has been severely traumatized and having the doctor this close - will help him heal. Since our family has experienced so much trauma at this time - it is vital that the doctor is able to observe important exchanges interfamily and community.

Was the online tool, B.I. CARE, easy enough to use in viewing the videos?		
Yes		79%
No		3%
Other		18%

If available, would you use the software to continue to work with your therapist?		
Yes		76%
No		6%
Other		18%

Qualitative Comments:

- My sons needs will always be changing, so I want to continue to access
- We'd love if Ryan could use this as support during college.
 - To support him once he goes to school, this will be very helpful especially for upcoming move