Evaluation of a Brief Family-Centered Service Provision Model for Treating Children's Severe Behavior: A Retrospective Consecutive Case Series Analysis

Collin Shepley¹ · Sally B. Shepley¹ · R. Allan Allday¹ · Melanie Tyner-Wilson² · Daniel Larrow²

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Abstract

This article serves as an initial program evaluation of a service provision model for providing applied behavior analysis services to families with severe behavior needs. A retrospective consecutive case series design was used to evaluate the effectiveness, feasibility, and cost of the model. We analyzed records for all families served through the model from summer 2017 to fall 2018. A total of 55 families received services, with 87% of children having autism and 63% having an intellectual disability. Within-participant single-case experimental designs were used to evaluate the clinic's assessment procedures, and caregiver interviews were used to evaluate the feasibility and effectiveness of developed and implemented treatments. Conclusive assessment results were obtained for approximately 69% of children. For families that received treatment, 92% reported improved child behavior. Intent-to-treat analyses that included families that withdrew from services prior to receiving treatment indicated that 61% of families experienced improved child behavior. Assessment and treatment outcomes for families that attended all appointments are commensurate with those of other similar clinics reported in the literature; however, the percentage of families that withdrew from services is substantially higher. For families adhering to the clinic's services, children's challenging behavior may be effectively assessed and treated through brief outpatient contacts utilizing services based on applied behavior analysis.

Keywords Applied behavior analysis · Autism · Functional analysis · Program evaluation · Severe behavior

Program evaluations should be conducted to obtain an unbiased determination regarding the extent to which a program's stakeholders find that a program is achieving its intended purpose (Miller, 2017). For community-based providers of applied behavior analysis (ABA) services, stakeholders include the children and families receiving services. The utility of program evaluation is that the collected information may be

used to improve a program's future activities (CDC, 2011). Across community-based ABA providers, such activities pertain to the assessment, development, and implementation of behavioral interventions and treatments. The relevance of program evaluation for community-based ABA providers has increased in recent years, as health insurance providers across the United States offer coverage for treatments based on ABA for children with autism, thus making services more accessible for many families. Although methods for analyzing data collected by community-based ABA providers for program evaluation purposes have been proposed (Burns, 2015), there is little evidence to suggest such evaluations are being conducted and shared via publication or presentation (Miller, 2017; cf. Dixon et al., 2017; Leaf et al., 2011).

Program evaluation often differs from research, given that services or interventions provided by a program will continue after the evaluation is complete. In contrast, in research the services or interventions administered within a study are often available only for the duration of that research project. In addition, program evaluation seeks to gather and collectively

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✉ Collin Shepley
collinshepley@uky.edu

¹ Department of Early Childhood, Special Education, and Rehabilitation Counseling, College of Education, University of Kentucky, 229 Taylor Education Building, Lexington, KY 40506, USA

² Developmental-Behavioral Pediatrics, College of Medicine, University of Kentucky, Lexington, KY, USA

analyze data from all relevant stakeholders, whereas research studies may have one primary data source on which decisions about the project are based (e.g., direct observation data of child behavior used to determine when to modify the intervention or change conditions). By collecting data from multiple sources (e.g., children, caregivers) and by collecting multiple types of data (e.g., quantitative observational data and qualitative interview data), the results from program evaluations provide stakeholders with meaningful information about a program's inputs, activities, and outcomes, so that changes to that program may be considered to better ensure the program is achieving its intended purpose. For example, community-based ABA programs do not operate for the sole purpose of teaching a child a specific sequence of skills or increasing a child's IQ. Rather, as stressed in Wolf's (1978) seminal writing, the goals, procedures, and effects of ABA services should be socially significant, appropriate, and important. If a community-based program solely examined child outcome data collected through observation when conducting a program evaluation, an understanding of the social significance of any improvement in the child's behavior would be unclear. Information from caregivers about improvements in the family's daily life is critical to assist providers in determining if the changes observed across the child's outcome data were socially important.

This notion of collecting and analyzing data for the purpose of making informed decisions about a program's activities highlights another significant difference between program evaluation and research activities. Within research, an investigator is attempting to contribute to a body of knowledge. Although some research may be conducted to inform decisions made by providers (e.g., meta-analysis to identify effective treatments for pica), research is generally not evaluating a specific program that is actively providing services. In program evaluation, the purpose is to collect data that can inform the activities of that program. As it pertains to community-based providers of ABA services, program evaluation involving all stakeholders is essential to ensuring that the goals, procedures, and effects of the providers' services are socially significant, appropriate, and important.

The purpose of this article is to present a program evaluation of a community-based outpatient severe behavior clinic (SBC) located in the southeastern United States. The SBC employed a brief family-centered service provision model that was developed specifically for use within the clinic to meet the unique needs of the surrounding communities. The SBC was operated in collaboration with a university-based hospital's developmental-behavioral pediatric clinic. The primary goals of the SBC were to reliably assess the functions of a child's severe behavior and train caregivers to implement a behavioral treatment plan resulting in improved child behavior in the family's home environment.

Method

Participants

Children and Families The data reported in this evaluation are from patient records, whereby all patients from the SBC's first 18 months in operation were reviewed. During this time, the SBC served 55 children and families. Families were referred for services by pediatricians from the affiliated university-based hospital. Information on the children served through the SBC is presented in Table 1.

Supervisors and Therapists ABA providers within the SBC were faculty members or doctoral-level scholars of the university's ABA program and were Board Certified Behavior Analysts having fulfilled supervision requirements established by the Behavior Analyst Certification Board. These providers were *supervisors* within the clinic and oversaw all aspects of a family's services. *Therapists*, who were master's-level scholars enrolled in the university's ABA, special education, or school psychology program and were accruing experience hours to sit for the Board Certified Behavior Analyst examination, assisted the supervisors.

Setting

The SBC was housed in a 206 m² freestanding building owned by the university and located adjacent to the university-based hospital. The building was equipped with video observation technology across assessment and therapy rooms allowing for simultaneous observation of therapists working with caregivers and children. In addition, the assessment room contained a one-way mirror for in vivo observation. One to three families were seen at the SBC during each day in operation when the university's academic semester was in session.

Service Provision Model

The SBC provided a structured sequence of five appointments to each family free of charge. All appointments were scheduled 1 to 2 weeks apart, except for the fifth appointment, which was approximately one month after the fourth appointment. Before the first appointment, caregivers completed an intake questionnaire that provided SBC personnel with information on a child's medical history, communication abilities, independence in daily routines, and environmental conditions surrounding challenging behavior. At the first appointment, therapists conducted a semistructured interview with caregivers to collaboratively identify behaviors to target during the admission. More than one behavior was targeted if it was determined that the behaviors were functionally equivalent. Once a target behavior was selected, therapists continued the

Table 1 Child Information

Variable Categories	#	% ^a
Admissions		
Total	55	100.0
Completed	45	80.0
In progress	10	20.0
Age		
Preschool (0–5 years)	19	36.5
Elementary school (6–12 years)	26	50.0
Middle and high school (13+ years)	7	5.13
Sex		
Female	9	16.4
Male	46	83.6
Diagnoses or eligibilities		
Autism	48	87.3
Intellectual disability ^b	35	63.6
Autism and intellectual disability ^b	31	56.4
Other	3	5.5
Has an individualized education plan or individualized family service plan		
Yes	43	86.0
No	5	10.0
Caregiver unsure	2	4.0
Has a behavior intervention plan through school		
Yes	5	11.6
No	18	41.9
Caregiver unsure	20	46.5
Additional services received		
Speech-language therapy	43	87.8
Occupational therapy	42	80.8
Physical therapy	8	17.0
Other	6	12.5
Takes prescribed medication		
Yes	35	64.8
No	19	35.2
Target behavior(s) puts client or others in physical danger		
Yes	38	69.1
No	17	30.9

^a The percentage of total admissions without missing data for the row variable. ^b Caregiver-reported child communication and imitation skills are used as a proxy for the presence of intellectual disability if not specifically reported.

interview with open-ended questions to gather information about the specific conditions under which the behavior did and did not occur, as well as typical changes in the environment that followed the behavior's occurrence. During the interview, different therapists conducted a series of naturalistic play-based assessments with the child in a separate room to evaluate preferences and communication abilities.

At the second appointment, therapists conducted or trained caregivers to conduct a series of functional analyses (FAs) to identify the maintaining functions of a child's challenging behavior. The conditions and procedures for each FA were individualized based on data obtained during the first appointment. After the second appointment and prior to the third appointment, therapists used FA data to develop a reinforcement-based treatment plan and data collection system. Procedures and dosages of treatment plans were individualized to each family, with dosages generally limited to 10 min per day (see Wacker et al., 1998). At the third appointment, therapists used behavioral skills training to teach caregivers how to implement the treatment plan and collect data. When possible, different therapists in a separate room implemented the treatment plan with the child while caregivers watched through video observation. The observation of the treatment plan was used for caregiver training purposes (i.e., modeling of treatment procedures) and assessed the treatment's ecological validity. For example, following observation, caregivers may have indicated that aspects of the treatment were likely not feasible in their daily lives, which allowed therapists to adjust treatment procedures to better fit within the family's daily routine and abilities.

At the fourth appointment, therapists conducted an interview with the caregivers to determine the extent to which the treatment was feasible and resulted in the desired change in child behavior. Parent-collected data were also examined. After the interview, caregivers described and modeled their implementation of the treatment. Based on caregiver implementation, therapists provided retraining or expanded on the treatment. The fifth appointment was identical to the fourth appointment. If, at the fifth appointment, procedures were being implemented with fidelity and desired changes in child behavior were reported, the therapists discussed strategies for promoting the generalization of child behavior to new settings and activities.

Outcomes

Functional Analysis FAs employing multielement single-case experimental designs were conducted to identify the functions of each child's target challenging behavior (Hanley, Jin, Vanselow, & Hanratty, 2014; Wacker, Berg, Harding, & Cooper-Brown, 2004). All FAs used 5-min conditions, in which test conditions were paired with a matched control condition. Based on caregiver input provided throughout conditions, sequential modifications were made to the analyses (Hammond, Iwata, Rooker, Fritz, & Bloom, 2013; Kurtz, Fodstad, Huete, & Hagopian, 2013). Interobserver agreement data were collected in vivo throughout FA conditions and evaluated using formative assessment methods after each session, allowing for proactive remediation of any data collection issues (e.g., bias, observer drift, ambiguous definition, human

error) prior to the completion of a child's FA (Chazin, Ledford, Barton, & Osborne, 2018).

Differentiation was the primary outcome for each child's FAs and was defined as no overlapping data points between a test and a control condition with at least one replication of the effect (see Fig. 1). Differentiation was coded as a dichotomous variable for each child (1 = differentiation, 0 = no differentiation). We also coded if a target challenging behavior was evoked during a child's FAs (1 = evoked, 0 = not evoked). Descriptive statistics (i.e., frequencies and percentages) were analyzed.

Effectiveness and Feasibility Interviews To assess the effectiveness and feasibility of treatments developed based on FA results, therapists conducted a semistructured interview with caregivers during their fourth and fifth appointments. The use of interviews allowed for an evaluation of the treatment's feasibility and the clinical significance of any changes to behavior (Scheithauer et al., 2019). Although recommended (e.g., Baer & Schwartz, 1991), such evaluations are rarely conducted in experimental studies targeting severe behavior (Brosnan & Healy, 2011). When these evaluations are conducted, they typically use stakeholder-completed rating scales (Machalicek, O'Reilly, Beretvas, Sigafos, & Lancioni, 2007), which are of minimal use to community-based providers of ABA services. Such ratings do not provide information about changes the providers should make to improve their services (Ledford, Hall, Conder, & Lane, 2016). In contrast, interviews utilizing open-ended questions allow for the identification of nuanced caregiver issues with treatments (e.g., treatment acceptability) and potential modifications (Park & Blair, 2019). Regarding the frequent use of direct behavioral observation data within outpatient clinics targeting severe behavior, the utility of these data is generally limited to assessing a treatment's *efficacy* (i.e., "the results of a systematic evaluation of [an] intervention in a controlled clinical research context"; Barlow, 1996, p. 1053) rather than its *effectiveness* (i.e., the impact of an intervention under "real-world" conditions; Shepherd, Csako, Landon, Goedeke, & Ty, 2018), although there are notable exceptions (Chung, Snodgrass, Meadan, Akamoglu, & Halle, 2016). Furthermore, numerous studies have highlighted concerns surrounding the sole use of behavioral observation data to draw conclusions about a treatment's feasibility and subsequent generality of effects (Chung et al., 2016; Scheithauer et al., 2019; Strain, Baron, & Dunlap, 2012). We refer readers to Scheithauer et al. (2019) for further discussion on using data collected through caregiver interviews to inform treatment effectiveness within the context of a clinic-based model for providing ABA services to treat severe behavior.

During each interview conducted at the SBC, the first structured question asked was "How is [child's target behavior]?" (e.g., "How are CJ's meltdowns?"). The second structured

Fig. 1 Hypothetical graphs depicting functional analysis outcomes

question asked was "How are you doing with the procedures?" At a family's fifth appointment, therapists asked a third structured question: "Are you going to continue using the procedures?" Based on caregiver responses to these questions, additional information related to the feasibility and effectiveness of a treatment was requested (e.g., "Walk me through your use of the treatment one day last week," "Describe how your child responded during treatment yesterday."). Anecdotal notes were taken throughout the interviews. Following interviews, caregiver responses were aggregated and coded into categories. Coding was completed by two therapists, with rationales and disagreements reviewed by a supervisor.

Caregiver responses that were related to treatment effectiveness were coded to indicate that a child's behavior was *worse*, *same*, or *improving*. A code of *worse* indicated that caregivers reported contratherapeutic changes in a dimension of the target behavior. *Same* indicated that there were no reported therapeutic or contratherapeutic changes in any dimension of the target behavior. *Improving* indicated therapeutic changes in a dimension of the target behavior and no reported contratherapeutic changes in any dimension of the behavior. Regarding treatment feasibility, caregiver responses were coded to indicate that procedures were *too difficult to do*, *OK some of the time*, or *easy to embed*. A code of *easy to embed* indicated that there were no reported issues related to any specific steps of the procedures or the dosage at which the treatment was to be implemented. *OK some of the time* indicated that there was an issue with either the steps of the procedures or the dosage at which the treatment was to be provided. *Too difficult to do* indicated that there were reported issues related to both the procedures and the dosage. Caregiver responses regarding their continuance of the treatment were coded to indicate *yes*, caregivers would continue using the treatment, or *no*, caregivers would not continue using the treatment. Descriptive statistics were reported and analyzed.

In addition, we conducted treatment-on-the-treated and intent-to-treat analyses. The treatment-on-the-treated analysis included families that received assessment *and* treatment services as indicated by a family attending at least one follow-up appointment following the receipt of caregiver training. The intent-to-treat analysis included all families with completed admissions to the SBC, regardless of the point in time at which they may have withdrawn from services. The critical difference between our treatment-on-the-treated and intent-to-treat analyses is that families who withdrew from services prior to ever receiving training on a treatment were included in the intent-to-treat analysis, but they were not included in the treatment-on-the-treated analysis. For some readers, this distinction may be similar to studies examining the effect of an intervention when attritors are omitted (i.e., treatment-on-the-treated) and included (i.e., intent-to-treat). By including *all* families that received services through the SBC, the intent-to-treat analysis provides a less biased measure of the SBC's impact within the community than the treatment-on-the-treated analysis (Murnane & Willet, 2010).

Adherence For families with completed admissions to the SBC, adherence to services was measured during a family's initial follow-up appointment (i.e., fourth appointment). We counted the number of appointments attended, number of cancellations, number of families that withdrew from services, and total duration in months from the first appointment a family attended to the last appointment attended. Descriptive statistics were analyzed.

Cost Costs were calculated at the family and university levels (Lindgren et al., 2016). Although the SBC's services were free to families, we report estimated family income lost due to time off from work and driving expenses, given that the clinic frequently served families living in rural areas of our state. To calculate family costs, we used the average yearly income per capita in our state and a driving cost of \$0.54 per mile. In addition, we report the hypothetical costs of our ABA services for all five appointments using disclosed reimbursement rates of local ABA providers. University-level costs included data-management software, videoconferencing software, computer hardware, videoconferencing hardware, printer hardware, building maintenance, building utilities, custodial services, personnel training on protective procedures, and faculty time. All costs were calculated to reflect the cost per family served by the SBC. A further breakdown of costs is included in the [Supplemental Materials](#).

Design

The data for this evaluation were analyzed within a retrospective consecutive case series design (Hagopian, 2020). The consecutive case series design requires that (a) all participants meeting a study's inclusion criteria receive treatment and (b) the participants receive the treatment based on the order in which they are determined to meet those inclusion criteria. Assessment data (i.e., FAs) were collected and visually analyzed using within-participant multielement single-case experimental designs in which each participant served as his or her own control. Feasibility and effectiveness data were collected through caregiver interviews gathered at multiple time points; there was not a control group. Data from interviews were coded into predefined categories for reporting purposes; descriptive statistics were analyzed.

The data for this study were initially entered into the SBC's family monitoring system. Supervisors and therapists inputted data for each family into the system as a family progressed through appointments. Data from this system were used in this evaluation, which was determined by our university's institutional review board to meet the definition of a quality improvement activity involving archival data. In compliance with this determination, all data for families admitted to the clinic before the end of 2018 were extracted at the beginning of 2019 for this evaluation. However, some families had not yet completed all appointments; therefore, data were not entered for variables pertaining to later appointments. In addition, other families with completed appointments may not have had all data entered into the monitoring system at the time of extraction, resulting in missing data. As a result of incomplete and missing data, the numbers and percentages reported throughout the results may not sum to the total number of admissions included in the evaluation (i.e., 55). We have attempted to provide clarification for the percentages

reported in tables, as well as indicate the number of families for whom effectiveness and feasibility data could not be determined.

Results

Functional Analysis

Results of FAs are presented in Table 2. Differentiation was obtained for 69.4% of children during FAs, indicating that at least one maintaining function was identified for these children's severe behavior. For 14.3% of children, the target severe behavior was never evoked during the FAs.

Effectiveness and Feasibility Interviews

Table 3 provides the results of caregiver interviews following the receipt of treatment. Data were missing for 25 of the 228 variables (11.0%) on which information was collected across all families. Over the SBC's first 18 months in operation, 36

families received treatment and attended their first follow-up appointment (i.e., fourth appointment) and 30 families attended their final appointment (i.e., fifth appointment). Across both appointments, there were similar percentages of caregiver-reported improvements in child behavior (range 77.8%–76.7%) and feasibility of treatment (range 72.2%–70.0%). For families reporting that treatment feasibility was *OK some of the time* or *too difficult to do*, reported issues varied, with families noting issues related to dosage, procedures, data collection, or a combination of issues. Caregiver-collected data varied across appointments, with 47.2% of attending caregivers providing data at the fourth appointment and 30.0% providing data at the fifth appointment. At the final appointment, 80.0% of attending caregivers reported that they would continue to use the treatment.

Treatment on the Treated Of the 45 families with completed admissions at the SBC and adequate data, 33 received treatment and attended their fourth appointment, and 25 families attended their fifth appointment. Of the caregivers attending their fourth appointment, 27 caregivers (81.8% [27/33]) reported that behavior was *improving*. At the fifth appointment, 23 caregivers (92.0% [23/25]) reported that behavior was *improving*.

Intent to Treat Of the 45 families with completed admissions at the SBC, adequate data were available for 40 families at the fourth appointment and 38 families at the fifth appointment to conduct intent-to-treat analyses. At the fourth appointment, 27 caregivers (67.5% [27/40]) reported that behavior was *improving*, and at the fifth appointment, 23 caregivers (60.5% [23/38]) reported that behavior was *improving*.

Adherence

All families with completed admissions attended their first and second appointments; 10 families withdrew from services prior to their fourth appointment. Withdrawing families attended an average of 2.8 ($SD = 0.9$) appointments, canceled an average of 1.4 ($SD = 1.3$) appointments prior to withdrawing, and received services for an average of 0.8 ($SD = 0.5$) months. Of the families that received services through their first follow-up appointment, they canceled an average of 0.4 ($SD = 0.8$) appointments and received services for an average of 1.5 ($SD = 0.9$) months.

Cost

The average estimated income lost for families attending all five appointments was \$591.41. The average cost of services to the university for five appointments was \$2,332.73 per family. If billing, the estimated cost of the SBC's services for a family across all five appointments was \$2,250.00. For the 45 families that completed their admissions to the SBC, they

Table 2 Children's Functional Analysis Results

Variable Categories	#	% ^a
Functional analysis conducted for the child		
Yes	50	92.6
No	4	7.4
Implementer		
Therapist	18	37.5
Caregiver	16	33.3
Both	14	29.2
Type		
Brief functional analysis ^b	32	64.0
Synthesized contingency analysis ^c	10	20.0
Both	8	16.0
Target behavior evoked during the functional analyses		
Yes	42	85.7
No	7	14.3
Differentiated results obtained		
Yes	34	69.4
No	15	30.6
Function identified		
Attention	4	8.2
Tangible	12	24.5
Escape	7	14.3
Automatic	1	2.0
Multiple	10	20.4

^a The percentage of total admissions without missing data for the row variable. ^b See Wacker et al. (2004). ^c See Hanley et al. (2014)

Table 3 Effectiveness and Feasibility Results

	Effectiveness	#	% ^a	Feasibility	#	%
4th appt. (<i>n</i> = 36)	Rating			Rating		
	Improving	28	77.8	Easy	26	72.2
	Same	2	5.6	OK	4	11.1
	Worse	2	5.6	Too difficult	0	0.0
	CNBD	4	11.1	CNBD	6	11.1
				Caregiver collected data		
				Yes	17	47.2
				No	19	52.8
5th appt. (<i>n</i> = 30)	Rating			Rating		
	Improving	23	76.7	Easy	21	70.0
	Same	2	6.7	OK	3	10.0
	Worse	0	0.0	Too difficult	1	3.3
	CNBD	5	16.7	CNBD	5	16.7
				Caregiver collected data		
				Yes	9	30.0
				No	21	70.0
				Caregiver continuance of treatment		
				Yes	24	80.0
				No	1	3.3
				CNBD	5	16.7

Note. CNBD = could not be determined due to inadequate data collection

^a The percentage of families attending the appointment

attended a total of 170 appointments, for which the estimated average cost of billable services was \$1,707.96 per family. The total university operations cost across the 18 months was \$125,967.63. By using the total university operations cost and dividing it by the number of caregivers rating the effectiveness of the treatment as *improving* at their last attended appointment (*n* = 27), an estimate of the SBC's cost-effectiveness suggests that each rating of *improving* cost the university \$4,498.84. An itemized breakdown of billable services and expenses to families and the university is provided in Fig. 2.

Discussion

To provide context for interpreting the social significance of the reported results, we discuss the SBC's outcomes in relation to those reported by other outpatient clinics in the peer-reviewed literature. Regarding differentiated FA outcomes reported across clinics, the SBC's percentage ranks in the bottom half (see Fig. 3). When viewed alongside the total percentage of cases with differentiated FAs reported at outpatient clinics in the literature, our percentage of 69.4% approximates the 71.9% (156/217) of total cases with differentiated outcomes. When compared to the percentage of cases with zero rates of behavior occurring during FAs at outpatient clinics reported in the literature, our percentage also ranks in the

bottom half (see Fig. 3). Similar to the differentiated analysis outcomes, the SBC's percentage of 14.3% of cases with zero rates of behavior is comparable to the 18.4% of all cases with zero rates of behavior reported in the literature. It should be noted that FA outcomes at the SBC relative to those reported at other clinics are difficult to interpret due to differences in methodology and supervisor training. For example, it is unclear if all studies we identified in the literature followed the logic of a consecutive case series design. Furthermore, the majority of the study authors comes from a lineage of individuals who worked with or trained under individuals at the Kennedy Krieger Institute or affiliated Johns Hopkins University School of Medicine. Despite the potential moderating impact of supervisor training experiences, the reported outcomes across studies suggest that there is room for improvement at the SBC with respect to obtaining differentiated FA outcomes (e.g., Jessel, Metras, Hanley, Jessel, & Ingvarsson, 2019). It should be noted that we did not identify any studies that reported or discussed caregivers' feasibility of treatments.

Treatment-on-the-treated analyses indicate that more than 80% of families receiving treatment and follow-up services at the SBC reported improved child behavior at their fourth appointment, and more than 90% of families receiving treatment and follow-up services reported improved child behavior at their fifth and final appointment. Direct comparisons of

Fig. 2 Breakdown of costs per family across the university, families, and billable services

treatment effectiveness between the SBC and other outpatient clinics targeting severe behavior reported in the literature are difficult due to other clinics reporting behavioral observation data rather than data collected through caregiver interviews. However, using the generally accepted method of achieving an 80% reduction in observational data measuring severe behavior to indicate that a treatment was efficacious for a child, we can compare the SBC's effectiveness to that of other clinics. Kurtz et al. (2003) found that their treatments were effective for 93.1% of children when solely targeting self-injurious behavior and effective for 83.3% of children when

targeting multiple behaviors. Jessel, Ingvarsson, Metras, Kirk, and Whipple (2018) found that their treatments were effective for 100% of children. No other studies reported in Fig. 3 presented treatment effectiveness data.

Although the effectiveness of the SBC's services is relatively positive, as well as consistent with effects reported at similar clinics for families that receive treatment, results of intent-to-treat analyses at the SBC require further examination. Fewer than 70% of all families with completed admissions reported improved child behavior at their fourth appointment, and only 60% of families with completed admissions

Fig. 3 Functional analysis outcomes across outpatient severe behavior clinics reported in the literature

reported improved child behavior at their fifth appointment. We attribute this discrepancy between treatment-on-the-treated and intent-to-treat analyses to family adherence to services, as more than 20% of families withdrew from services prior to follow-up appointments. Discussions of family adherence to ABA services for severe behavior are limited in the literature. Across the three studies we identified that discussed families withdrawing from services, percentages of withdrawing families ranged from 3% to 7%, which is well below the percentage of families withdrawing from the SBC. Interviews with families that withdrew from the SBC may identify modifications to the service provision model to prevent future withdrawals, along with additional screening procedures for families to evaluate the appropriateness of the SBC's services to meet their needs. In addition, the hospital affiliated with the SBC provided services to families from rural areas of the state; therefore, many of the families seen at the SBC were commuting relatively long distances for each appointment. In conversations with developmental-behavioral pediatricians from the affiliated hospital, they reported that cancellation rates for appointments approximated one in five (i.e., one in every five appointments has a cancellation or a no-show), which is commensurate to those reported by related outpatient health clinics (McLean et al., 2016).

Regarding the costs of services, we identified two studies in the literature to allow for comparisons between the SBC and other models for assessing and treating severe behavior using outpatient ABA services. Hanley et al. (2014) reported that the average cost of billable services for a family was \$5,900. These services included report writing, FAs, development of a function-based treatment, and implementation of the treatment by the clinic's therapists. In addition, services were provided by a supervisor and assisting therapist over an average of 27 appointments, each lasting 1 hr in duration. Lindgren et al. (2016) provided a cost comparison of in-home services, clinic-based telehealth services, and home-based telehealth services. The average total costs of services per family were \$4,786.90 for in-home services, \$1,865.50 for clinic-based telehealth services, and \$1,287.44 for in-home telehealth services. These costs included facility costs and clinic staffing costs. Lindgren et al. also estimated family expenses for income lost and transportation costs to receive services. The average amount of family expenses was \$1,163.06 for in-home services, \$1,202.96 for clinic-based telehealth services, and \$858.20 for home-based telehealth services. Families were provided an average of 18 appointments across service types, and each appointment lasted approximately 1 hr. Comparatively, the total cost of the SBC's services was less than other clinic- and home-based services but more than telehealth services we identified in the literature. Regarding estimated family expenses related to income lost and traveling, families receiving services through the SBC had fewer expenses than all other service types we identified.

Implications

Miller (2017) describes program evaluation as finding “an empirical answer to the question, ‘How are we doing?’” (p. 35). We conducted this evaluation to determine how well our implementation of the developed service provision model was achieving the SBC's primary goals. The data we collected and analyzed allow us to make informed decisions about potential changes to our implementation and model. For example, given that almost half of the caregivers reported that they were unsure whether their child had a behavior intervention plan through school-based services, requesting that caregivers bring a client's school-based individualized education plan may be a simple method to collect this information.

Regarding treatment feasibility and effectiveness, the currently used semistructured interview has not been assessed for psychometric properties; therefore, supplemental measures with technical adequacy or those that provide standardized scores may yield more reliable or possibly meaningful data for interpreting the relative effects of the SBC's services across families. In addition, this evaluation provides information related to the implementation of research-based practices in a community-based setting for treating children's severe behavior, an area in which there has been minimal investigation, particularly for children with autism and related developmental disabilities (Miller, 2017; cf. Dixon et al., 2017; Leaf et al., 2011). We urge consumers and practitioners of ABA services to consider the importance of program evaluation for ensuring that services are effective, sustainable, and achieving their intended purposes.

Limitations

This evaluation was designed to provide data for the purposes of informing the described SBC. We caution readers against using these data to make inferences about the populations of individuals they serve, as those individuals may be meaningfully different from the families reported in this evaluation. For example, families receiving services at the SBC were referred by a pediatrician; therefore, these families may be different than families that are actively and independently contacting providers about ABA services.

Conclusions

This study serves as an evaluation of an outpatient clinic utilizing a brief family-centered service provision model to provide ABA services to families with children engaging in severe behavior. Findings indicate that FA outcomes are commensurate to those reported by other outpatient clinics, but there is area for improvement. In this program evaluation, caregiver-reported treatment effectiveness was relatively positive when families adhered to services; however, there is a

critical need to determine why families with children exhibiting severe behavior withdrew from recommended and pediatrician-referred services. Given that these data were collected within the context of community-based practice, rather than for research purposes, we caution readers against attempting to extrapolate findings to make or justify population-level claims. Lastly, we hope providers of ABA services will further engage in routine program evaluation to better ensure services and practices are monitored and modified to promote meaningful outcomes for children and families.

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Compliance with Ethical Standards

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