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Multisystemic Therapy Improves the Patient-Provider Relationship in Families of Adolescents with Poorly Controlled Insulin Dependent Diabetes

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Abstract

Objective—The purpose of this study was to determine if Multisystemic Therapy (MST), an intensive, home and community-based family treatment, significantly improved patient-provider relationships in families where youth had chronic poor glycemic control.

Methods—One hundred forty-six adolescents with type 1 or 2 diabetes in chronic poor glycemic control (HbA1c $\geq 8\%$) and their primary caregivers were randomly assigned to MST or a telephone support condition. Caregiver perceptions of their relationship with the diabetes multidisciplinary medical team were assessed at baseline and treatment termination with the Measure of Process of Care-20.

Results—At treatment termination, MST families reported significant improvement on the Coordinated and Comprehensive Care scale and marginally significant improvement on the Respectful and Supportive Care scale. Improvements on the Enabling and Partnership and Providing Specific Information scales were not significant.

Conclusions—Results suggest MST improves the ability of the families and the diabetes treatment providers to work together.

Keywords

Family Therapy; Health Care Services; Diabetes; Randomized Controlled Trial

Conflict of Interest Statement

Author Phillippe B. Cunningham is a board member of Evidence Based Services, which has a licensing agreement with MST Services, LLC, for dissemination of Multisystemic Therapy treatment technology. Authors April Idalski Carcone, Xinguang Chen, Deborah A. Ellis, Sylvie Naar and Kathleen Moltz declare that they have no conflict of interest.

The importance of an effective patient-provider relationship for optimal pediatric diabetes management is well-established (Anderson, 2003; La Greca, Bearman, & Roberts, 2003). Upon diagnosis, families and diabetes care providers initiate a reciprocal relationship that relies upon effective communication and collaboration. Providers rely upon the family to provide them with accurate information about the patient's diabetes management and health status in order to make appropriate adjustments in the prescribed diabetes regimen, whereas patients and families rely upon the provider's expertise in medical decision-making and encouragement of good diabetes care. Empirical research has linked both adolescent and caregiver perceptions of the patient-provider relationship to critical diabetes outcomes (Hanson et al., 1988; La Greca et al., 2003). Empirical research suggests a poorer patient-provider relationship is associated with poorer illness management behavior (Hanson et al., 1988) and may be related to poorer glycemic control and increased hospitalizations.

Because parents play a critical role in supporting diabetes care, even during adolescence (Silverstein et al., 2005), cultivating an effective relationship between parents and providers is important. This may be particularly true when diabetes is poorly controlled, as poor communication regarding barriers to diabetes management in the home can lead providers to simply increase insulin dosage rather than helping families address critical barriers to care. However, to date, there have been limited interventions developed that are effective at improving the patient-provider relationship (Nobile & Drotar, 2003) and none focusing on adolescents with poorly controlled diabetes.

Multisystemic Therapy (MST) is an intensive, home- and community-based intervention that has been adapted to address the multiple factors that contribute to poorly controlled diabetes (Ellis et al., 2005b; Ellis et al., 2012; Ellis et al., 2007). Youths with poor metabolic control and their families are characterized by high rates of psychiatric co-morbidity (Kovacs, Goldston, Obrosky, & Iyengar, 1992), family psychopathology (Liss et al., 1998) and poor follow up with health care providers (Jacobson, Hauser, Willett, Wolfsdorf, & Herman, 1997; Kaufman, Halvorson, & Carpenter, 1999; Urbach et al., 2005). The MST treatment approach is an excellent fit with the known etiology of poor metabolic control, because the scope of MST interventions encompasses the individual youth, the family system and the broader community systems within which the family operates (e.g. school, health care system). A major addition to MST adapted for adolescents with poorly controlled diabetes has been intervening in the relationship between the family and the medical care team.

Because of the comprehensive nature of the MST intervention and the focus upon intervening within multiple systems that contribute to poor metabolic control, the relationship between the family and the medical care team becomes a critical point for intervention. By enhancing the relationship between families and treatment providers, the MST therapist tries to maximize the likelihood that any improvements in diabetes management will be maintained once treatment is concluded. MST has been shown to improve relevant diabetes-related endpoints such as glycemic control (Ellis et al., 2012), illness management behavior (Ellis et al., 2005b) as well as other important outcomes such as adolescent diabetes stress (Ellis et al., 2005a) and parental involvement in diabetes care

(Ellis, Yopp, et al., 2006; Naar-King, Ellis, Idalski, Frey, & Cunningham, 2007), but, to date, its impact on the patient-provider relationship, has not been examined.

The objective of this study was to test the efficacy of MST in improving the patient-provider relationship as compared to an attention control condition. Given MST's focus on improving collaboration and information sharing between the family and health care team, we predicted that families receiving MST would report significant improvements in their patient-provider relationship at the end of treatment, as compared to the control condition.

Methods

The data reported in the present study represent secondary endpoints from a larger randomized clinical trial for which the primary endpoints were diabetes management and metabolic control. A detailed description of trial methods and primary outcomes has been reported elsewhere (see Ellis and colleagues (Ellis et al., 2012)).

Subjects

Adolescents with chronic poor glycemic control were recruited from university-affiliated pediatric endocrinology clinics within a tertiary care children's hospital located in a major Midwestern metropolitan area between 2006 and 2010. Eligibility included diagnosis of type 1 or 2 diabetes for at least one year requiring insulin therapy, HbA_{1c} ≥ 8% at the clinic visit prior to enrollment and over the previous year and 10-17 years of age. Two adolescents' baseline HbA_{1c} was <8.0%; however, they otherwise met the criteria for study enrollment and, therefore, were enrolled in the trial. Exclusion criteria were moderate-severe cognitive impairment (assessed via caregiver-report of a previously diagnosed learning disability, special education placement, and/or inability to independently complete research assessments), psychosis, or non-English speaking.

Protocol

The study was a randomized controlled trial in which participants were blocked based on by HbA_{1c} and BMI. A permuted block algorithm was used to randomly assign participants to four strata: Stratum 1 included adolescents with a low HbA_{1c} (< 10.5% but ≥ 8%) and a low BMI (< 85th percentile). Stratum 2 included adolescents with a low HbA_{1c} (< 10.5% but ≥ 8%) and a high BMI (≥ 85th percentile). Stratum 3 included adolescents with a high HbA_{1c} (≥ 10.5%) and a low BMI (< 85th percentile). Stratum 4 included adolescents with a high HbA_{1c} (≥ 10.5%) and a high BMI (≥ 85th percentile). The project statistician generated the randomization sequence and participants were notified of their randomization status by the project manager to maintain research assistants' blindness to treatment assignment.

Potential participants were approached by medical staff during routine clinic appointments or hospitalizations regarding their interest in participating. Research assistants not affiliated with the clinical care site followed up by phone to explain the study, including details of the two study interventions, and the random assignment and data collection processes. Research assistants obtained informed consent and assent via home-based consent procedures. A trained research assistant collected data at baseline and seven months later (one month post-treatment) in participants' homes. Baseline data collection occurred prior to randomization

and research assistants completing the 7-month follow up data collection were blind to study conditions. Families received \$50 for each completed data collection. Prior to the initiation of recruitment, informed consent and data collection activities, all research assistants were trained to administer the study assessments using standardized scripts and a professional demeanor to ensure consistency across participants. The university-affiliated Human Investigation Committee approved the research protocol which was in accordance with the Declaration of Helsinki. The trial was registered in [ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT00372814) (NCT00372814).

The CONSORT flow diagram, Figure 1, summarizes the process of participant recruitment and enrollment. Study staff screened 513 families for participation, of which 238 were ineligible and 36 could not be contacted. Of the remaining 239, 52 declined participation and 10 withdrew prior to randomization resulting in a 74% participation rate. The 146 adolescents and their primary caregivers enrolled were randomly assigned to either six months of MST ($n = 74$) or telephone support (TS; $n = 72$). Treatment was initiated within one month of baseline ($M = 27.9$ days, $SD = 17.5$). The mean duration of treatment for MST participants was 5.6 months ($SD = 1.2$) and 4.9 months ($SD = 1.6$) in TS. Twelve MST families (16%) and 14 telephone support families (19%) failed to complete the full course of treatment. Only two MST families and one telephone support family refused to complete follow-up data collection subsequent to treatment dropout (98% retention rate). All participants were included in the intent-to-treat analyses.

MST is an empirically supported, intensive, family-centered, community-based treatment originally designed for use with adolescents presenting with serious antisocial behavior (Henggeler, Schoenwald, Borduin, Rowland, & Cunningham, 2009). Our group has extensively adapted MST to the treatment of poor self-management in adolescents with chronic illnesses including diabetes (Ellis et al., 2005c), HIV infection (Ellis, Naar-King, Cunningham, & Secord, 2006), and asthma (Naar-King, Ellis, Kolmodin, Cunningham, & Secord, 2009). MST is not a typical standardized “one size fits all” psychotherapy approach where the therapist implements a set of pre-arranged interventions in a prescribed sequence. Rather, MST involves an initial multisystemic assessment of the problem behavior and the strengths and weaknesses of family members. Based on this assessment, the MST therapist develops a comprehensive treatment plan utilizing empirically supported interventions individually tailored for each family to best treat the identified problem behavior. Treatment delivery is guided by the following key features. (1) Interventions are individualized to comprehensively target the adolescent's unique risk factors that support the problem behavior within the adolescent's social ecology, including the individual, family, peer, school, and community social systems within which the adolescent is embedded. (2) Interventions integrate empirically supported clinical treatments at each level of the adolescent's social ecology. (3) Interventions focus on promoting behavioral changes in the adolescent's natural ecology by empowering caregivers with parenting skills and resources and empowering adolescents to cope with family, school, and neighborhood problems. (4) Services are delivered via a community-based model in home, school, and/or neighborhood settings at times convenient to the family, which facilitates high engagement and low dropout. (5) MST requires an intensive quality assurance surveillance that aims to optimize

adolescent outcomes by supporting therapist fidelity to MST treatment protocols (Henggeler et al., 2006).

As adapted for the treatment of poorly controlled diabetes, individual interventions with the adolescent included psychoeducation to improve skills related to diabetes care, counseling to enhance motivation for diabetes care completion, or mental health treatment such as cognitive-behavioral therapy to treat depression. Family interventions included: (1) parent training to decrease parental disengagement from the diabetes regimen, e.g., improving parental knowledge regarding diabetes care, developing parenting skills (such as increasing systematic monitoring, reward, and discipline systems) to increase parental supervision of the diabetes care regimen; (2) teaching strategies for and improving family organizational routines to support the adolescent's diabetes care; (3) behavioral family systems therapy to address day-to-day conflicts around diabetes care and improve caregivers' communication with each other about the adolescent's diabetes care; and (4) engaging social support from friends or extended family members who could assist with diabetes care. Peer interventions included enlisting the active support of peers regarding regimen adherence and encouraging disclosure of diabetic status to peers. At the community level, interventions included developing strategies to monitor and promote the youth's diabetes care while in school or other community settings (i.e., extracurricular activities or visiting extended family members). To illustrate, school interventions included improving family-school communication about the adolescent's diabetes care needs and adherence behaviors (such as having school personnel provide weekly reports to parents about blood glucose readings completed during the school) and working with school personnel to monitor and support the adolescent's regimen completion (e.g., finding a private place to test blood glucose). Healthcare system interventions involved fostering information sharing between families and diabetes care providers by: (1) helping parents to utilize clinic resources between regular office visits, e.g., encouraging parents to report results of blood glucose tests to obtain insulin dose adjustments and encouraging parents to come to educational sessions or support group meetings; (2) helping the family to resolve barriers to keeping appointments; (3) helping caregivers and adolescents improve communication skills by assisting them to prepare for clinic visits by generating lists of questions and concerns they wanted to discuss during the clinic visit, by actually accompanying families to medical appointments during which the therapist serves as a role model who demonstrated appropriate communication skills, and who also supports the family during the clinic visit. Therapists also, with the family's permission, worked with the diabetes care providers to promote a positive working relationship by meeting independently with the providers outside of diabetes clinic appointments to exchange information about the child's specific diabetes treatment needs, facilitate communication between clinic appointments and better coordinate the youth's diabetes care. These biweekly meetings with the therapist provided the diabetes care team with greater knowledge of the family and the child's diabetes care, thus enabling them to provide better information to the family during clinic visits that is specific to the child's diabetes illness experience and to develop a stronger, more responsive relationship with the family. MST therapists met families twice weekly; the initial visit was 60 minutes and the second a briefer (30 minute) follow up session.

Adolescents assigned to the TS condition received weekly 30-minute phone calls focusing on support for diabetes care using a client-centered, non-directive counseling approach using the Rogerian counseling techniques of reflective listening and providing empathetic support (Cheung, 2014; Patterson, 1979). The purpose of the calls was to provide emotional support regarding the adolescent's diabetes, to assess adherence to the prescribed regimen and to help the adolescent brainstorm solutions to any barriers they identify to completion of diabetes care. Non-diabetes related problems such as peer, school, or family relationship problems were also addressed during calls at the discretion of the adolescent. The telephone support condition did not include elements specific to MST such as cognitive-behavioral intervention content or family intervention. In both conditions, standard medical care was provided at 3-4 month intervals per American Diabetes Association recommendations (Silverstein et al., 2005) by a multidisciplinary team including a pediatric endocrinologist, nurse educator, dietician, social worker, and psychologist.

Measurements

Patient demographic characteristics were collected at baseline using an investigator developed, self-report questionnaire.

The *Measure of Process of Care-20* (MPOC-20; King, King, & Rosenbaum, 2004) is designed to assess parents' perceptions of the medical services their children receive, including the interactional components of care and the family-centeredness of the patient-provider relationship. It was developed for use with parents of children with chronic health conditions. At baseline and follow up, the primary caregiver, the person who typically accompanied the adolescent to their diabetes clinic visits and assisted with diabetes care independently completed the pencil-and-paper measure. Caregivers rated their relationship with their diabetes providers using a 7-point Likert scale (1 = not at all, 7 = to a very great extent). Four summary scales assessing the caregivers' relationship with medical providers are formed from 15 items beginning with the stem "to what extent do the people who work with your teen...". Summary scales are constructed by calculating the mean response to the scale's items; thus, the range of possible scores on each scale is 1 - 7. Higher scale scores reflect a more positive patient-provider relationship. The Enabling and Partnership (EP) scale is the mean of three items, including "provide opportunities for you to make decisions about treatment?" and "fully explain treatment choices to you?" Providing Specific Information (PSI) is the mean of three items, including "provide you with written information about your child's treatment?" and "tell you about the results from tests?" Coordinated and Comprehensive Care (CCC) is the mean of four items, including "make sure that at least one clinic staff is someone who works with you and your family over a long period of time?" and "look at the needs of your child (e.g., at mental, emotional, and social needs) instead of just at physical needs?" Respectful and Supportive Care (RSC) is the mean of five items, including "treat you as an equal rather than just as the parent of a patient?" and "help you to feel competent as a parent?" A fifth scale, Providing General Information, is formed from five items using the stem "to what extent does the organization where you receive services..." and reflects interactions with the institution as a whole (e.g. the clinic or hospital). This scale was not included in this study because the broader institution was not a target of the MST intervention. Reliability and validity of the measure

has been established (King et al., 2004; Moore, Mah, & Trute, 2009). At baseline, each of the four scales examined demonstrated good internal consistency, as assessed using Cronbach's alpha: EP = .751, PSI = .771, CCC = .781 and RSC = .872.

Statistical Analyses

The intent-to-treat approach was used to assess the intervention effect from MST. In the intent-to-treat analysis, all randomized families were included in the analysis regardless of their withdrawal from treatment or other protocol deviations (Gupta, 2011). Three families (2%) were excluded because of incomplete MPOC-20 data. The effects of MST on the patient-provider relationship were evaluated using multiple linear regression modeling based on the following prediction equation:

$$Y_1 = a + \beta_1 (Y_0) + \beta_2 (\text{intervention}) + \beta_3 (\text{Cov1}) + \beta_4 (\text{Cov2}) + \dots$$

Y_1 represented the outcome variable (in four regression models testing the four domains of the patient-provider relationship assessed by the MPOC-20) measured at follow-up (7 months post-baseline). a and β s were regression coefficients. B_1 represents the baseline outcome variable measurements. A significant and positive β_2 (the net increases in the outcome variable in response to the MST intervention relative to the telephone support intervention) was used as evidence to support intervention effect after adjusting for baseline differences and the effects of covariates. Covariates included were adolescent age, adolescent race (dummy coded, non-African American race as the reference category), and family type (dummy coded, two-parent family as the reference category) due to the fact that these demographic variables were related to the primary study outcomes (Ellis et al., 2012). In these models, a β_2 falling within a 95% confidence interval not including zero is equivalent to $p < .05$ and, therefore, supports the effect of MST. Statistical analyses were conducted using the software SAS version 9.3 (SAS Institute Inc., Cary, NC, USA).

Results

Demographic characteristics are shown in Table 1. Consistent with the population served by the institution where participants were recruited, the sample was comprised primarily of African American (77%) adolescents. As expected, baseline measures of glycemic control suggested poor glycemic control overall ($M = 11.7\%$, $SD = 2.5$). Most caregivers were single-parenting (59%) biological parents (93%). There were no statistically significant differences between MST and TS groups at baseline on demographics or glycemic control (Ellis et al., 2012). (Table 1)

The effect of MST relative to families enrolled in TS on each MPOC scale was evaluated using four linear regression models with all variables entered simultaneously. Despite random assignment at baseline, MST families reported a more positive patient-provider relationship on three scales relative to families enrolled the control condition: Enabling and Partnership ($M_{MST} = 5.61$, $SD_{MST} = 1.32$ versus $M_{TS} = 5.03$, $SD_{TS} = 1.49$), Providing Specific Information ($M_{MST} = 6.15$, $SD_{MST} = 0.98$ versus $M_{TS} = 5.54$, $SD_{TS} = 1.40$), and Respectful and Supportive Care ($M_{MST} = 5.67$, $SD_{MST} = 1.30$ versus $M_{TS} = 5.21$, $SD_{TS} =$

1.36). Therefore, the patient-provider relationship baseline measurements were entered to control for these initial differences in addition to adolescent age, race, and family type. Table 2 presents the correlation matrix for all variables entered into the regression analyses. (Table 2)

Results from the regression analyses, presented in Table 3, indicated a significant treatment effect in the Coordinated and Comprehensive Care scale at the end of treatment ($\beta = 0.45$, 95% CI [0.06, 0.84] $p < .05$). A marginally significant effect was observed in the Respectful and Supportive Care scale ($\beta = 0.36$, 95% CI [-0.01, 0.73] $p < .10$), but improvements on the Enabling and Partnership and Providing Specific Information scales were not statistically significant. (Table 3)

Discussion

Although previous research has found the families of youth with poorly controlled diabetes to have ineffective relationships with diabetes care providers (Hanson et al., 1988), few intervention studies have examined whether patient-provider relationships can be improved among the families of youth with poorly controlled diabetes, a group known to have ineffective relationships with diabetes care providers (Hanson et al., 1988). This study found that MST improved caregivers' perceptions of their family's relationship with diabetes care providers in a multidisciplinary diabetes specialty clinic as compared to caregivers in an attention control condition. Over the course of treatment, caregivers' perceptions of the patient-provider relationship significantly improved in the area of Coordinated and Comprehensive Care and marginally improved in the Respectful and Supportive Care domain.

This finding adds to the empirical literature supporting the efficacy of MST as an intervention impacting the multiple determinants of poor diabetes control. Throughout treatment, MST therapists engage in multiple activities to enhance the patient-provider relationship. Specifically, therapists facilitate Coordinated and Comprehensive Care by helping families arrive at their diabetes clinic appointments better prepared to obtain the information they need to effectively manage the adolescent's diabetes. For example, the therapist helped families prepare for clinic by generating lists of questions and concerns they wanted to discuss. This helped families to better convey relevant information to providers and to more effectively articulate any additional medical, emotional or social needs of their child. Therapists also met with the health care provider outside of diabetes clinic appointments for guidance on the child's specific diabetes treatment needs and to facilitate communication between clinic appointments. These activities also may have contributed to the trend observed in the Respectful and Supportive Care domain. Health care providers may have interacted in a more supportive and responsive manner when they were better informed about patient and caregiver efforts to improve diabetes management, family barriers to adherence and better understood their specific treatment needs. Therapists may have also contributed to this domain by role-modeling appropriate communication during diabetes clinic appointments to help shape patients' and caregivers' interactions with health care providers. While these activities map onto the MPOC-20 constructs, additional research is needed to determine which, if any, of these therapist behaviors were directly responsible

for any improvement in the patient-provider relationship. Future research is also needed to examine the sustainability of the improvements in the patient-provider relationship once treatment has ended and the MST therapist is no longer facilitating these relationships. Should the patient-provider relationship deteriorate post-intervention, this might suggest that high risk patients, those with chronically poor illness management, might benefit from the assistance of a patient advocate during medical care visits.

Contrary to the study hypothesis, findings for the Enabling and Partnership and Providing Specific Information scales were not statistically significant. Ratings on these scales were already high at baseline, leaving limited room for improvement. One explanation for the lack of significant change on these scales might be the clinical care practices of the study recruitment site. All families seen in the clinic received formal diabetes education from a diabetes educator at the time of diagnosis and on an ongoing basis during routine clinic visits. In addition, families experiencing difficulty managing their child's illness as indicated by poor glycemic control were routinely re-referred to diabetes education programs outside of standard office visits. During every diabetes clinic visit, providers routinely reviewed test results (e.g., point of service HbA_{1c}) and gave families written information about the adolescent's progress and treatment plan. Thus, families were likely already well educated in the various tasks necessary to manage their child's diabetes, their child's current disease status as well as their treatment options prior to the MST intervention. Consequently, the exchange of diabetes-specific information was already high (e.g. as assessed by the Providing Specific Information scale; mean score at baseline ($M = 6.15$ out of 7)).

The nonsignificant finding on the Enabling and Partnership scale might suggest that the MST therapist assumed too much of a leadership role or functioned as a liaison between the family and health care providers during clinical interactions rather than encouraging the caregiver to work with the medical team directly. Alternatively, health care providers may have already been utilizing a high level of partnership in their interactions with this high risk population of adolescents with chronically poor illness management. In sum, the study results suggest that the most significant impact the MST intervention had on the patient-provider relationship in these adolescents with poorly controlled diabetes was to better address all the adolescents' needs and enhance the continuity of care across providers and possibly settings (i.e., home, school, etc.).

This research was limited by the use of self-report data from the caregivers' perspective only. Assessing the adolescents' and medical care teams' perspective would provide a more comprehensive picture of the patient-provider relationship. It is particularly important to consider the adolescents' perspective. Both family caregivers and health care providers expect adolescents to become increasingly involved in the health care decision-making process. However, research suggests that family caregivers and physicians tend to dominate the clinical encounter (Tates & Meeuwesen, 2000; van Dulmen, 1998), which may lead to adolescents feeling marginalized and dissatisfied (Young, Dixon-Woods, Windridge, & Heney, 2003), feelings that might translate to poorer illness outcomes. Also, it should be noted that since MST therapists typically accompanied families to clinic visits, clinic staff were not blinded to family participation in MST. Therefore, the possibility that providers changed their behavior in response to therapist presence rather than the content of the

therapeutic intervention itself cannot be ruled out. In addition, although prior studies have shown that the MST intervention improved diabetes management and HbA1c, the study was not adequately powered to directly test the mediating effect of improvements in patient provider relationships on diabetes health outcomes. Additional research is needed to test the mediator hypothesis and to also clarify the mechanisms responsible for improved relationships. Finally, it is important to acknowledge the high costs of delivery of home and community-based interventions such as MST, where therapists must be available to intervene in a variety of systems, including patient-provider relationships during medical clinic visits. However, prior work by our group suggests that the high cost of the intervention may be offset by associated decreases in costs of medical care, such as unnecessary hospitalizations due to insulin non-compliance (Ellis et al., 2008).

Despite these limitations, this research provides insights directly translatable to clinical practice. Because the majority of adolescent diabetes care occurs outside of the medical setting, the ability of the family and medical care team to work together to set and implement diabetes management goals is critically important. Families of adolescents with chronic poor glycemic control are likely to have an impaired relationship with their diabetes medical care team. An impaired patient-provider relationship is likely to impact how families manage diabetes making improving the patient-provider relationship of critical importance for the effective management of diabetes. Comprehensive, targeted, family-based interventions (like MST) have the potential to improve the relationship between the family and diabetes medical team, in addition to improving illness management behavior and glycemic control, which may increase the likelihood that optimal diabetes care and health outcomes persist over time.

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Figure 1. CONSORT diagram showing flow of participants through the study for the multisystemic (MST) and telephone support (TS) groups

Table 1

Baseline Characteristics of Adolescents and their Families by Treatment Condition: Multisystemic Treatment (MST) and Telephone Support (TS)

	MST (n=74)	TS (n=72)
Adolescent Race		
African American	60 (81%)	53 (74%)
White	13 (18%)	16 (22%)
Other	1 (1%)	3 (4%)
Adolescent Gender		
Male	32 (43%)	32 (44%)
Female	42 (57%)	40 (56%)
Adolescent Age, years	14.2 (2.2)	14.1 (2.4)
Adolescent BMI percentile	71.9 (27.2)	77.0 (22.2)
Caregiver Race		
African American	60 (81%)	53 (74%)
White	14 (19%)	18 (25%)
Other	0 (0%)	1 (1%)
Caregiver Age, years	40.3 (6.9)	42.6 (8.7)
Caregiver Gender		
Female	68 (92%)	65 (90%)
Male	6 (8%)	7 (10%)
Relationship to Adolescent		
Biological Parent	71 (96%)	65 (90%)
Other (e.g., step, foster)	3 (4%)	7 (10%)
Parenting Status		
Single Parent	43 (58%)	43 (60%)
Two Parents	31 (42%)	29 (40%)
Duration of diabetes, years	4.7 (3.2)	4.6 (2.9)
Type of Diabetes		
Type 1	65 (88%)	66 (92%)
Type 2	9 (12%)	6 (8%)
Insulin Regimen ^a		
Conventional	21 (28%)	18 (25%)
Intensive injections	39 (53%)	44 (61%)
Insulin pump	10 (14%)	9 (13%)
Basal insulin only	4 (5%)	1 (1%)
Metabolic Control, HbA _{1c}	11.6 (2.5)	11.8 (2.6)
Patient-Provider Relationship		
Enabling and Partnership	5.61 (1.32)	5.03 (1.49) *
Providing Specific Information	6.15 (0.98)	5.54 (1.40) **
Coordinated and Comprehensive Care	5.52 (1.29)	5.19 (1.38)

	MST (n=74)	TS (n=72)
Respectful and Supportive Care	5.67 (1.30)	5.21 (1.36) *

Notes:

*
 $p < .05$

**
 $p < .01$

^a“Conventional” insulin regimen refers to the prescription of two-three daily injections of intermediate-acting and short-acting insulin. “Intensive injections” refers to the insulin regimen characterized by one daily injection of a long-acting (basal) insulin and the administration of short-acting insulin boluses whenever carbohydrates are consumed. “Insulin pump” refers to the insulin regimen where only short-acting insulin is administered using an insulin infusion pump; the patient receives a continuous infusion of short-acting insulin and additional boluses whenever carbohydrates are consumed. “Basal insulin only” refers to the insulin regimen where only basal insulin is administered, by daily injections.

Table 2

Correlation Matrix of Study Variables

	1. Treatment Group ^a	2.	3.	4.	5.	6.	7.	8.
2. Adolescent Age, in years at study entry	-.023							
3. Adolescent Race ^b	.089	-.067						
4. Single versus Two-Parent Home ^c	-.016	-.146	.214**					
5. Enabling & Partnership Scale, at Baseline	-.203*	-.029	-.024	-.041				
6. Enabling & Partnership Sub-Scale, at 7 months	-.243**	-.014	-.099	-.006	.443***			
7. Providing Specific Information Sub-Scale, at Baseline	-.250**	-.185*	-.078	-.027	.632***	.361***		
8. Providing Specific Information Sub-Scale, at 7 months	-.232**	-.084	-.177*	.009	.406***	.758***	.474***	
9. Coordinated & Comprehensive Care Scale, at Baseline	-.122	-.132	.003	.100	.721***	.431***	.718***	.438***
10. Coordinated & Comprehensive Care Scale, at 7 months	-.234**	-.068	-.054	.124	.490***	.837***	.392***	.739***
11. Respectful & Supportive Care Scale, at Baseline	-.172*	-.075	-.006	-.007	.755***	.411***	.731***	.357***
12. Respectful & Supportive Care Scale, at 7 months	-.290**	-.078	-.065	.061	.493***	.841***	.411***	.738***

^aTS is the reference group^bAfrican American is the reference group^cSingle parent is the reference group*
 $p < .05$ **
 $p < .01$

Table 3

Effects of Multisystemic Therapy (MST) versus Telephone Support (TS) on the Patient-Provider Relationship

	Effect (regression analysis)		
	β (SE)	95% CI	
		Lower Limit	Upper Limit
Model 1: Enabling and Partnership			
Treatment Condition	0.33 (0.23)	−0.12	0.78
Baseline	0.41 (0.08) **	0.25	0.57
Age (in years)	−0.02 (0.05)	−0.12	0.08
Race (if black)	0.26 (0.27)	−0.27	0.79
Family type (if single parent)	−0.09 (0.23)	−0.54	0.36
Model fit: Adjusted R2	0.19		
Model 2: Providing Specific Information			
Treatment Condition	0.23 (0.20)	−0.16	0.62
Baseline	0.46 (0.08) **	0.30	0.62
Age (in years)	−0.01 (0.04)	−0.09	0.07
Race (if black)	0.44 (0.24) †	−0.03	0.91
Family type (if single parent)	−0.01 (0.21)	−0.40	0.42
Model fit: R2	0.23		
Model 3: Coordinated and Comprehensive Care			
Treatment Condition	0.45 (0.20) *	0.06	0.84
Baseline	0.46 (0.07) **	0.32	0.60
Age (in years)	−0.04 (0.04)	−0.12	0.04
Race (if black)	0.19 (0.24)	−0.28	0.66
Family type (if single parent)	−0.03 (0.21)	−0.38	0.44
Model fit: R2	0.26		
Model 4: Respectful and Supportive Care			
Treatment Condition	0.36 (0.19) †	−0.01	0.73
Baseline	0.55 (0.08) **	0.39	0.71
Age (in years)	−0.01 (0.04)	−0.09	0.07
Race (if black)	−0.17 (0.24)	−0.30	0.64
Family type (if single parent)	−0.06 (0.21)	−0.35	0.47
Model fit: R2	0.31		

Note: Program effect was assessed using four multiple regression models with simultaneous entry controlling for baseline status and demographic variables.

* $p < .05$

** $p < .01$

† $p < .10$