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Self-Management as a Mediator of Family Functioning and Depressive Symptoms With Health Outcomes in Youth With Type 1 Diabetes

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Abstract

This study examined the relationship of family functioning and depressive symptoms with self-management, glycemic control, and quality of life in a sample of adolescents with type 1 diabetes. It also explored whether self-management mediates family functioning, depressive symptoms, and diabetes-related outcomes. Structural equation modeling was used to estimate parameters in the conceptual causal pathway and test mediation effects. Adolescents ($n = 320$) were primarily female (55%), younger adolescents (58%), and self-identified as White (63%). Self-management mediated the relationship between family conflict, family warmth-caring, parent guidance-control, and youth depressive symptoms with glycosylated hemoglobin (A1C). In addition, self-management mediated the relationship between family conflict and youth depressive symptoms with quality of life. Supporting optimal family functioning and treating elevated depressive symptoms in adolescents with type 1 diabetes has the potential to improve self-management, glycemic control, and quality of life.

Keywords

type 1 diabetes; adolescence; family functioning; depressive symptoms; self-management

Type 1 diabetes is one of the most common chronic pediatric illnesses with more than 15,000 U.S. children and adolescents diagnosed annually (Centers for Disease Control and Prevention, 2011). Age of onset is as early as birth and peaks in adolescence, affecting up to 1 in 400 youth (Search for Diabetes in Youth Study Group et al., 2006). Management is complex, requiring frequent blood glucose monitoring, administration of insulin, maintenance of diet and exercise, and management of episodes of hypo- and hyperglycemia (American Diabetes Association [ADA], 2013).

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Declaration of Conflicting Interests

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Because type 1 diabetes is typically diagnosed in childhood, responsibility for management falls on the family. Family functioning is a critical factor in adolescent diabetes management, accounting for 34% of the variance in metabolic control (Lewin et al., 2006) and 13% to 34% of quality of life outcomes (Weissberg-Benchell et al., 2009). Research examining the specific mechanisms by which family functioning affects health outcomes in youth with type 1 diabetes is needed.

The *Childhood Adaptation Model to Chronic Illness: Diabetes Mellitus* identifies numerous factors that influence childhood adaptation to type 1 diabetes (glycemic control and quality of life; Whittemore, Jaser, Guo, & Grey, 2010). The framework posits that individual and family characteristics (e.g., age, socioeconomic status, race/ethnicity) as well as psychosocial responses (e.g., depression), and individual and family responses (e.g., family functioning and self-management) influence the level of adaptation. Empirical evidence supports relationships within the framework and suggests the potential role of self-management as a mediator between family functioning and adaptation. For example, researchers have demonstrated that the relationship between family conflict/cohesion and glycemic control is mediated by self-management (Herge et al., 2012; Hilliard, Guilfoyle, Dolan, & Hood, 2011; Hilliard et al., 2013); and self-management has been shown to be a mediator between youth depressive symptoms and glycemic control (McGrady, Laffel, Drotar, Repaske, & Hood, 2009). To date, there is no research exploring mediators between family functioning or depressive symptoms and quality of life in adolescents with type 1 diabetes. Building on the model described above, the aim of this study is to expand what is known about the relationships among family functioning and depressive symptoms with self-management, glycemic control, and quality of life. For these purposes, family functioning is defined via the constructs of family conflict, parental monitoring (guidance-control), and warmth-caring behaviors.

Current literature shows that diabetes-specific family conflict is strongly linked with poorer diabetes outcomes. Parent-reported family conflict is higher in families of adolescents with type 1 diabetes compared with manualized norms (Moore, Hackworth, Hamilton, Northam, & Cameron, 2013). Conflict in youth with diabetes is associated with lower health-related quality of life (Weissberg-Benchell et al., 2009) and suboptimal glycemic control (Anderson et al., 2002; Hilliard et al., 2011; Ingerski, Anderson, Dolan, & Hood, 2010; Moore et al., 2013; Williams, Laffel, & Hood, 2009), and is more predictive of lower quality of life than disease severity or intensity (Grey, Boland, Yu, Sullivan-Bolyai, & Tamborlane, 1998; Laffel et al., 2003). Family conflict is also associated with several psychological and behavioral outcomes in youth with type 1 diabetes, including greater depressive symptoms and psychological distress (Hood et al., 2006; Williams et al., 2009), behavior difficulties and poor mental health (Moore et al., 2013), as well as poor self-management (Ingerski et al., 2010).

Parental monitoring is another aspect of family functioning that has been shown to influence health outcomes in youth with type 1 diabetes. During adolescence, parents must skillfully pass responsibility for diabetes management onto their children. Despite adolescents' need for independence, a preponderance of the literature supports continued parental monitoring, showing that ongoing monitoring or developmentally appropriate guidance and control leads

to better health and psychosocial outcomes (Anderson et al., 2002; Ellis et al., 2007; Helgeson, Siminerio, Escobar, & Becker, 2009; Horton, Berg, Butner, & Wiebe, 2009). One study linked less adolescent-independent responsibility and more family support with better self-management, with family support mediating the relationship between responsibility and self-management (Hsin, La Greca, Valenzuela, Moine, & Delamater, 2010).

That being said, the quality of parental monitoring is critical, with research advocating a collaborative style that consists of appropriate guidance and control. Adolescent perception of parents being over involved in care, with greater guidance and control, is associated with poorer glycemic control (Cameron et al., 2008). Conversely, uninvolved parenting is associated with poor self-management and lower quality of life (Wiebe et al., 2005). Thus, collaborative parent involvement in diabetes care is advocated to improve glycemic control (Wysocki et al., 2009), psychosocial outcomes (Ellis et al., 2007; Wiebe et al., 2005), and health-related quality of life (Weissberg-Benchell et al., 2009).

In addition, a family environment that is warm, caring, and cohesive is associated with better quality of life (Faulkner & Chang, 2007; Grey et al., 1998), self-management, and glycemic control in youth with type 1 diabetes (Berg et al., 2008; Cohen, Lumley, Naar-King, Partridge, & Cakan, 2004). Thus, it is possible that family warmth-caring supports positive youth qualities and self-management, which in turn supports better metabolic control (Mackey et al., 2011).

Last, depressive symptoms in youth with type 1 diabetes have been shown to affect family functioning and diabetes self-management. Higher levels of depressive symptoms in youth with type 1 diabetes have been associated with less diabetes self-management (McGrady et al., 2009), lower quality of life (Grey, Cameron, & Thurber, 1991), and poor glycemic control (Hood et al., 2006; Stewart, Rao, Emslie, Klein, & White, 2005; Whittemore et al., 2002). A recent study demonstrated that family processes around self-management mediated the relationship between depressive symptoms and glycemic control (Wu, Hilliard, Rausch, Dolan, & Hood, 2013).

Taken together, the literature on family functioning and depressive symptoms in youth with type 1 diabetes, including studies of diabetes-related conflict, parental monitoring (guidance-control), and warmth-caring, demonstrate the importance of these factors in child and adolescent adaptation to T1D. However, few studies have examined the mechanisms of how these variables are related. Additional research is necessary to more fully examine the ways in which these factors work together. An understanding of these mechanisms is essential to providing meaningful and targeted interventions.

Purpose

The aims of this study were to (a) explore demographic factors associated with family functioning of families of adolescents with type 1 diabetes; (b) examine the associations of family functioning and depressive symptoms with self-management activities and goals, glycemic control, and quality of life of adolescents with type 1 diabetes; and (c) to examine self-management as a mediator of family functioning, depressive symptoms, and diabetes-related outcomes (glycemic control and quality of life).

Method

Design

Baseline data from a multi-site randomized clinical trial in which two Internet-based programs for adolescents, a coping skills training program, and a diabetes education program were compared. Details of this study have been published elsewhere (Grey et al., 2009; Grey et al., 2012, 2013; Whittemore et al., 2012).

Participants/Sampling

In brief, adolescents diagnosed with type 1 diabetes were recruited from four diabetes clinics in Pennsylvania, Arizona, Florida, and Connecticut. Inclusion criteria were age 11 to 14 years, no other significant health problems, diagnosis of type 1 diabetes for at least 6 months, school grade appropriate to age within 1 year, and able to speak and write English.

Procedures

After recruitment, trained research assistants obtained informed consent from parents and assent from adolescents. Parents completed a demographic data form at the time of enrollment and adolescents completed psychosocial data online. Research assistants obtained glycemic control data from medical charts. Institutional Review Boards at each clinical site approved the study.

Data Collection/Measures

Demographic/clinical data collection for this study included a questionnaire with items pertaining to age, gender, annual family income, marital status, race/ethnicity, and therapy type.

Family functioning was measured by 3 constructs: diabetes family conflict, warmth-caring behaviors, and guidance-control. Exogenous variables for the structure equation modeling (SEM) included family conflict, family warmth-caring behaviors, family guidance-control, and depressive symptoms.

Diabetes family conflict was measured using the Diabetes Family Conflict Scale (Hood, Butler, Anderson, & Laffel, 2007). This instrument measures the degree of conflict between family members related to diabetes management activities. It consists of 19 items and is scored on a 3-point Likert-type scale (1 = *never argue*, 2 = *sometimes argue*, and 3 = *always argue*). These 19 items were totaled with possible scores ranging from 19 to 57. In this sample, the Cronbach's alpha was .87.

Family warmth-caring behaviors and guidance-control were measured with the Diabetes Family Behavior Scale (McKelvey et al., 1993). The measure consists of 30 questions using a 5-point Likert-type scale (1 = *all of the time*, 2 = *most of the time*, 3 = *sometimes*, 4 = *hardly ever*, and 5 = *never*). The family warmth-caring subscale is the sum of 15 items and evaluates the perceived family support for diabetes self-management. The guidance-control subscale is the sum of 15 items and evaluates perceived parental control for diabetes self-management. Each subscale has a range of 15 to 75 with higher scores indicating a greater

frequency of each behavior. In this sample, the Cronbach's alpha for the warmth-caring subscale was .79. and .62 for the guidance-control subscale.

Depressive symptoms were measured using the Children's Depression Inventory (full version [CDI]; Kovacs, 1985). This instrument consists of 27 items that measure self-reported depressive symptoms, including disturbance in mood and hedonic capacity, self-evaluation, vegetative functions, and interpersonal behaviors. Each item consists of three statements increasing in severity and is scored from 0 to 2. The items were summed with a possible range from 0 to 52. A score of 12 was the clinical cutoff for elevated depressive symptoms in the study. Typically, the criterion score for this instrument is 13; however, 1 item on suicidal ideation was eliminated because adolescents' completed the instrument online, and staff were not able to respond immediately to suicidal ideation. Therefore, a clinical cutoff of 12 was used. The Cronbach's alpha for the sample was .92.

Mediator variables included self-management activities and goals which were measured using the Self-Management of Type 1 Diabetes in Adolescence (SMOD-A) questionnaire (Schilling et al., 2007), a 52-item self-report instrument. For this analysis, two of the subscales to measure the construct of self-management were used: Diabetes Care Activities and Goals. Adolescents were asked how frequently they perform diabetes care activities on a 4-point Likert-type scale (0 = *never*, 1 = *sometimes*, 2 = *most of the time*, 3 = *always*). Fifteen items comprise this subscale. The range of the subscale is 0 to 45 with higher scores indicating more/better performance of diabetes care activities. Adolescents were asked about setting self-management goals, such as "taking care of my diabetes more on my own" (0 = *never*, 1 = *sometimes*, 2 = *definitely*, 3 = *I've met this goal*). The self-management goals subscale consists of 7 items and has a range of 0 to 21 with higher scores indicating more goal setting or more goals met. Reliabilities of the subscales in this sample were adequate: the Cronbach's alpha for diabetes care activities was .73 and goals was .62.

Outcome variables in the model were glycemic control and quality of life. Glycemic control was measured with glycosylated hemoglobin (A1C) which provides objective evidence of glycemic control over the past 3 months. In the majority of the sample (80%), A1C was determined by the Bayer Diagnostics DCA2000, which uses a fingerstick of blood (normal range = 4.2%–6.3%). The other methods used were Roche Tinaquant, immunoturbidimetry, and High Performance Liquid Chromatography. Statistical analyses indicated no significant variability in measurements analyzed using different methods. In youth with type 1 diabetes, the recommended A1C is at or below 8% (ADA, 2013).

The Pediatric Quality of Life Inventory version 4.0 was used to evaluate quality of life in adolescents with chronic health conditions (Varni, Seid, & Rode, 1999). The measure consists of 23 items and questions are asked on a 5-point Likert-type scale (0 = *never*, 1 = *almost never*, 2 = *sometimes*, 3 = *often*, 4 = *almost always*). The measure evaluates four dimensions of quality of life: physical, emotional, social, and school functioning. For this study, the total score (range = 0–100) was used which is an indicator of overall psychosocial quality of life. The Cronbach's alpha for the sample was .87.

Data Analysis

To examine demographic and clinical differences in family functioning, *t* tests and one-way ANOVAs were used. As previously mentioned, family functioning was composed of three variables: family conflict, warmth-caring, and guidance-control. Demographic and clinical factors were dichotomized: children's age was categorized into younger (11–12 years) and older (13–14 years), race/ethnicity was categorized into White and non-White, and depression scores were dichotomized into high CDI (≥ 12) and low CDI (<12). Marital status was categorized as partnered or un-partnered and household income was categorized into low ($<US\$40,000$ /year), middle ($US\$40,000$ – $US\$80,000$ /year), and high ($>US\$80,000$ /year).

Pearson correlation coefficients were calculated to examine the relationships among family functioning, depressive symptoms, self-management, A1C, and quality of life. Next, SEM was used to test whether self-management mediated the relationship between family functioning, depression, and A1C and quality of life, while controlling for age, race/ethnicity, and income. Self-management was specified as a latent variable of diabetes care activities and self-management goals. The model included four exogenous variables (family conflict, warmth-caring, guidance-control, and depressive symptoms), one mediator (latent variable for self-management), and two outcome variables (A1C and quality of life). SEM was performed using Mplus (Version 5.2), and the estimated coefficients and standard errors adjusted for age, race/ethnicity, and income were used to test direct and indirect (mediation) effects between exogenous variables and outcome variables. Model fit was assessed using the Comparative Fit Index (CFI), the Tucker–Lewis Index (TLI), and the Root Mean Square Error of Approximation (RMSEA). CFI and TLI greater than 0.9 and RMSEA less than 0.05 are considered to have an acceptable model fit.

Results

Sample Attributes

The sample ($n = 320$) was 55% female, with 57.8% of the sample in the younger age group (11–12 years), and 42.2% were in the older age group (13–14 years). The majority of the sample self-identified as White (62.9%), while 20.1% identified as White, Hispanic/Latino, 7.9% as Black, 7.5% as multiracial, and 1.6% Other. Approximately half of adolescents had a high family income of $US\$80,000$ or more (50.8%), while 28.2% were from middle-income families ($US\$40,000$ – $US\$79,999$) and 21.0% were from low-income families ($<US\$40,000$). The mean duration of diabetes was 4.9 ± 3.4 years, and the mean A1C was $8.3 \pm 1.5\%$. Slightly more adolescents were treated with an insulin pump (59.9%) compared with injections (40.1%), and 16.6% of the sample had elevated depressive symptoms scores (CDI ≥ 12).

Demographic Factors Associated With Family Functioning

There were significant differences in family functioning by age, income, race/ethnicity, and depression but no difference by therapy type (Table 1). Younger adolescents (11–12 years) had lower diabetes family conflict ($p = .04$), and higher warmth-caring ($p < .01$) and guidance-control ($p < .01$) compared with older adolescents (13–14 years). Adolescents who

lived in single family households reported less warmth-caring behaviors compared with adolescents in families with 2 parents ($p = .05$). The high-income group (US\$80,000) had less family conflict compared with the low-income group (<US\$40,000) and significantly more warmth-caring compared with the middle- and low-income groups ($p < .01$). White participants had significantly lower family conflict ($p = .03$) and higher warmth-caring ($p < .01$) than those of other race/ethnicities. Those with elevated depressive symptoms (CDI 12) had higher family conflict ($p < .01$), lower warmth-caring ($p < .01$) and guidance-control ($p < .01$) compared with those with low depressive symptoms (CDI < 12). There were no differences in guidance-control by income or race/ethnicity.

Associations With Family Functioning

Bivariate correlations indicate the associations between family functioning variables (diabetes family conflict, warmth-caring, and guidance-control) and other key variables (self-management, depression, A1C, and quality of life; Table 2). There were significant associations between the family functioning variables ($p < .01$ to $p = .02$). Diabetes family conflict was negatively associated with self-management ($p < .01$ to $p = .005$) and quality of life ($p < .01$) and positively associated with A1C ($p = .02$). Perception of warmth-caring was positively associated with self-management ($p < .01$) and quality of life ($p < .01$) and negatively associated with A1C ($p = .01$). Perceived guidance-control was positively associated with self-management diabetes care activities ($p < .01$). Depression was positively associated with diabetes family conflict ($p < .01$), and was negatively associated with warmth-caring, self-management, and quality of life ($p < .01$).

Mediation Analyses

The structural model based on the hypothesized relationships between family functioning, depression, self-management, A1C, and quality of life was a good fit for the data (CFI = 0.988, RMSEA = 0.034; Figure 1). There was no direct effect of family functioning on A1C or quality of life (Table 3). There was a significant direct effect between child depressive symptoms and quality of life ($p < .01$); however, there was no significant direct effect of depressive symptoms on A1C. With respect to A1C, support for mediation was found with significant indirect effects of family conflict, warmth-caring, guidance-control, and depressive symptoms on A1C through self-management (Table 3). Due to the opposite directions of the direct and indirect effects on A1C, the total effect on A1C was not significant regardless of the significant mediation effect. With respect to quality of life, support for mediation was found with significant indirect effects of family conflict and depression on quality of life through self-management. The direct and indirect effects were in the same direction for quality of life, and the total effect was significant.

Results of the univariate and multivariate analysis of the relationship between parent guidance-control and self-management was not consistent. In the univariate analysis, higher parent guidance-control was correlated with better self-management activities, but not self-management goals (Table 2). In the mediation analysis, there was a negative association between parent guidance-control and self-management goals (Figure 1), and parent guidance-control had a negative mediation effect through self-management on A1C and quality of life (Table 3). Further analyses were conducted to explore these relationships. In

partial correlations, adjusting for family conflict and warmth-caring, the positive correlation between parent guidance-control and self-management activities was attenuated ($p = .34$), and the negative correlation between parent guidance-control and self-management goals was strengthened ($p < .01$; data not shown). Thus, greater parent guidance-control has a negative effect on A1C and quality of life in adolescents through self-management goal setting.

Discussion

In this study, family functioning, youth depressive symptoms, self-management, and diabetes-related outcomes were examined in a sample of adolescents with type 1 diabetes. Self-management mediated the relationships among family conflict, warmth-caring behaviors, parent guidance-control, depressive symptoms, and glycemic control, as well as family conflict and depressive symptoms and quality of life.

Considerable research has demonstrated the role of family conflict and warmth-caring behaviors on glycemic control in youth with type 1 diabetes (Anderson et al., 2002; Berg et al., 2008; Cohen et al., 2004; Hilliard et al., 2011; Ingerski et al., 2010; Moore et al., 2013), suggesting that self-management mediates this relationship (Hilliard et al., 2011, 2013). Results of this study provide further evidence of the critical importance of family conflict on youth quality of life, with self-management mediating this relationship as well.

In addition, the current study demonstrated that higher parental guidance-control has a negative influence on glycemic control and quality of life in early adolescents with type 1 diabetes through self-management goal setting. Research supports that parental collaboration and monitoring are essential to assure optimal outcomes in the transfer of diabetes self-management responsibility to adolescents (Anderson et al., 2002; Ellis et al., 2007; Wysocki et al., 2009). However, too much parental guidance-control or parental involvement perceived as intrusive can have the opposite effect, contributing to worse glycemic control via poorer self-management in this developmental stage. In this study, increased parental guidance-control (e.g., parent does things for adolescent that he or she could do for self) contributed to less goal setting for diabetes self-management by adolescents, which in turn had a detrimental effect on glycemic control and quality of life. While these results need to be interpreted cautiously due to low reliability coefficients of the subscales, a critical developmental task in early adolescence may be to set specific diabetes self-management goals to optimize glycemic control and adolescent quality of life.

Previous studies have been consistent in finding that elevated depressive symptoms in youth with diabetes have negative influences on glycemic control and quality of life (Grey et al., 1991; Kovacs, Obrosky, Goldston, & Drash, 1997; Stewart et al., 2005). Self-management of blood glucose monitoring has been shown to mediate the relationship between depressive symptoms and glycemic control (McGrady et al., 2009). This study provides further support for self-management activities and goals as a mediator between depressive symptoms and glycemic control. What this study adds to the understanding of this relationship is that self-management also mediates the relationships between depressive symptoms and quality of

life. Thus, the critical role of assessing and treating depressive symptoms as recommended by the ADA (2013) in adolescents with type 1 diabetes is reinforced.

In addition to screening for depressive symptoms in youth, assessment and support of family functioning is also indicated. In particular, provider attention to the family factors of family conflict, family warmth-caring behaviors, and parental guidance-control will support parents and youth with type 1 diabetes through the adolescent transition. Diabetes care providers assess self-management (e.g., following recommendations for blood glucose monitoring and insulin injections) regularly, especially when there are problems with depression and metabolic control. As summarized above, attention to youth goal setting toward self-management may be a valuable addition to discussions. For example, adolescents may have set a long-term goal of taking care of their diabetes independently. With this goal in mind, clinicians can help families with discussions regarding setting incremental and concrete goals that support adolescents' self-management, such as taking responsibility for diabetes management on a school trip.

Family-based interventions have been developed and evaluated, both for brief office-based interventions (Anderson, Brackett, Ho, & Laffel, 1999) and for high-risk youth (Wysocki et al., 2006) with promising results. However, dissemination into practice has been slow to occur. Research is urgently needed on the most effective and efficient strategies that support family functioning through the challenging developmental stage of adolescents. Establishing a collaborative self-management approach with the appropriate level of guidance and control while simultaneously minimizing family conflict and optimizing family warmth-caring behaviors is difficult during adolescence. This study has identified some risk factors for poor family functioning that may offer guidance to providers. Some issues may be too time-consuming or complex to address in a diabetes clinic visit, and referrals for family therapy may be indicated.

There are limitations that must be acknowledged when interpreting the results from this study. First, cross-sectional data were used, and thus temporality cannot be inferred. Future studies examining family functioning, depressive symptoms, self-management, A1C, and quality of life longitudinally would be of benefit. Second, the sample was in relatively good metabolic control, which may limit generalizability. Third, the sample was recruited for a randomized controlled trial and those with better self-management may have been more likely to participate in the clinical trial.

In a sample of adolescents with type 1 diabetes, self-management mediated the relationship between family functioning and A1C as well as the relationship between family conflict and quality of life. In addition, self-management mediated the relationships between youth depressive symptoms and A1C and quality of life. Supporting optimal family functioning and evaluating and treating increased depressive symptoms in adolescents with type 1 diabetes has the potential to improve self-management, which in turn may improve glycemic control and quality of life during this challenging developmental stage.

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Figure 1.
Mediation model.

Note. Standardized coefficients and standard errors (*SEs*) for the relationships between family functioning, depression, quality of life, and A1C as mediated by self-management. Self-management was measured as a latent variable using the diabetes care activities and self-management goals subscales from the SMOD-A. A1C = glycosylated hemoglobin; SMOD-A = Self-Management of Type 1 Diabetes in Adolescence.

Table 1

Comparisons of Family Functions by Demographic and Clinical Characteristics.

	Diabetes Family Conflict		Warmth-caring		Guidance-control	
	M (SD)	p value	M (SD)	p value	M (SD)	p value
Age						
Younger (11–12)	25.78 (5.6)	.04	57.92 (7.8)	<.01	46.42 (6.8)	<.01
Older (13–14)	27.12 (6.1)		55.28 (8.4)		43.32 (7.2)	
Income (in US\$) ^a						
Low (<40,000)	27.49 (7.1)	.07	53.84 (8.7)	<.01	45.88 (7.6)	.47
Middle (40,000–79,999)	26.56 (4.9)		55.8 (8.1)		45.46 (7.4)	
High (>80,000)	25.62 (5.3)		58.53 (7.5)		44.67 (6.9)	
Race/ethnicity						
White, non-Hispanic, non-Latino	25.81 (5.7)	.03	57.93 (7.7)	<.01	44.66 (7.2)	.12
Other	27.28 (6.13)		54.83 (8.5)		45.96 (6.9)	
Parents' marital status						
Partnered	26.15 (5.86)	.22	57.24 (8.20)	.05	44.82 (7.29)	.14
Unpartnered	27.18 (5.84)		54.92 (7.73)		46.33 (6.24)	
Therapy type						
Pump	26.37 (5.9)	.98	56.68 (8.0)	.80	44.79 (7.0)	.32
Injection	26.35 (5.9)		56.91 (8.4)		45.61 (7.4)	
Depression						
Low depression (CDI < 12)	25.83 (5.9)	<.01	58.43 (7.2)	<.01	45.62 (7.2)	<.01
High depression (CDI ≥ 12)	28.92 (4.8)		48.44 (7.6)		42.46 (5.8)	

^aIncome: Duncan's multiple comparisons were performed between two income levels at .05 significance. Low-income group was found to have significantly more family conflict compared with high-income groups. High-income group was found to have significantly more warmth-caring than middle- and low-income groups, but no difference in guidance-control. CDI = The Children's Depression Inventory.

Table 2

Pearson Correlation Analyses.

	Diabetes family conflict	Warmth-caring	Guidance-control	Self-management diabetes care activities	Self-management goals	Depression	A1C
Warmth-caring	-.30 (<.01)						
Guidance-control	-.13 (.02)	.26 (<.01)					
Self-management diabetes care activities	-.31 (<.01)	.39 (<.01)	.16 (<.01)				
Self-management goals	-.16 (<.01)	.22 (<.01)	-.09 (.12)	.34 (<.01)			
Depression	.28 (<.01)	-.60 (<.01)	-.21 (<.01)	-.30 (<.01)	-.22 (<.01)		
A1C	.13 (.02)	-.14 (.01)	.01 (.93)	-.26 (<.01)	-.20 (<.01)	.07 (.21)	
Quality of life	-.30 (<.01)	.46 (<.01)	.10 (.08)	.35 (<.01)	.26 (<.01)	-.59 (<.01)	-.09 (.12)

Note. Pearson correlation coefficients (*p* values in parentheses). A1C = glycosylated hemoglobin.

Table 3

Direct and Indirect (Mediation) Effects of Family Functioning and Depression on Quality of Life and A1C.

Casual variables	Effects	Outcome variables	
		A1C estimate $\pm$ SE (p value)	Quality of life estimate $\pm$ SE (p value)
Family conflict	Direct effect	-0.004 ± 0.011 (.73)	-0.012 ± 0.009 (.18)
	Indirect effect through self-management	0.017 ± 0.007 (.01)	-0.011 ± 0.005 (.02)
	Total effect	0.013 ± 0.010 (.16)	-0.023 ± 0.008 (.003)
Warmth-caring	Direct effect	0.001 ± 0.007 (.85)	0.006 ± 0.006 (.25)
	Indirect effect through self-management	-0.008 ± 0.004 (.04)	0.005 ± 0.003 (.06)
	Total effect	-0.007 ± 0.006 (.30)	0.012 ± 0.005 (.02)
Guidance-control	Direct effect	-0.001 ± 0.007 (.84)	-0.007 ± 0.006 (.24)
	Indirect effect through self-management	0.008 ± 0.004 (.04)	-0.005 ± 0.003 (.06)
	Total effect	0.007 ± 0.006 (.30)	-0.012 ± 0.005 (.02)
Depression	Direct effect	-0.016 ± 0.009 (.08)	-0.061 ± 0.007 (<.001)
	Indirect effect through self-management	0.012 ± 0.005 (.02)	-0.008 ± 0.004 (.03)
	Total effect	-0.004 ± 0.008 (.63)	-0.069 ± 0.006 (<.001)

Note. Estimates and standard errors (SEs) represent indirect (mediation) effect on A1C and quality of life through self-management, and were obtained from path-analysis after controlling for age, race, and household income. A1C = glycosylated hemoglobin.