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A Descriptive Analysis of Self-Care Behaviors in Emerging Adults with Type 1 Diabetes

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Abstract

Objective—To evaluate diabetes self-care behaviors, metabolic control, and associated demographic and medical correlates in an understudied sample of emerging adults with type 1 diabetes.

Methods—Participants included 49 individuals (65% female) aged 18–26 years recruited from two major metropolitan areas and staff from a diabetes summer camp. Participants completed two diabetes interviews to assess daily self-care behaviors and self-report measures of psychosocial adjustment and demographic/medical characteristics. Metabolic control was assessed via HbA_{1c}.

Results—Most participants (82%) utilized three or more daily insulin injections or an insulin pump. Self-care behaviors varied widely with an average of 2.56 daily blood glucose checks and 3.78 meals/snacks per day. Forty-one percent of participants engaged in daily exercise; just over half were active for 30 minutes or more. Across recall interviews, only 8% ($n = 4$) met American Diabetes Association (ADA) recommendations for both blood glucose monitoring (BGM) and daily physical activity. Average metabolic control was 8.25% with 81% of HbA_{1c} values above 7.0%. Psychosocial adjustment was within normal limits and unrelated to self-care.

Conclusions—Daily diabetes care could be improved within this age group, as a significant percentage did not meet minimal ADA recommendations for disease care and metabolic control. Increased BGM and physical activity is recommended, and BGM should correspond to insulin regimen as well as meal and exercise habits. Emerging adults may benefit from targeted education, training, and behavioral support to enhance self-care behaviors during this critical period.

Keywords

Type 1 Diabetes; emerging adults; metabolic control; self-care behaviors

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Introduction

In the past decade, developmental researchers have reconceptualized the period between adolescence and adulthood as emerging adulthood (1). Emerging adults are no longer dependent adolescents solely reliant on parents, nor are they fully self-sufficient adults constrained by routinized responsibilities. As a group, they experience considerable instability and change in demographic and living characteristics, financial status, and subjective perceptions of responsibility (1). Emerging adults with chronic illnesses have the added developmental task of greater responsibility for their health care (2), and research suggests that self-care behaviors during this critical period may set the stage for enduring adult health outcomes (3, 4).

Type 1 diabetes (T1D) is the most common chronic illness of childhood (5) and daily management requires performance of a complex routine of blood glucose monitoring (BGM), insulin administration, diet management, and physical activity (6). While considerable variability in individual treatment goals and diabetes management plans exists, the American Diabetes Association (ADA) recommends a basal-bolus insulin regimen (i.e. multiple daily injections or an insulin pump) when appropriate, BGM at least four times daily, individualized meal planning, and 30–60 minutes of moderate physical activity daily for children and adolescents (7). In emerging adulthood, a primary developmental task is the integration of these behaviors into an evolving lifestyle while also achieving a more stringent hemoglobin A_{1c} (HbA_{1c}) goal of < 7.0% (7, 8).

Clinically, the demands and variability inherent in the transition to adulthood can compete with the rigors of appropriate diabetes management (9). College students with diabetes identify numerous barriers to optimal disease management (e.g. time management, stress, inconvenience) and express a perceived inability to incorporate routine self-care into their inconsistent schedules (10). Yet, surprisingly little data exists to characterize the daily self-management behaviors of emerging adults, including BGM, dietary, and exercise practices. Since greater adherence to a self-care regimen is linked to better metabolic control in pediatric populations (e.g. HbA_{1c}; (11), systematic evaluation of daily self-care behaviors is relevant in an emerging adult population to better understand risk factors associated with poorer health outcomes. In addition, mental health status (3, 12, 13) as well as established demographic predictors in pediatric populations, including age, race, and socio-economic status (14–16), can impact daily disease care and should be considered when evaluating health behaviors in emerging adults.

This cross-sectional study provides a detailed first look at daily self-care behaviors, metabolic control, and their related demographic and medical correlates within a population of emerging adults with T1D. Dimensions of psychosocial adjustment (17, 18) were screened to determine their relation to diabetes-management behaviors and metabolic control.

Methods

Emerging adults with T1D were recruited via posted advertisement flyers on college campuses and from weekly city newspaper listings within two metropolitan areas. Seven young adult staff members with T1D from a diabetes summer camp also were included. A total of 50 individuals volunteered and received \$30 compensation plus delayed feedback of HbA_{1c} results after the study. Telephone interviews established initial eligibility and usable data was available for 98% of the 50 eligible participants (n = 49); one participant was excluded due to incomplete data. Eligible participants were free from severe disease complications and other major medical conditions at the time of participation. Written informed consent was obtained, and this study was approved by appropriate Institutional Review Boards.

Participants completed demographic and psychosocial questionnaires, which were returned via a study-provided stamped envelope. Two interviews were conducted to assess self-care behaviors over a 24-hour period; the first was completed in-person at the time of consent and the second over the telephone approximately two weeks after consent. To obtain a small quantity of capillary blood, participants performed a finger stick and metabolic control was assayed with a one-time use, disposable A_{1c}Now™ kit (19).

Measures

Self-care—The 24-hour diabetes interview (15, 20) documented frequency of self-care behaviors. Participants completed two interviews over the course of the study; all diabetes relevant behaviors—blood glucose testing, insulin injection behaviors, diet, and exercise—from the previous day were recorded in sequential order. For the purposes of this study, frequency measures were used to approximate engagement in daily self-care behaviors. BGM frequency, eating frequency, and exercise frequency were selected as primary daily self-care variables, as these behaviors can be reliably assessed based on cross-informant coefficients in pairs of late adolescents (age 16–19) and their parents (20). Further, these behaviors typically have greater variability than injection frequency (21). The 24-hour diabetes interview has not been used previously in this age group. Self-reported insulin regimens were broadly classified as intensive treatments (IT; i.e. basal-bolus regimens, 3 injections) or conventional treatments (CT; 2 injections).

Metabolic control and biometric status—HbA_{1c} assessed degree of metabolic control with a one-time use, disposable A_{1c}Now™ kit (19). A_{1c}Now™ is certified by the National Glycohemoglobin Standardization Program (NGSP) to provide standardized assay results comparable to those of the landmark Diabetes Control and Complications Trial (HbA_{1c}: reference range = 4–6%). HbA_{1c} values generally represent metabolic control over the past 6–12 weeks, but are weighted towards the most recent 3–4 weeks (22). Thus, two HbA_{1c} readings separated by approximately four-week intervals were averaged to serve as an indicator of mean metabolic control. Height and weight were also measured at each site, and body mass index (BMI) was calculated for each participant.

Demographic Characteristics—Demographic and medical characteristics were reported via a brief self-report questionnaire.

Psychosocial Adjustment—The Brief Symptom Inventory (BSI;(23) is a 53-item self-report measure of distress, rated on a five-point scale. The Global Severity Index (GSI), combines information about number of symptoms and their perceived intensity. Higher scores indicate greater perceived distress. The GSI demonstrates strong test-retest reliability ($r = .90$). The Diabetes Quality of Life measure (24) is a 46-item self-report measure rated on a 5-point scale that measures subjective experience of diabetes care and treatment. The DQOL demonstrates strong internal consistency (Cronbach's $\alpha = .66-.92$), excellent test-retest reliability ($r = .78-.92$), and convergent validity with measures of psychological well-being and diabetes-adjustment (25). Raw scores were converted to an 100-point scale; higher scores indicate more favorable quality of life (26).

Data Analysis Plan

Means and standard deviations for HbA_{1c} and daily self-care behaviors were calculated to characterize the sample's metabolic control and frequency of health behaviors. Mean psychosocial adjustment scores also were calculated. Point biserial correlations were conducted to assess preliminary relationships among frequency of daily self-care variables (BGM frequency, eating frequency, and exercise frequency) with demographic, medical, and psychosocial characteristics.

Results

Sample Characteristics

Participants were 65% female ranging in age from 18.00 – 26.67 years ($M = 20.62 \pm 1.90$). Seventy-eight percent of the sample self-identified their race as Caucasian. Age of onset ranged from 2.33 – 21.83 years, and participants had an average illness duration of 10 years ($M = 10.40 \pm 3.69$). The Hollingshead Four Factor Index (27) was used to determine socioeconomic status (SES) based on parental occupation and education for financially dependent participants or personal occupation and education for financially independent participants. The majority of participants were from middle class families. Most were enrolled in post-high school education and lived away from their family of origin, but 9 participants (18%) considered themselves financially independent. See Table 1 for detailed demographic characteristics of the sample.

Overall, participants scored within the normal range on the GSI of the BSI, indicating appropriate emotional wellbeing ($M = 53.64$, range = 33 – 80); only a small number ($n = 3$) evidenced elevated levels of psychological distress ($GSI > 70$). Diabetes quality of life also revealed generally positive perceptions of diabetes self-care requirements ($M = 67.77$; range = 46–92).

Metabolic Control

On average, participants demonstrated suboptimal metabolic control ($M = 8.25\%$, range = 5.20–12.80%). Eighty-one percent of HbA_{1c} values fell above 7.0%, the ADA recommendation for adults.

Daily Self-care Behaviors

Blood glucose monitoring—Most participants took three or more daily injections of insulin or were on the insulin pump (82%). BGM frequency ranged from zero to five times daily, with participants reporting a mean of 2.56 tests per day. Thirty-one percent of emerging adults met the ADA recommendation of BGM four or more times daily. In comparison, 31% tested three times per day; 20% tested twice daily; 12% tested once daily; and 6% did not test at all across the two recall interviews. Fourteen percent of the sample reported no BGM for at least one 24-hour period.

Diet data—Meal frequency and diet composition varied considerably across participants. Average eating frequency ranged from two to seven meals/snacks per day, with an average of 3.78 meals/snacks daily. Most participants (74%) consumed four or more meals/snacks per day. On average, participants reported a daily caloric intake of 1907.36 calories. Carbohydrates comprised 44.26% (range = 19.25 – 59.50%) and fats comprised 35.75% (range = 18.75 – 51.50%) of daily caloric intake.

Exercise and BMI data—The ADA recommends at least 30 minutes of daily physical activity for youth. Forty-one percent of participants engaged in exercise at least once daily (range = 0–3.50); 55% of those individuals who engaged in daily exercise demonstrated a mean duration of 30 minutes or more. Mean exercise duration was 29.56 minutes/day and ranged from 0 to 157 minutes. Average BMI was in the upper end of the normal range (healthy adult BMI range = 18.50 – 24.90; sample $M = 24.89$, range = 16.63 – 32.55). Thirty-three percent of participants had BMIs in the overweight range (25.00 – 29.99), and 8% of participants had BMIs in the obese range (≥ 30.00).

In summary, 4 of 49 participants (8%) met ADA recommendations for both BGM and daily physical activity across self-care interviews. Of note, all 4 participants who met general ADA recommendations used an intensive insulin regimen.

Correlates of Self-Care Behaviors and Metabolic Control

Correlational analyses were conducted to evaluate associations among demographic, psychosocial and medical variables (e.g., age, race, SES, BMI, disease duration, insulin regimen), self-care behaviors (BGM, eating frequency, exercise frequency), and HbA_{1c}. Results are presented in Table 2.

Within this sample of emerging adults, age and gender were not significantly associated with frequency of self-care behaviors. Caucasian participants, $r(49) = .29, p < .05$, and participants with higher SES, $r(49) = .32, p < .05$, performed more frequent BGM. More frequent BGM was also associated with use of an intensive insulin regimen, $r(49) = .48, p < .01$. Eating frequency was associated with disease duration, indicating that participants with longer diabetes duration ate more frequently, $r(49) = .33, p < .05$. A trend indicated that Caucasian participants consumed more meals/snacks, $r(49) = .26, p = .07$. Exercise frequency also related to eating frequency, $r(49) = .30, p < .05$, such that emerging adults who exercised more frequently reported consuming more meals/snacks daily. A trend indicated Caucasian participants $r(49) = .25, p = .08$ and participants using an intensive

insulin regimen $r(49) = .27, p = .06$) reported more frequent exercise. BMI was not significantly associated with BGM, meal/snack frequency, total calories, diet composition, exercise frequency, or type of insulin regimen.

Demographic variables were not significantly associated with metabolic control. Use of intensive insulin therapy (IT) was associated with better metabolic control, $r(49) = -.49, p < .01$. Additionally, a trend indicated that more frequent BGM was associated with better metabolic control, $r(49) = -.26, p = .07$.

Correlates of Self-care Behaviors and Psychosocial Adjustment

Point biserial correlations revealed psychological well-being and quality of life were not significantly related to demographic or disease variables. Better psychological well-being correlated with more favorable diabetes quality of life, $r(45) = -.33, p < .05$.

Conclusions

Overall, emerging adults demonstrated considerable variability in self-care behaviors. While physical activity data were fairly favorable, two-thirds of the sample did not perform the recommended 4 or more BG checks per day and 81% of HbA_{1c} values were above the ADA recommended value for adults (7). Use of a conventional insulin regimen related to less frequent BGM and poorer metabolic control. Results highlight sample heterogeneity consistent with the theoretical conceptualization of emerging adulthood across a range of demographic, psychosocial, and medical characteristics. Nevertheless, the majority of high functioning post-adolescents in this sample endorsed healthy psychological adjustment and positive quality of life.

Given the variability and change that characterizes the developmental transition from adolescence to young adulthood, it is not surprising that emerging adults in this sample demonstrated considerable variability in BGM frequency, eating frequency, exercise frequency and metabolic control. It is disturbing, however, that only a small percentage of the sample (8%) demonstrated optimal self-care across behavioral domains. Just 31% of the sample monitored their blood glucose four or more times daily and 22% participated in physical activity 30–60 minutes daily as recommended by the ADA (7). Congruently, metabolic control was poorer than the 7.0% HbA_{1c} recommended by the ADA for adults (sample $M = 8.25\%$). Further, 41% of the sample was overweight or obese; a finding that adds to the literature of higher than ideal HbA_{1c} levels and weight concerns in young adults with T1D (4). Thus, self-care behaviors could, and should, be improved within this age group. Importantly, psychological distress can not explain these suboptimal self-care behaviors since the majority of the sample reported appropriate psychosocial functioning and no relation was detected between psychological status and self-care behaviors.

Use of an intensive insulin regimen was associated with better metabolic control and more frequent BG monitoring with a trend toward more frequent exercise. As use of an intensive insulin regimen was associated with favorable health behaviors and was not correlated with negative psychosocial adjustment, this supports the widespread use of basal-bolus insulin regimens (multiple daily injections or insulin pump) with emerging adults that is often seen

in current clinical practice. The benefits of intensive treatment are well-established and may result in further improvements in disease course and prognosis among emerging adults (28). Higher SES was associated with use of an intensive insulin regimen, and while the costs of an insulin pump may be a factor that precludes its adoption by some, use of a basal-bolus regimen of multiple daily injections is a viable alternative (29).

Caucasian participants and those with a longer illness duration reported eating more meals/snacks during the day, consistent with other samples (e.g., (30)). However, it is unclear if this finding is adaptive and beneficial to overall glycemic control or if this result represents a decrease in attention to meal scheduling and potentially poorer self-care habits, since eating frequency was not related to BGM or metabolic control. Recent information on the association between meal/snack frequency and metabolic control is limited, but there is evidence that skipped meals and increased snacking relate to poorer metabolic control and dietary composition as well as physical inactivity (31). Of clinical relevance, it is also important to note that the emerging adults in this sample demonstrated average BGM frequency below that of their average meal/snack frequency. Emerging adults, particularly those with longer illness duration, may benefit from targeted diabetes education, skills training, and behavioral support as they assume independent responsibility for diabetes management. Review could target diabetes management knowledge and skills, such as meal planning, carbohydrate counting, pre- and post-prandial blood glucose monitoring to promote consistency and optimize daily self-management behaviors.

In contrast to less frequent disease care behaviors, many emerging adults in the present sample reported healthy psychological well-being. Psychological health is notable in light of complex disease management demands and developmental challenges inherent in the shift from adolescence to young adulthood. Consistent results are reported in demographically similar cross-sectional (32) and longitudinal (33) samples. Normative psychological status should be considered promising as less favorable outcomes have been reported in lower socioeconomic groups of young adults (3, 4), possibly due to restricted resources. Demographic characteristics, including socioeconomic status, and medical variables were not associated with psychosocial adjustment in this predominantly middle-class sample.

Several potential limitations should be taken into consideration when drawing inferences from present results. A larger sample could have provided additional statistical power beyond these initial descriptions of diabetes care behaviors and metabolic control. However, sampling young adults can be challenging, as this population must transition from pediatric to adult care providers and lengthy gaps between medical visits can occur or patients may be lost to follow-up (2, 34). The sample also consisted of predominantly Caucasian, financially-dependent emerging adults; future studies may benefit from sampling emerging adults with diverse life trajectories, including those who work full time or live independently. Future studies could measure development and progression of disease complications, particularly *apropos* in a young adult sample such as this one, in addition to metabolic control. Similarly, psychological screening may be improved with use of a diagnostic interview (35).

In the current sample, the majority of emerging adults do not meet ADA recommendations for daily diabetes self-management and metabolic control. This preliminary investigation of

daily diabetes-care behaviors in a population about whom relatively little is known points to clear avenues for future investigation. The use of the 24-hour diabetes interview with this population supports the utility of this measure to provide detailed data on daily care behaviors; additionally, as this interview can be administered over the telephone, data collection with a traditionally mobile population is enhanced. Future research could further explore perceived disease management barriers and the impact of emergent treatment technology (e.g. continuous glucose monitoring) that may minimize barriers and enhance disease management.

Emerging adulthood is a critical developmental period during which improvement in self-care behaviors may become life-long habits and increase the odds for a healthy long-term prognosis (2). Practitioners who work with emerging adults should place great emphasis on incorporation of self-care behaviors into busy schedules for improved immediate and long-term health. Additionally, as disease duration increases, emerging adults may benefit from ongoing diabetes education, skills training, and behavioral support services (e.g. psychology services) when indicated. Development, implementation, and evaluation of psychoeducational interventions designed to specifically address the developmental and medical transition from adolescence to adulthood also is desirable. At a minimum, assessment and enhancement of self-care skills in emerging adults is needed to promote increased adherence to a diabetes regimen. These recommendations have the potential to promote change and inform better clinical care of emerging adults with type 1 diabetes.

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REFERENCES

1. Arnett J. Emerging adulthood: a theory of development from late teens through the twenties. *American Psychologist*. 2000; 55:469–80. [PubMed: 10842426]
2. Weissberg-Benchell J, Wolpert H, Anderson B. Transitioning from pediatric to adult care: a new approach to the post-adolescent young person with type 1 diabetes. *Diabetes Care*. 2007; 30:2441–6. [PubMed: 17666466]
3. Bryden K, Dunger D, Mayou R, Peveler R, Neil H. Poor prognosis of young adults with type 1 diabetes: a longitudinal study. *Diabetes Care*. 2003; 26:1052–7. [PubMed: 12663572]
4. Bryden K, Peveler R, Stein A, Neil H, Mayou R, Dunger D. Clinical and psychological course of diabetes from adolescence to young adulthood: a longitudinal cohort study. *Diabetes Care*. 2001; 24:1536–40. [PubMed: 11522695]
5. SEARCH for Diabetes in Youth Study Group. Liese A, D'Agostino RJ, Hamman R, Kilgo P, Lawrence J, Liu L, Loots B, Linder B, Marcovina S, Rodriguez B, Standiford D, Williams D. The burden of diabetes mellitus among US youth: prevalence estimates from the SEARCH for Diabetes in Youth Study. *Pediatrics*. 2006; 118:1510–8. [PubMed: 17015542]
6. Coffen R, Dahlquist L. Magnitude of type 1 diabetes self-management in youth: health care needs diabetes educators. *Diabetes Educator*. 2009; 35:302–8. [PubMed: 19218484]
7. Silverstein J, Klingensmith G, Copeland K, Plotnick L, Kaufman F, Laffel L, Deeb L, Grey M, Anderson B, Holzmeister L, Clark N. Care of children and adolescents with type 1 diabetes. *Diabetes Care*. 2005; 28:86–212.

8. American Diabetes Association. Standards of medical care in diabetes - 2010. *Diabetes Care*. 2010; 33:S11–S61. [PubMed: 20042772]
9. Ramchandani N, Cante-Kiser J, Alter C, Brink S, Yeager S, Tamborlane W, Chipkin S. Self-reported factors that affect glycemic control in college students with type 1 diabetes. *Diabetes Educator*. 2000;656–666. [PubMed: 11140074]
10. Wdowik M, Kendall P, Harris M. College students with diabetes: using focus groups and interviews to determine psychosocial issues and barriers to control. *Diabetes Educator*. 1997; 23:558–62. [PubMed: 9355372]
11. Hood K, Peterson C, Rohan J, Drotar D. Association between adherence and glycemic control in pediatric type 1 diabetes: a meta-analysis. *Pediatrics*. 2009; 124:e1171–e9. [PubMed: 19884476]
12. Insabella G, Grey M, Knafl G, Tamborlane W. The transition to young adulthood in youth with type 1 diabetes on intensive treatment. *Pediatric Diabetes*. 2007; 8:228–34. [PubMed: 17659065]
13. Rewers A, Chase H, Mackenzie T, Walravens P, Roback M, Hamman R, Klingensmith G. Predictors of acute complications in children with type 1 diabetes. *Journal of the American Medical Association*. 2002; 287:2511–8. [PubMed: 12020331]
14. Delamater A, Shaw K, Applegate E, Pratt I, Eidson M, Lancelotta G, Gonzalez-Mendoza L, Richton S. Risk for metabolic control problems in minority youth with diabetes. *Diabetes Care*. 1999; 22:700–5. [PubMed: 10332669]
15. Holmes C, Chen R, Streisand R, Marschall D, Souter S, Swift E, Peterson C. Predictors of youth diabetes care behaviors and metabolic control: a structural equation modeling approach. *Journal of Pediatric Psychology*. 2006; 31:770–84. [PubMed: 16221954]
16. Urbach S, LaFranchi S, Lambert L, Lapidus J, Daneman D, Becker T. Predictors of glucose control in children and adolescents with type 1 diabetes mellitus. *Pediatric Diabetes*. 2005; 6:69–74. [PubMed: 15963032]
17. Hislop A, Fegan P, Schlaeppi M, Duck M, Yeap B. Prevalence and associations of psychological distress in young adults with type 1 diabetes. *Diabetic Medicine*. 2008; 25:91–6. [PubMed: 18199136]
18. Ingerski L, Laffel L, Drotar D, Repaske D, Hood K. Correlates of glycemic control and quality of life outcomes in adolescents with type 1 diabetes. *Pediatric Diabetes*. 2010; 11:563–71. [PubMed: 20149122]
19. Medtrika Incorporated. A1cNow Disposable Hemoglobin A1c kit. Sunnyvale, CA: 2002.
20. Johnson S, Silverstein J, Rosenbloom A, Carter R, Cunningham W. Assessing daily management in childhood diabetes. *Health Psychology*. 1986; 5:545–64. [PubMed: 3542527]
21. Chisholm V, Atkinson L, Donaldson C, Noyes K, Payne A, Kelnar C. Predictors of treatment adherence in young children with type 1 diabetes. *Journal of Advanced Nursing*. 2007; 57:482–93. [PubMed: 17284277]
22. Rohlfing C, Wiedmeyer H, Little R, England J, Tennill A, Goldstein D. Defining the relationship between plasma glucose and HbA1c: analysis of glucose profiles and HbA1c in the Diabetes Control and Complications Trial. *Diabetes Care*. 2002; 25:275–8. [PubMed: 11815495]
23. Derogatis L, Melisaratos N. The brief symptom inventory: an introductory report. *Psychological Medicine*. 1983; 13:595–605. [PubMed: 6622612]
24. Jacobson, A.; Diabetes Control and Complications Trial Research Group. The diabetes quality of life measure. In: Bradley, C., editor. *Handbook of Psychology and Diabetes*. Harwood Academic; Newark, NJ: 1994. p. 64-87.
25. Diabetes Control and Complications Trial Research Group. Reliability and validity of a diabetes quality-of-life measure for the Diabetes Control and Complications Trial (DCCT). *Diabetes Care*. 1988; 11:725–32. [PubMed: 3066604]
26. Jacobson A, de Groot M, Samson J. The evaluation of two measures of quality of life in patients with type 1 and type 2 diabetes. *Diabetes Care*. 1994; 17:267–74. [PubMed: 8026281]
27. Hollingshead, A. Four Factor Index of Social Status. Yale University; New Haven, CT: 1975.
28. Diabetes Control and Complications Trial Research Group. *Journal of Pediatrics*. The effect of intensive diabetes treatment on the development and progression of long-term complications in adolescents with insulin-dependent diabetes mellitus. 1994; 125:177–88.

29. Wu Y, Graves M, Roberts M, Mitchell A. Is insulin pump therapy better than injection for adolescents with diabetes? *Diabetes Research and Clinical Practice*. 2010; 89:121–5. [PubMed: 20488572]
30. Streisand R, Respass D, Overstreet S, Gonzalez de Pijem L, Chen R, Holmes C. Brief report: self-care behaviors of children with type 1 diabetes living in Puerto Rico. *Journal of Pediatric Psychology*. 2002; 27:759–64. [PubMed: 12403866]
31. Overby NC, Margeirsdottir HD, Brunborg C, Dahl-Jorgensen K, Andersen LF. Sweets, snacking habits, and skipping meals in children and adolescents on intensive insulin treatment. *Pediatric Diabetes*. 2008; 9:393–400. [PubMed: 18774998]
32. Wysocki T, Hough B, Ward K, Green L. Diabetes mellitus in the transition to adulthood: adjustment, self-care, and health status. *Journal of Developmental and Behavioral Pediatrics*. 1992; 13:194–201. [PubMed: 1613115]
33. Jacobson A, Hauser S, Willett J, Wolfsdorf J, Dvorak R, Herman L, De Groot M. Psychological adjustment to IDDM: 10-year follow-up of an onset cohort of child and adolescent patients. *Diabetes Care*. 1997; 20:811–8. [PubMed: 9135947]
34. Pacaud D, Yale J, Stephure D, Trussell R, Davies H. Problems in transition from pediatric care to adult diabetes care for individuals with diabetes. *Canadian Journal of Diabetes*. 2005; 29:13–8.
35. Anderson R, Grigsby A, Freedland K, De Groot M, McGill J, Clouse R, Lustman P. Anxiety and poor glycemic control: a meta-analytic review of the literature. *International Journal of Psychiatry in Medicine*. 2002; 32:235–7. [PubMed: 12489699]

Table 1Demographic and Disease Characteristics *Total N = 49*

	<i>N (%) or M ± SD</i>
Male	17 (35)
Caucasian	38 (78)
Age (years)	20.62 ± 1.90
SES score	48.94 ± 12.22
Financially dependent	40 (82)
Age of onset (years)	10.14 ± 3.79
Disease duration (years)	10.40 ± 3.89
HbA _{1c} (%)	8.25 ± 1.55
BMI (kg/m ²)	24.89 ± 3.35
GSI	53.64 ± 10.61
DQOL	67.77 ± 9.72
Regimen (Intensive Therapy)	40 (82)
BG monitoring frequency	2.56 ± 1.33
Carbohydrate calories (% total)	44.26 ± 10.69
Fat calories (% total)	35.74 ± 8.21
Eating frequency	3.78 ± .87
Exercise frequency (daily)	0.74 ± .81
Exercise duration (min)	29.56 ± 40.80

Data are *N (%)* or *M ± SD*.

Table 2

Demographic and Medical Correlates of Self-Care Behaviors and Metabolic Control

	Frequency of Self-Care Behaviors			Metabolic Control
	BGM	Eating	Exercise	HbA1c
Age	.01	.07	-.11	-.21
Gender	-.06	.23	-.03	.18
Race	.29 *	.26 †	.25 †	-.02
SES	.32 *	.18	.07	-.18
BMI	.14	.05	.17	-.01
Disease Duration	-.03	.33 *	-.01	.09
Regimen	.48 **	.21	.27 †	-.49 **

gender 0 = male, 1 = female; ethnicity 0 = non-Caucasian, 1 = Caucasian; regimen 0 = conventional, 1 = intensive (multiple daily injections or pump)

†
p < .10;

*
p < .05;

**
p < .01;