Published in final edited form as:

Adolesc Med State Art Rev. 2010 April ; 21(1): 138–xi.

Psychological Problems in Adolescents with Diabetes

Sarah S. Jaser, PhD

Yale University School of Nursing, 100 Church Street South, PO Box 9740, New Haven, CT 06536

Sarah S. Jaser: sarah.jaser@yale.edu

Abstract

For youth with type 1 diabetes (T1DM), the transition into adolescence is often associated with poorer adherence to treatment, deteriorating metabolic control, and increased risk for psychological disorders.¹ Adolescence is a developmental stage during which youth are developing independence from parents, at the same time that they are experiencing rapid biological and hormonal changes.² Thus, diabetes may compound the risk for psychological problems in adolescents. The current article summarizes recent findings on psychological problems for adolescents with diabetes and provides recommendations for ways that primary care providers can treat and support adolescents with diabetes.

Family Functioning

Family functioning is widely acknowledged to be an important factor in adolescents' adaptation to diabetes, accounting for up to 34% of the variance in metabolic control (as compared with only 10% for adherence).^{3,4} As children enter adolescence, family conflict related to treatment management is likely to increase.⁵ Family conflict over diabetes management, such as negative and critical parenting, has been related to poor metabolic control and poorer quality of life in youth with T1DM.^{3,4,6} Indeed, one study found that diabetes-specific family conflict had a stronger negative impact on quality of life than the intensity of treatment.⁶ The chronic stress of treatment management is likely to contribute to increased family conflict,⁷ but other individual and diabetes-related factors may also intensify family conflict. For example, a recent study found that poorer metabolic control and more psychological distress (ie, greater symptoms of parental anxiety and adolescent depression) were related to higher levels of diabetes-specific family conflict.⁸ It is possible that parents who are anxious about an adolescent's deteriorating metabolic control are more likely to engage in intrusive parenting behaviors such as nagging, which may result in arguments about diabetes management. Whether family conflict is a cause or consequence of poor metabolic control, it is important to acknowledge its impact on adolescents with diabetes.

In contrast, adolescents' perceptions of parental acceptance have been related to better metabolic control and adherence,⁹ and higher levels of family cohesion have been related to better adherence.¹⁰ Recent studies suggest that the benefits of warmth and acceptance from parents may occur through parental monitoring,^{9,11} and this relationship seems particularly strong for fathers.⁹ A review of the literature on family functioning in youth with diabetes indicated that more family cohesion, more diabetes-specific support, and more family organization was related to better psychosocial outcomes in adolescents.⁴

Adolescent Autonomy and Responsibility for Treatment Management

Research indicates that greater parental involvement in adolescent diabetes management is associated with better metabolic control, and that shared responsibility for diabetes management tasks is associated with better psychological health and self-care behavior in adolescents.^{7,12} However, studies suggest that parents frequently transfer the responsibility of diabetes management at too young an age, and poor adherence during adolescence may result from youth taking on self-care levels that are disproportionate to their psychological maturation.¹² Mothers of adolescents report that they are likely to transfer responsibility for disease management in response to adolescents' increasing autonomy, external pressures from others, and the desire to avoid hassles and conflicts.¹² The current American Diabetes Association standards of care recommend a gradual transition toward independence in management during middle school and high school, emphasizing that adult supervision remains important throughout the transition.¹³

Researchers are beginning to recognize the importance of distinguishing between supportive parental involvement and overprotective parenting. While parental involvement might improve metabolic control, a recent study found that adolescents who perceive their parents as “nagging” or controlling are more likely to become withdrawn and depressed, or, alternatively, resistant and noncompliant.¹⁴ On the other hand, adolescents who perceived their mothers as uninvolved had poorer adherence to treatment and poorer quality of life.¹⁴ Better adherence and metabolic control was associated with perceived collaboration between adolescents and their mothers.¹⁴ Similarly, a recent multinational study found that adolescents' perceptions of parents as over-involved in diabetes care and conflict about responsibility for diabetes care were stronger predictors of metabolic control than age, gender, or insulin treatment regimen.¹⁵ Another recent study found that, in general, youth who rated both caregivers as being low on collaborative involvement had consistently poorer outcomes than youth who rated at least one caregiver as being supportive and involved.¹⁶ In addition, a recent study using visual illness narratives suggested that higher levels of parental involvement, as seen on adolescents' videos of diabetes care, was associated with better metabolic control.¹⁷ Together, these findings suggest that the goal may be for adolescents to gradually assume independence with continued parental monitoring.

Given that mothers are usually the primary caregivers,¹⁸ little research has focused on the role fathers play in adolescent adjustment to T1DM. Recent studies, however, suggest that fathers' (but not mothers') monitoring of diabetes tasks is directly related to adolescents' metabolic control.⁹ When fathers are highly involved in care for chronically ill children, the usual decline in treatment adherence in adolescence is not observed.¹⁹ Paternal involvement in disease management has also been associated with better quality of life in youth age 14 and older, but not for younger children.¹⁹ However, an observational study indicated that fathers of adolescents with diabetes were less energetic and goal-oriented and responded less frequently to their child's contributions when engaged in a planning task than fathers of youth without diabetes.²⁰ Thus, fathers may need encouragement to actively participate in diabetes management.

Depression

Research supports that diabetes is a risk factor for developing psychological problems in adolescence. One of the few longitudinal studies to follow youth with T1DM into young adulthood found that 42% developed at least one episode of psychiatric disorder, with the most common being depressive disorders (26%), followed by anxiety disorders (20%), and behavior disorders (16%).²¹ A recent multi-center study of youth with diabetes aged 10 to

21 (the SEARCH for Diabetes in Youth study) reported that 14% of youth were mildly depressed and 8.6% were moderately/severely depressed.²² Therefore, adolescents with diabetes appear to be at particular risk for developing depression.

Depression in adolescents with T1DM has important psychosocial and physiologic consequences. First, children and adolescents with diabetes have been found to experience longer episodes of depression than medically-well depressed youth and to report higher levels of suicidal thoughts.^{23,24} Depressive symptoms have also been shown to predict increased risk for retinopathy,²⁵ and increased risk for hospitalization.^{22,26,27} The relationship between depression and metabolic control is still unclear. While one study found that depressive symptoms predicted later problems with metabolic control,²⁸ another study found that every unit rise in HbA1c increased the probability of depression by 27%.²⁹ Still others have reported no relationship between depressive symptoms and metabolic control.³⁰ It is important to note that adolescents do not need to meet the full criteria for Major Depressive Disorder for their quality of life and health to be affected; sub-threshold symptoms of depression seem to confer a significant risk for poor psychosocial and physiologic outcomes.²⁷

Several risk factors have been identified for depression in adolescents with T1DM. In terms of demographics, depression in adolescents with diabetes is more common in girls, in older adolescents, and in nonwhite, non-Hispanic youth.^{22,31,32} Diabetes-related characteristics associated with depression in adolescents include poor adherence to treatment³² and duration of disease, such that the number of depressive symptoms reported by youth may be higher in the first few years after diagnosis, lower 4 to 9 years postdiagnosis, and rise again after 10 years.³¹ Family factors also are important to consider; depressive symptoms have been associated with less support for diabetes management from families, higher levels of diabetes-specific conflict, higher levels of parenting stress, and lower family cohesion and adaptability.^{32–34}

One of the strongest risk factors for depressive disorders in adolescents with T1DM is maternal depression, which occurs in about one-third of mothers of youth with T1DM.^{23,35} Research has shown that most parents are likely to experience significant distress (eg, symptoms of anxiety and depression) after the child's initial diagnosis, and that after a period of initial adjustment, parents seem to experience an increase in depressive symptoms and overall psychological distress with duration of illness.^{36,37} These findings suggest that a considerable number of adolescents with T1DM have parents who are experiencing significant emotional distress, which is likely to impact adolescents' psychosocial adjustment.³⁸ More specifically, one study found that youth with T1DM whose mothers had depression were 2.6 times more likely to develop a depressive disorder than youth without a depressed mother.²¹ Research in the general population suggests that the effects of maternal depression on children are likely transmitted through multiple mechanisms, including exposure to negative maternal cognitions, behaviors, and affect, and the stressful context of the children's lives.³⁹ Depressed mothers may model maladaptive ways of thinking and coping, thereby compromising their children's ability to cope successfully with stressful life events.⁴⁰ It is thought that maternal depression may negatively affect adjustment in youth with T1DM through its influence on quality of life, coping, and family functioning.⁴¹

Eating Disorders and Disordered Eating Behavior

Eating disorders and eating disordered behavior also are of concern in adolescents with T1DM. Although some studies have shown that adolescents with T1DM are *less* likely to report dissatisfaction with weight or unhealthy weight control practices than their healthy peers,⁴² others indicated that adolescent girls with T1DM were significantly *more* likely

than healthy controls to have an eating disorder (eg, bulimia nervosa).⁴³ Rates of eating disorders among adolescents with T1DM are estimated at 10%—a rate twice as high as in girls without diabetes—and evidence supports that the incidence of eating disorders increases into young adulthood.⁴⁴ Other studies have found that adolescents girls with T1DM are more likely than other adolescent girls to have eating disordered behavior, defined as dieting for weight control, binge eating and purging, exercising to lose weight, and/or unrealistic beliefs about size or weight.⁴⁵ For example, one study found disordered eating behavior in 17% of girls with T1DM ages 10 to 14.⁴⁶ Perhaps the eating disordered behavior of greatest concern for adolescents with T1DM is intentional insulin restriction. Insulin restriction results in hyperglycemia, which creates a state of glucosuria, resulting in weight loss. This behavior is fairly common and may occur in patients who do not meet criteria for an eating disorder; it has been reported by 31 % to 36% of women with T1DM.^{44,47} These findings underscore the prevalence of eating disorders and the need to identify them in adolescents with T1DM.

Several risk factors have been identified for the development of eating disorders in the general population, including depression, higher body mass index (BMI), internalization of a culture's thin beauty ideal, body dissatisfaction, and history of dieting.⁴⁸ Some of these risk factors may occur at higher rates among adolescents with T1DM, placing them at even greater risk for developing an eating disorder. Depression, for example, occurs at a rate 2 to 3 times higher among adolescents with T1DM,³² and BMI is likely to be elevated among adolescents with T1DM.⁴⁹ In addition, the attention to carbohydrates and control of overeating required by the treatment regimen may predispose youth with T1DM to the kind of rigid thinking about food that characterizes anorexia nervosa.⁵⁰ Longitudinal studies indicate that lower self-esteem, concerns about weight/shape, depressive symptoms, higher BMI percentile, and more disturbed maternal eating attitudes predict disturbed eating behavior in adolescent girls with T1DM.^{46,51}

Eating disorders, as well as sub-clinical eating disordered behaviors, have important clinical implications for adolescents with T1DM. Eating disturbances have been shown to predict poor metabolic control, independent of other risk factors.²⁸ Studies have also found that individuals with T1DM who have eating disorders are more likely to experience recurrent hospitalizations, microvascular complications (eg, retinopathy), and a higher mortality rate.⁴⁴ In addition, eating disordered behaviors—particularly the restriction of insulin—have been related to poorer metabolic control,⁴⁹ increased rates of diabetes complications (eg, nephropathy and foot problems), and a threefold increased risk of mortality.⁵² Thus, it is important that providers be aware of and screen for eating disordered behaviors, particularly among female adolescents.

Fear of Hypoglycemia

Maintaining metabolic control as close to normal as possible increases the risk of hypoglycemia,⁵³ and the fear of hypoglycemia is likely to affect diabetes management. Indeed, hypoglycemia is the most likely adverse event associated with insulin treatment in type 1 or type 2 diabetes.⁵⁴ Fear of hypoglycemia is likely to result from the fear of physical consequences (eg, loss of consciousness, nausea) and the fear of social embarrassment related to the behavioral, motor, and emotional changes that may occur during an episode of hypoglycemia.⁵⁴ When adolescents fear hypoglycemia, they may engage in behaviors to prevent it, such as taking less insulin than needed or overeating.⁵⁴ Exacerbating their fears, it can be difficult for adolescents to distinguish signs of hypoglycemia from anxiety (eg, sweatiness, shaking, and nausea).⁵⁵ Parents of youth who have experienced an episode of hypoglycemia are also likely to experience extreme worry for their children.¹⁷ Fear of hypoglycemia appears to be most common in people who have had experience with severe

hypoglycemic episodes, particularly those that involve loss of consciousness,⁵⁴ and in adolescents who have social anxiety.⁵⁶

Psychosocial Issues for Adolescents with Type 2 Diabetes

Recent estimates from a population-based study suggest that the prevalence of type 2 diabetes mellitus (T2DM) among adolescents is 0.22 cases per 1000 youth, with higher rates for Hispanic (0.48 cases per 1000) and black adolescents (1.05 cases per 1000),⁵⁷ and these rates are likely to increase with the rise of obesity rates. Although little research exists on psychosocial issues for adolescents with T2DM, one study reported that adolescents with T2DM report poorer quality of life than adolescents with T1DM.⁵⁸ A national survey found that adolescents with T2DM experience high rates of depression, with 19% reporting mild levels and 19% reporting moderate/severe levels of depressive symptoms.²² It is likely that symptoms of depression may affect the ability of these youth to engage in healthy lifestyle behaviors, such as physical activity and healthy diet, to manage weight and reduce their risk for health problems.⁵⁹ In addition, adolescents with T2DM are more likely than adolescents with T1DM to report unhealthy attempts to lose weight (ie, fasting, vomiting or using laxatives, using diet aids without a doctor's advice, or skipping insulin doses).⁴⁹ Thus, adolescents with T2DM experience many of the same psychosocial issues as youth with T1DM, possibly at even higher rates.

It is also important to recognize that most adolescents with T2DM have other family members, often parents, who are also struggling with diabetes.⁵⁸ Adolescents with T2DM may be affected positively (eg, inspired to engage in healthy lifestyle behaviors) or negatively (eg, fear of amputation) by family members with diabetes.⁶⁰ In addition, most adolescents with T2DM also are obese, which compounds their risk for psychosocial problems.⁵⁸ A recent study indicated that 36% of youth with obesity-related health conditions (including T2DM) had at least one psychiatric diagnosis.⁶¹ New studies support that depressive symptoms predict obesity; one study found that adolescents who had elevated depressive symptoms at baseline were twice as likely to be obese one year later.^{62,63} Obese youth also report poorer quality of life than healthy youth, related to increased parent distress, depressive symptoms, and peer victimization.^{64,65} Thus, adolescents with T2DM, particularly those who are obese, appear to be at increased risk for poor quality of life and depression.

Strategies for Primary Care Providers

Screening

The American Diabetes Association recommends screening for depression in youth with T1DM ages 10 and older,¹³ and researchers have recently advocated screening both adolescents and their mothers for depressive symptoms.⁶⁶ Providers can use known risk factors, such as age, gender, maternal history of depression, and duration of disease to target these efforts.³¹ Again, it is important to note that adolescents do not need to meet the full criteria for Major Depressive Disorder to warrant a referral.²⁷ Although no clinical trials of depression treatment have been conducted in youth with T1DM, studies with adults suggest that cognitive behavioral therapy can effectively treat depression and improve metabolic control.⁶⁷ Because depressive symptoms may affect ability to engage in healthy behavior changes, evaluation and treatment of depressive symptoms should also be considered in adolescents with T2DM before addressing weight management.^{58,59} Finally, parents who are experiencing depressive symptoms may also benefit from treatment.⁴¹ For example, it may be helpful to address parental depression and anxiety before working on improving family communication around diabetes management.⁸

Given the prevalence of eating disorders/disturbed eating behaviors among adolescent girls, and the medical risks associated with these in adolescents with T1DM, it is important for providers to be aware of patterns that may indicate such problems. Researchers recommend early and routine screening for such problems by asking about satisfaction with body weight and shape, unusually low-caloric meal plans, unexplained elevations in HbA_{1c}, repeated problems with DKA, and amenorrhea.^{50,51} In addition, asking a simple question, such as “do you take less insulin than you should” may serve as a screening tool for identifying adolescents at risk.⁵⁰ If problems are identified, the best approach is a collaborative, multidisciplinary team approach to treating the eating disorder within the context of diabetes, with the goal of establishing medical safety.⁵⁰ Offering healthy weight-management strategies is also recommended.⁴⁹

Similarly, the common fear of hypoglycemia should be assessed for and addressed in patient education. Asking specifically about the occurrence of any recent episodes of hypoglycemia and the patient's (and parents') reaction to these episodes is likely to yield useful information. By normalizing these fears and providing suggestions for preventing hypoglycemia, providers may put adolescents and parents at ease.⁵⁶ Those who are particularly vulnerable may include patients who have had a recent episode of hypoglycemia, those who have preexisting anxiety disorders, those who have hypoglycemic unawareness, and parents of children who have experienced seizures.⁵⁴ Adolescents and parents who express extreme fears or compensatory behaviors should be referred for additional counseling; cognitive behavior therapy for anxiety and Blood Glucose Awareness Training have shown promise for reducing the fear of hypoglycemia and improving treatment management.⁵⁴ In addition, transitioning from injections to insulin pump therapy has been shown to decrease fear of hypoglycemia in parents of adolescents.⁶⁸

Finally, periodic monitoring and discussion of health-related quality of life may have positive effects on the psychosocial well-being of adolescents with T1DM.⁶⁹ Clinicians who inquire about quality of life are perceived as more supportive, and adolescents report that such inquiries provide opportunities for shared decision-making.⁶⁹ Recommendations and attempts to improve quality of life should target child, parent, and family adjustment, rather than focusing only on disease-related outcomes, such as HbA_{1c}. Spending part of each visit alone with the adolescent may increase the likelihood of honest responses when screening for psychosocial problems.

Promoting Parent-Child Collaboration

Maintaining family involvement in diabetes management has been consistently associated with better outcomes. The goal for providers is to encourage high levels of involvement while minimizing family conflict. By assessing parental-adolescent division of diabetes management responsibilities at each visit, providers can offer appropriate guidance regarding the transfer of responsibility for diabetes-related tasks. Providers can stress continued supervision of diabetes management and encourage a collaborative approach, reminding families of the positive outcomes associated with parental involvement, including improved metabolic control and adherence.^{14,70} Fathers' involvement in diabetes care should also be encouraged, as it has been associated with better metabolic control and adherence, as well as better quality of life, particularly for adolescents.^{9,19}

Beginning in preadolescence, providers can talk with parents and children about the importance of continued parental involvement in diabetes management in the upcoming years, acknowledging that adolescents may resist parental supervision. The goal is for adolescents to gradually assume independence with continued parental monitoring, based on the adolescent's success in the performance of management tasks and his or her level of maturity.⁷ It may be helpful for providers to discuss concrete examples of problematic

situations in a nonjudgmental manner (eg, “some kids tell me it is hard to remember to bolus at lunchtime”) to develop solutions that are more acceptable to adolescents. Interviewing an adolescent alone for a portion of each visit to address risky behaviors, such as substance abuse and sexual activity, may also be important. Providers can offer developmentally appropriate examples (eg, managing insulin with alcohol intake, what to do with the pump in intimate settings) to elicit discussion about topics that adolescents may be embarrassed to raise.

For adolescents who are on pump therapy, the pump memory may serve as a useful tool in assessing and negotiating the safe transition of responsibility to adolescents. Providers can help families identify methods of pump review to try, such as scrolling through the pump history together, allowing the parent to “borrow” the adolescent's pump for review during a time when the pump is removed (eg, showers), or giving the parent a computer printout of delivery summaries to review. By presenting such reviews as a routine part of pump therapy, providers may help to avoid parent-child conflicts over this issue.

Researchers have developed interventions to improve parent-child communication and collaboration around treatment management. Anderson and colleagues, for example, reported that a brief, in-office intervention to promote parent-child teamwork had positive effects on metabolic control and parental involvement.⁷¹ In addition, Wysocki and colleagues have shown that the Behavioral Family Systems Therapy for Diabetes improved metabolic control and parent-child communication in high-conflict families.^{72,73} These interventions have shown promise for improving both family functioning and health outcomes, but they may require more intensive levels of treatment than primary care providers can offer.

Promoting Adaptive Coping

The broader literature on coping has shown that the ways in which children and adolescents cope with stress are important mediators and moderators of the emotional and behavioral outcomes of stressful situations.⁷⁴ In adolescents with T1DM, greater use of avoidant (or disengagement) coping strategies has been related to poorer treatment adherence and metabolic control.^{75–79} When looking at more specific coping strategies in adolescents with T1DM, poorer metabolic control has been related to investing in close friends, avoidance behaviors, and daydreaming; better metabolic control has been associated with seeking professional support and the use of humor.⁸⁰ Greater use of avoidance coping has also been related to poor psychosocial outcomes in children with T1DM, including poorer quality of life, more depressive symptoms, poorer teacher-rated adjustment, poorer social competence, and lower academic achievement.^{77,80,81} In contrast, the use of cognitive restructuring and social support has been associated with less depression and greater positive well-being.⁸²

It is important to note that adolescents' cognitive ability and mood are likely to be affected by blood sugar levels.⁸³ These changes may limit adolescents' ability to use the most adaptive coping strategies. It may be important, therefore, for parents and other caregivers to be given the same education regarding coping skills, so that they can reinforce these skills in adolescents. Parents can be encouraged to offer support and reinforce the use of positive coping strategies in adolescents with T1DM, which may help to prevent depression.²⁷ Given that parenting stress has been related to higher levels of fear of hypoglycemia and poorer outcomes in youth with T1DM, parents may also be encouraged to use adaptive coping strategies themselves, to cope with the stress of treatment management.^{34,84}

A series of studies has been conducted using coping skills training for children and adolescents with diabetes. Coping skills training for youth with diabetes is based on the hypothesis that teaching coping skills, such as social problem solving and assertive

communication, will improve the ability of youth to cope with the daily stress of managing diabetes. Gray and colleagues reported that coping skills training improved metabolic control, self-efficacy, and quality of life in adolescents (aged 12-20 years) with T1DM.⁸⁵ More recently, coping skills training has shown promise for reducing metabolic risk in adolescents at risk for T2DM.⁸⁶ How adolescents cope with the stress of a chronic illness condition has an important impact on their adaptation to the illness, and it is important for providers to discuss the most adaptive coping with adolescents.⁸⁷

Team Management

Given the complexity of diabetes management, adolescents with diabetes are likely to benefit from a multidisciplinary team of practitioners who are knowledgeable about and experienced in the specific challenges of adolescents.⁸⁸ Such teams should ideally consist of pediatric endocrinologists, diabetes nurse specialists or practitioners, dietitians, social workers or psychologists, and referral resources for eye, renal, neurologic, and other problems. By using the strategies described in this article, primary care providers have the potential to support adolescents with diabetes, while screening for problems that may be better treated by other professionals on the team.

References

1. Hocking MC, Lochman JE. Applying the transactional stress and coping model to sickle cell disorder and insulin-dependent diabetes mellitus: Identifying psychosocial variables related to adjustment and intervention. *Clin Child Fam Psychol Rev*. 2005; 8:221–246. [PubMed: 16151619]
2. Salerno M, Argenziano A, Di Maio S, et al. Pubertal growth, sexual maturation, and final height in children with IDDM: Effects of age at onset and metabolic control. *Diabetes Care*. 1997; 20:721–724. [PubMed: 9135933]
3. Lewin AB, Heidgerken AD, Geffken GR, et al. The relation between family factors and metabolic control: The role of diabetes adherence. *J Pediatr Psychol*. 2006; 31:174–183. [PubMed: 16467317]
4. Whittemore, R.; Kanner, S.; Grey, M. The influence of family on physiological and psychosocial health in youth with type 1 diabetes: A systematic review. In: Melnyk, B.; Fineat-Overholt, E., editors. *Evidence-Based Practice in Nursing and Healthcare: A Guide to Best Practice*. Philadelphia: Lippincott Williams & Wilkins; 2004. p. CD22-73-CD22-87.
5. Davidson M, Penney EA, Muller B, Grey M. Stressors and self-care challenges faced by adolescents living with type 1 diabetes. *Appl Nurs Res*. 2004; 17:72–80. [PubMed: 15154119]
6. Laffel LM, Connell A, Vangness L, Goebel-Fabbri A, Mansfield A, Anderson BJ. General quality of life in youth with type 1 diabetes: relationship to patient management and diabetes-specific family conflict. *Diabetes Care*. 2003; 26:3067–3073. [PubMed: 14578241]
7. Anderson BJ, Vangness L, Connell A, Butler D, Goebel-Fabbri A, Laffel LMB. Family conflict, adherence, and glycaemic control in youth with short duration Type 1 diabetes. *Diabet Med*. 2002; 19:635–642. [PubMed: 12147143]
8. Williams LB, Laffel LMB, Hood KK. Diabetes-specific family conflict and psychological distress in paediatric Type 1 diabetes. *Diabet Med*. 2009; 26:908–914. [PubMed: 19719712]
9. Berg CA, Butler JM, Osborn P, et al. Role of parental monitoring in understanding the benefits of parental acceptance on adolescent adherence and metabolic control of type 1 diabetes. *Diabetes Care*. 2008; 31:678–683. [PubMed: 18202244]
10. Cohen DM, Lumley MA, Naar-King S, Partridge T, Cakan N. Child behavior problems and family functioning as predictors of adherence and glycemic control in economically disadvantaged children with Type I diabetes: A prospective study. *J Pediatr Psychol*. 2004; 29:171–184. [PubMed: 15131135]
11. Ellis DA, Podolski C-L, Frey M, Naar-King S, Wang B, Moltz K. The role of parental monitoring in adolescent health outcomes: Impact on regimen adherence in youth with type 1 diabetes. *J Pediatr Psychol*. 2007; 32:907–917. [PubMed: 17426045]

12. Palmer DL, Berg CA, Wiebe DJ, Beveridge RM, Korbel C, Upchurch R. The role of autonomy and pubertal status in understanding age differences in maternal involvement in diabetes responsibility across adolescence. *J Pediatr Psychol*. 2004; 29:35–46. [PubMed: 14747364]
13. Silverstein JH, Klingensmith G, Copeland K, et al. Care of children and adolescents with type 1 diabetes. *Diabetes Care*. 2005; 28:184–212.
14. Wiebe DJ, Berg CA, Korbel C, et al. Children's appraisals of maternal involvement in coping with diabetes: Enhancing our understanding of adherence, metabolic control, and quality of life across adolescence. *J Pediatr Psychol*. 2005; 30:167–178. [PubMed: 15681311]
15. Cameron FJ, Skinner TC, de Beaufort CE, et al. Are family factors universally related to metabolic control outcomes in adolescents with type 1 diabetes? *Diabet Med*. 2008; 25:463–468. [PubMed: 18294223]
16. Wysocki T, Nansel TR, Holmbeck GN, et al. Collaborative involvement of primary and secondary caregivers: Associations with youths diabetes outcomes. *J Pediatr Psychol*. 2009; 34:869–881. [PubMed: 19112077]
17. Buchbinder MH, Detzer MJ, Welsch RL, Christiano AS, Patashnick JL, Rich M. Assessing adolescents with insulin-dependent diabetes mellitus: A multiple perspective pilot study using visual illness narratives and interviews. *J Adolesc Health*. 2005; 36(71):e9–e13. [PubMed: 15661602]
18. Anderson BJ, Auslander WF, Jung KC, Miller JP, Santiago JV. Assessing family sharing of diabetes. *J Pediatr Psychol*. 1990; 15:477–492. [PubMed: 2258796]
19. Wysocki T, Gavin L. Paternal involvement in the management of pediatric chronic diseases: Associations with adherence, quality of life, and health status. *J Pediatr Psychol*. 2006; 31:501–511. [PubMed: 16002481]
20. Sieffge-Krenke I. “Come on, say something, Dad!;”: Communication and coping in fathers of diabetic adolescents. *J Pediatr Psychol*. 2002; 27:439–450. [PubMed: 12058008]
21. Kovacs M, Goldston D, Obrosky DS, Bonar LK. Psychiatric disorders in youth with IDDM: Rates and risk factors. *Diabetes Care*. 1997; 20:36–44. [PubMed: 9028691]
22. Lawrence JM, Standiford DA, Loots B, et al. Prevalence and correlates of depressed mood among youth with diabetes: The SEARCH for Diabetes in Youth Study. *Pediatrics*. 2006; 117:1348–1358. [PubMed: 16585333]
23. Kovacs M, Obrosky DS, Goldston D, Drash A. Major depressive disorder in youths with IDDM: A controlled prospective study of course and outcome. *Diabetes Care*. 1997; 20:45–51. [PubMed: 9028692]
24. Goldston DBP, Kelley AEMD, Reboussin DMP, et al. Suicidal Ideation and behavior and noncompliance with the medical regimen among diabetic adolescents. *J Am Acad Child Adolesc Psychiatry*. 1997; 36:1528–1536. [PubMed: 9394937]
25. Kovacs M, Mukerji P, Drash A, Iyengar S. Biomedical and psychiatric risk factors for retinopathy. *Diabetes Care*. 1995; 18:1592–1599. [PubMed: 8722057]
26. Garrison MM, Katon WJ, Richardson LP. The impact of psychiatric comorbidities on readmissions for diabetes in youth. *Diabetes Care*. 2005; 28:2150–2154. [PubMed: 16123482]
27. Stewart SM, Rao U, Emslie GJ, Klein D, White PC. Depressive symptoms predict hospitalization for adolescents with type 1 diabetes mellitus. *Pediatrics*. 2005; 115:1315–1319. [PubMed: 15867041]
28. Hegelson VS, Siminerio L, Escobar O, Becker D. Predictors of metabolic control among adolescents with diabetes: A 4-year longitudinal study. *J Pediatr Psychol*. 2009; 34:254–270. [PubMed: 18667479]
29. Hassan K, Loar R, Anderson BJ, Heptulla RA. The role of socioeconomic status, depression, quality of life, and glycemic control in type 1 diabetes mellitus. *J Pediatr*. 2006; 149:526–531. [PubMed: 17011326]
30. Dantzer C, Swendsen J, Maurice-Tison S, Salaman R. Anxiety and depression in juvenile diabetes: A critical review. *Clin Psychol Rev*. 2003; 23:787–800. [PubMed: 14529698]
31. Grey M, Whittemore R, Tambolane WV. Depression in type 1 diabetes in children: natural history and correlates. *J Psychosom Res*. 2002; 53:907–911. [PubMed: 12377302]

32. Hood KK, Huestis S, Maher A, Butler D, Volkening L, Laffel LMB. Depressive symptoms in children and adolescents with type 1 diabetes: association with diabetes-specific characteristics. *Diabetes Care*. 2006; 29:1389–1391. [PubMed: 16732028]
33. Whittemore R, Kanner S, Singleton S, Hamrin V, Chiu J, Grey M. Correlates of depressive symptoms in adolescents with type 1 diabetes. *Pediatr Diabetes*. 2002; 3:135–143. [PubMed: 15016153]
34. Mullins LL, Fuemmeler BF, Hoff A, Chaney JM, Van Pelt J, Ewing CA. The relationship of parental overprotection and perceived child vulnerability to depressive symptomatology in children with type 1 diabetes mellitus: The moderating influence of parenting stress. *Child Health Care*. 2004; 33:21–34.
35. Whittemore R, Urban AD, Tamborlane WV, Grey M. Quality of life in school-age children with type 1 diabetes on intensive treatment and their parents. *The Diabetes Educ*. 2003; 29:847–854.
36. Kovacs M, Finkelstein R, Feinberg TL, Crouse-Novak M, Paulauskas S, Pollock M. Initial psychologic responses of parents to the diagnosis of insulin-dependent diabetes mellitus in their children. *Diabetes Care*. 1985; 8:568–575. [PubMed: 4075942]
37. Kovacs M, Iyengar S, Goldston D, Obrosky DS, Steward J, Marsh J. Psychological functioning among mothers of children with insulin-dependent diabetes mellitus: A longitudinal study. *J Consult Clin Psychol*. 1990; 58:189–195. [PubMed: 2335636]
38. Drotar D. Relating parent and family functioning to the psychological adjustment of children and with chronic health conditions: What have we learned? What do we need to know? *J Pediatr Psychol*. 1997; 22:149–165. [PubMed: 9114640]
39. Goodman SH, Gotlib IH. Risk for psychopathology in the children of depressed mothers: A developmental model for understanding mechanisms of transmission. *Psychol Rev*. 1999; 106:458–490. [PubMed: 10467895]
40. Hammen C, Shih JH, Brennan PA. Intergenerational transmission of depression: Test of an interpersonal stress model in a community sample. *J Consult Clin Psychol*. 2004; 72:511–522. [PubMed: 15279534]
41. Jaser SS, Whittemore R, Ambrosino J, Lindemann E, Grey M. Mediators of depressive symptoms in children with type 1 diabetes and their mothers. *J Pediatr Psychol*. 2008; 33:509–519. [PubMed: 17991690]
42. Ackard DM, Vik N, Neumark-Sztainer D, Schmitz KH, Hannan P, Jacobs DR. Disordered eating and body dissatisfaction in adolescents with type 1 diabetes and a population-based comparison sample: Comparative prevalence and clinical implications. *Pediatr Diabetes*. 2008; 9:312–319. [PubMed: 18466215]
43. Smith FM, Latchford GJ, Hall RM, Dickson RA. Do chronic medical conditions increase the risk of eating disorder? A cross-sectional investigation of eating pathology in adolescent females with scoliosis and diabetes. *J Adolesc Health*. 2008; 42:58–63. [PubMed: 18155031]
44. Peveler RC, Bryden KS, Neil HAW, et al. The relationship of disordered eating habits and attitudes to clinical outcomes in young adult females with type 1 diabetes. *Diabetes Care*. 2005; 28:84–88. [PubMed: 15616238]
45. Hegelson VS, Snyder PR, Escobar O, Siminerio L, Becker D. Comparison of adolescents with and without diabetes on indices of psychosocial functioning for three years. *J Pediatr Psychol*. 2007; 32:794–806. [PubMed: 17426042]
46. Colton PA, Olmstead MP, Daneman D, Rydall AC, Rodin GM. Natural history and predictors of disturbed eating behaviour in girls with type 1 diabetes. *Diabet Med*. 2007; 24:424–429. [PubMed: 17298588]
47. Polonsky WH, Anderson BJ. Insulin omission in women with IDDM. *Diabetes Care*. 1994; 17:1178–1185. [PubMed: 7821139]
48. Striegel-Moore RH, Bulik CM. Risk factors for eating disorders. *Am Psychol*. 2007; 62:181–198. [PubMed: 17469897]
49. Lawrence JM, Liese AD, Liu L, et al. Weight-loss practices and weight-related issues among youth with type 1 or type 2 diabetes. *Diabetes Care*. 2008; 31:2251–2257. [PubMed: 18809623]
50. Goebel-Fabbri AE. Disturbed eating behaviors in type 1 diabetes: Clinical significance and recommendations. *Curr Diab Rep*. 2009; 9:133–139. [PubMed: 19323958]

51. Olmstead MP, Colton PA, Daneman D, Rydall AC, Rodin GM. Prediction of the onset of disturbed eating behavior in adolescent girls with type 1 diabetes. *Diabetes Care*. 2008; 31:1978–1982. [PubMed: 18628570]
52. Goebel-Fabbri AE, Fikkan J, Franko DL, Pearson K, Anderson BJ, Weinger K. Insulin restriction and associated morbidity and mortality in women with type 1 diabetes. *Diabetes Care*. 2008; 31:415–419. [PubMed: 18070998]
53. DCCT Research Group. Hypoglycemia in the diabetes control and complications trial. *Diabetes*. 1997; 46:271–286. [PubMed: 9000705]
54. Wild D, von Maltzahn R, Brohan E, Christensen T, Clauson P, Gonder-Frederick L. A critical review of the literature on fear of hypoglycemia in diabetes: Implications for diabetes management and patient education. *Patient Educ Couns*. 2007; 68:10–15. [PubMed: 17582726]
55. Polonsky WH, Davis CL, Jacobson AM, Anderson BJ. Correlates of hypoglycemic fear in type I and type II diabetes mellitus. *Health Psychol*. 1992; 11:199–202. [PubMed: 1618174]
56. Di Battista AM, Hart TA, Greco L, Gloizer J. Type 1 diabetes among adolescents: Reduced diabetes self-care caused by social fear and fear of hypoglycemia. *Diabetes Educ*. 2009; 35:465–475. [PubMed: 19321802]
57. Liese AD. The burden of diabetes mellitus among US youth: Prevalence estimates from the SEARCH for Diabetes in Youth Study. *Pediatrics*. 2006; 118:1510–1518. [PubMed: 17015542]
58. Anderson BJ, McKay SV. Psychosocial issues in youth with type 2 diabetes mellitus. *Curr Diab Rep*. 2009; 9:147–153. [PubMed: 19323960]
59. Jaser SS, Holl MG, Jefferson V, Grey M. Correlates of depressive symptoms in urban youth at risk for type 2 diabetes mellitus. *J Sch Health*. 2009; 79:286–292. [PubMed: 19432869]
60. Mulvaney SA, Mudasiru E, Schlundt DG. Self-management in type 2 diabetes: The adolescent perspective. *Diabetes Educ*. 2008; 34:674–682. [PubMed: 18669809]
61. Janicke DM, Harman JS, Kelleher KJ, Zhang J. The association of psychiatric diagnoses, health service use, and expenditures in children with obesity-related health conditions. *J Pediatr Psychol*. 2009; 34:79–88. [PubMed: 18522995]
62. Goodman E, Whitaker RC. A prospective study of the role of depression in the development and persistence of adolescent obesity. *Pediatrics*. 2002; 110:497. [PubMed: 12205250]
63. Stice E, Presnell K, Shaw H, Rohde P. Psychological and behavioral risk factors for obesity onset in adolescent girls: A prospective study. *J Consult Clin Psychol*. 2005; 73:195–202. [PubMed: 15796626]
64. Janicke DM, Marciel KK, Ingerski LM, et al. Impact of psychosocial factors on quality of life in overweight youth. *Obesity*. 2007; 15:1799–1807. [PubMed: 17636099]
65. Zelmer MH, Modi AC. Predictors of health-related quality of life in obese youth. *Obesity*. 2006; 14:122–130. [PubMed: 16493130]
66. Cameron FJ, Northam EA, Ambler GR, Daneman D. Routine psychological screening in youth with type 1 diabetes and their parents: a notion whose time has come? *Diabetes Care*. 2007; 30:2716–2724. [PubMed: 17644619]
67. Lustman PJ, Clouse RE. Treatment of depression in diabetes: Impact on mood and medical outcome. *J Psychosom Res*. 2002; 53:917–924. [PubMed: 12377304]
68. Muller-Godeffroy E, Treichel S, Wagner VM. Investigation of quality of life and family burden issues during insulin pump therapy in children with Type 1 diabetes mellitus—a large-scale multicentre pilot study. *Diabet Med*. 2009; 26:493–501. [PubMed: 19646189]
69. De Wit M, Delemarre-van De Waal HA, Bokma JA, et al. Monitoring and discussing health-related quality of life in adolescents with type 1 diabetes improve psychosocial well-being: A randomized controlled trial. *Diabetes Care*. 2008; 31:1521–1526. [PubMed: 18509204]
70. Berg CA, Wiebe DJ, Beveridge RM, et al. Mother-child appraised involvement in coping with diabetes stressors and emotional adjustment. *J Pediatr Psychol*. 2007; 32:995–1005. [PubMed: 17569712]
71. Anderson BJ, Brackett J, Ho J, Laffel LM. An office-based intervention to maintain parent-adolescent teamwork in diabetes management. *Diabetes Care*. 1999; 22:713–722. [PubMed: 10332671]

72. Wysocki T, Harris MA, Buckloh LM, et al. Randomized trial of behavioral family systems therapy for diabetes: maintenance of effects on diabetes outcomes in adolescents. *Diabetes Care*. 2007; 30:555–560. [PubMed: 17327320]
73. Wysocki T, Harris MA, Buckloh LM, et al. Randomized, controlled trial of behavioral family systems therapy for diabetes: maintenance and generalization of effects on parent-adolescent communication. *Behav Ther*. 2008; 39:33–46. [PubMed: 18328868]
74. Compas BE, Connor-Smith JK, Saltzman H, Thomsen AH, Wadsworth ME. Coping with stress during childhood and adolescence: Progress, problems, and potential in theory and research. *Psychol Bull*. 2001; 127:87–127. [PubMed: 11271757]
75. Jacobson AM, Hauser ST, Lavori P, et al. Adherence among children with insulin-dependent diabetes mellitus over a four-year longitudinal follow-up: I. The influence of patient coping and adjustment. *J Pediatr Psychol*. 1990; 15:511–526. [PubMed: 2258798]
76. Hanson CL, Cigrang JA, Harris MA, Carle DL, Relyea G, Burghen GA. Coping styles in youth with insulin-dependent diabetes mellitus. *J Consult Clin Psychol*. 1989; 57:644–651. [PubMed: 2794185]
77. Graue M, Wentzel-Larsen T, Bru E, Hanestad BR, Sovik O. The coping styles of adolescents with type 1 diabetes are associated with degree of metabolic control. *Diabetes Care*. 2004; 27:1313–1317. [PubMed: 15161781]
78. Delamater AM, Kurtz SM, Bubb J, White NH, Santiago JV. Stress and coping in relation to metabolic control of adolescents with type 1 diabetes. *J Dev Behav Pediatr*. 1987; 8(3):136–140. [PubMed: 3597781]
79. Reid GJ, Dubow EF, Carey TC, Dura JR. Contribution of coping to medical adjustment and treatment responsibility among children and adolescents with diabetes. *J Dev Behav Pediatr*. 1994; 15:327–335. [PubMed: 7868700]
80. Grey M, Cameron ME, Thurber FW. Coping and adaptation in children with diabetes. *Nurs Res*. 1991; 40:144–149. [PubMed: 2030992]
81. Reid GJ, Dubow EF, Carey TC. Developmental and situational differences in coping among children and adolescents with diabetes. *J Appl Dev Psychol*. 1995; 16:529–554.
82. Edgar KA, Skinner TC. Illness representations and coping as predictors of emotional well-being in adolescents with type 1 diabetes. *J Pediatr Psychol*. 2003; 28:485–493. [PubMed: 12968040]
83. Perlmutter LC, Flanagan BP, Shah PH, Singh SP. Glycemic control and hypoglycemia. *Diabetes Care*. 2008; 31:2072–2076. [PubMed: 18820231]
84. Streisand R, Swift EE, Wickmark T, Chen R, Holmes CS. Pediatric parenting stress among parents of children with type 1 diabetes: The role of self-efficacy, responsibility, and fear. *J Pediatr Psychol*. 2005; 30:513–521. [PubMed: 16055489]
85. Grey M, Boland EA, Davidson M, Li J, Tamborlane WV. Coping skills training for youth with diabetes mellitus has long-lasting effects on metabolic control and quality of life. *J Pediatr*. 2000; 137:107–113. [PubMed: 10891831]
86. Grey M, Jaser SS, Holl MG, Jefferson V, Dziura J, Northrup V. A multifaceted school-based intervention to reduce risk for type 2 diabetes in at-risk youth. *Prev Med*.
87. Thompson, RJ.; Gustafson, KE. *Adaptation to Chronic Childhood Illness*. Washington, DC: American Psychological Association; 1996.
88. Delamater AM. Psychological care of children and adolescents with type 1 diabetes. *Pediatr Diabetes*. 2009; 10:175–184. [PubMed: 19754628]