

# Routine Psychological Screening in Youth With Type 1 Diabetes and Their Parents

A notion whose time has come?

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young, in light of emerging mental health imperatives.

In the post-DCCT (Diabetes Control and Complications Trial) (1) and -EDIC (Epidemiology of Diabetes Interventions and Complications) (2) eras, considerable effort has been expended on early detection and treatment of diabetes-related microvascular complications in youth using screening programs. Numerous consensus statements have been generated relating to the timing, frequency, and content of such programs (3–7). Although each recommends a slightly different approach to screening, the same basic principles apply—achieve and maintain excellent glycemic control; reduce known and modifiable risk factors, such as smoking, obesity, hyperlipidemia, and hypertension; and screen for nephropathy and retinopathy on a regular basis following the onset of puberty.

To be considered successful, any screening program must satisfy several criteria (8):

- Is the prevalence of the condition being screened for high enough to warrant universal screening?
- Do the tests used by the screening program have sufficient specificity and sensitivity to allow for appropriate detection of true positive cases?
- Is there an adequate intervention strategy for those patients detected by the screening process?
- Is the screening process cost-effective?

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**Abbreviations:** BGM, blood glucose monitoring; CHQ, Child Health Questionnaire; DCCT, Diabetes Control and Complications Trial; DQOL, Diabetes Quality of Life; EDIC, Epidemiology of Diabetes Interventions and Complications; HRQOL, health-related quality of life; PedsQL, Pediatric Quality of Life Inventory.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

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Certainly, given what we know about microvascular complications and their progression and treatment, universal diabetes complication screening programs satisfy most of these prerequisites. Ten years after the DCCT, average levels of metabolic control have improved in most clinical reports of children and adolescents with type 1 diabetes, although population-based data remain scanty and perhaps less optimistic (9–14). Contemporary clinic-based reports of microvascular complication rates in adolescence have shown a concomitant improvement (15–18).

On the other hand, reports relating to health-related quality of life (HRQOL) and psychological outcomes have been distressingly suboptimal (19–24). Although not all studies report significant associations (25–27), there are a number of reports showing that psychosocial dysfunction and family conflict are close correlates of poor health outcomes (28–33). Furthermore, the Hvidoere International Study Group demonstrated a close correlation between HRQOL and A1C in a large adolescent cohort (34). Thus, identifying and targeting psychosocial dysfunction should be an important focus for screening if diabetes-related morbidity and, perhaps in the longer term, mortality is to be reduced. The purpose of this review is to reassess traditional diabetes complication screening programs in the

## Is the prevalence of psychosocial distress in youth with type 1 diabetes sufficiently high enough to warrant universal screening?

**Functional health (HRQOL).** The medical literature pertaining to functional health in children and adolescents with diabetes can be divided into those who use generic or nondiabetes-specific measures and those who use diabetes-specific measures. The former studies allow HRQOL to be compared between diabetic and nondiabetic youth, whereas the latter studies allow HRQOL comparison solely within diabetic cohorts. In addition to this defining aspect of the two approaches to measuring HRQOL, disease-specific measures of HRQOL may underestimate the overall negative impact of diabetes by failing to take into account broader indirect lifestyle factors (35,36).

To date, two generic HRQOL tools have been used to compare diabetic and nondiabetic cohorts. The Pediatric Quality of Life Inventory (PedsQL) has been validated in diabetic cohorts (37) and used to compare diabetic and nondiabetic youth (38). This group found that HRQOL as measured by PedsQL was similar between youth with type 1 diabetes and a healthy control sample. Within the diabetic cohort, they reported that diabetes-specific family conflict was the only significant predictor of negative HRQOL. Another generic tool, the Child Health Questionnaire (CHQ) (39), has been used in both cross-sectional and longitudinal studies to compare diabetic youth with healthy children and children with other chronic diseases. One tertiary hospital clinic reported significantly impaired HRQOL (including physical and psychosocial impact on family) in cross-sectional and longitudinal studies of youth with type 1 diabetes (40,41). These findings have been replicated by other groups using the CHQ to compare diabetic youth with healthy control subjects and children with other chronic diseases (42–45). Poor overall HRQOL in children and

adolescents with diabetes does not appear to improve with time (41,43) and closely mirrors the longitudinal data concerning clinical and behavioral outcomes in childhood and adolescence (23,46,47). Indeed, CHQ global behavior and mental health scale scores accurately predict Behavior Assessment System for Children scale scores for externalizing and internalizing problems, respectively, in diabetic youth (48). The deleterious impact of type 1 diabetes on HRQOL as measured by CHQ is significant—it being comparable to HRQOL seen in children and adolescents suffering from life-threatening diseases such as cystic fibrosis or leukemia (45,49). This notion is further supported by longitudinal research up to 15 years after diagnosis of children with leukemia and diabetes showing that, while initial psychological distress scores are greater for parents of children with leukemia, distress over time is greater and more pervasive for families with children with diabetes (50).

Differences in findings between the CHQ and PedsQL may reflect qualitative differences in the various subscales or variable sensitivity to “response shift” across the different measures. Response shift is the tendency for people with chronic disease to regard their lives positively, despite the hardships imposed on them by the chronic disease (51,52). One possible way to deal with this phenomenon may be to use disease-specific HRQOL measures in tandem with generic measures (42,53).

The most widely used diabetes-specific HRQOL measure has been the Diabetes Quality of Life (DQOL). The DQOL has been used in the DCCT (54,55) and the Hvidoere multicenter comparative studies (34,56,57) to assess the impact of diabetes-specific interventions or varying treatment regimens/outcomes. In addition, the DQOL has been used to investigate the influence of underlying personal and family factors (27) and the impact of insulin pump therapy (58,59) on HRQOL. In the large multicenter international study of 2,101 adolescents using the DQOL, the Hvidoere Study Group found that lower A1C was associated with lower diabetes impact, fewer worries, greater satisfaction, and better health perception (56). Other groups addressing this question have sampled much smaller cohorts (52–130 subjects) and have used the DQOL, PedsQL, and CHQ. Two studies (60,61) replicated the Hvidoere Study Group’s

findings, while three reports (27,40,42) failed to show an association between metabolic control status and quality of life.

It is clear that type 1 diabetes in childhood and adolescence is associated with significantly reduced HRQOL as measured by physical, psychological, and family well-being. In addition, the weight of evidence indicates that poor HRQOL is associated with poor metabolic outcomes. Intensive diabetes therapies do not appear to reduce HRQOL (56,62,63). Therefore, there is some indication that early intensive therapy leading to improved glycemic control may reduce the impact of diabetes on HRQOL (64).

**Psychological outcomes.** Psychological morbidity is increased in children and adolescents with diabetes (19,20,23,26,65–67), as it is in children with other chronic illnesses (68). Initial adjustment to diabetes is characterized by sadness, anxiety, withdrawal, and dependency (23,66,69,70), and ~30% of children develop a clinical adjustment disorder in the 3 months after diagnosis (69). Such difficulties often resolve within the first year, but poor adaptation in this initial phase places children at risk for later psychological difficulties (19,23,66,71,72). In longitudinal studies using semistructured interviews and standardized diagnostic criteria, 10-year point prevalence and lifetime prevalence rates of psychiatric disorder in diabetic youth were found to be 47% (19) and 37% (23), respectively. These disorder rates are two to three times higher than those found in the general community (73,74).

Mood disorders such as major depressive disorder and dysthymia are the most frequently reported diagnoses in youth with type 1 diabetes, with a cumulative probability of 27.5% by the 10th year of type 1 diabetes duration (20). In cross-sectional studies, depression was observed in 10–26% of study samples using both self- (20,23,75,76) and/or parent-report (25,75,76). Hood et al. (76) noted that parent and youth reports of depression were more highly correlated than in community samples, suggesting that parents of type 1 diabetic youth may be more aware of emotional difficulties in their children because of the high level of involvement required to manage the illness. Kovacs et al. (20) examined recovery and recurrence rates of major depressive disorder in type 1 diabetic youth compared with psychiatric control subjects and found that episodes were

more protracted and recurrence rates were higher in female, but not male, subjects with type 1 diabetes. Maternal psychopathology was identified as a significant risk factor for a diagnosis of depression in the child (19). It is important to note that depression may be underdiagnosed in children with diabetes because of the overlap of symptoms such as fatigue, weight loss, and impaired memory, which are common in both mood disorder and poor metabolic control (77). In addition, fluctuations in blood glucose levels such as hypoglycemic episodes and chronic hyperglycemia may directly contribute to alterations in behavior and mood (78,79), which, while transient, may be distressing for both child and family.

High rates of anxiety (9–19%) and disruptive behavior disorders (12–20%) have also been reported in type 1 diabetic samples (19,20,23,72,75,80,81). Comorbidity is common, with up to 60% of those with a psychiatric diagnosis in some samples meeting criteria for more than one disorder (23,75). Diabetic youth, particularly female patients, also appear to be at increased risk of eating disorders with up to 10% in cross-sectional analyses having full-blown disorders (mainly bulimia nervosa and eating disorder not otherwise specified) and 14% with subthreshold, but clinically relevant, eating disorders (21,82). Of note, there is a continuum of impact of severity of eating disorders on both metabolic control and earlier-than-expected onset of diabetes-related complications, particularly retinopathy (21). These data underline the effects of subthreshold disorders on diabetes-related outcomes, thereby highlighting use of the term subthreshold rather than subclinical in these circumstances. In more than 90% of cases in one study (83), the eating disorder developed after diabetes onset, suggesting that the focus on food and issues around control and autonomy inherent in the diabetes regimen may be contributing factors.

In contrast to the findings reported above, some studies have found prevalence of psychiatric morbidity in young adults with diabetes to be similar to those of control subjects or the general population (46,84). The low rates of psychiatric problems detected by these researchers contrast with the inflated disorder rates generally reported in adults with type 1 diabetes (85) and may be reflective of methodological differences including sampling bias and the use of insufficiently

sensitive assessment instruments. For example, Bryden et al. (46) revealed that they were unable to interview several patients whose medical records were indicative of poor psychosocial outcomes, while Jacobson et al. (84) utilized measures that did not yield diagnoses based on DSM criteria and may not have been sensitive enough to detect psychiatric morbidity. These limitations may have led to an underestimation of the true rate of psychological dysfunction in the respective samples. Canning et al. (86) compared the sensitivity and specificity of behavioral/emotional questionnaires versus DSM-referenced semistructured interviews to detect psychiatric morbidity and found that the former are more useful as screening measures. It is of interest that two studies reporting high levels of morbidity in type 1 diabetic youth (19,23) utilized structured psychiatric interviews to assess symptoms in their samples. In addition, the Joslin sample (84) was predominantly of middle to upper socioeconomic status—a known protective factor in the face of illness-related stress (80). This may limit the generalizability of their findings to more representative samples.

**Psychological adjustment and metabolic control.** Psychological maladjustment in young people with diabetes is particularly concerning because it has been associated with poor metabolic control (23,29–32,80), which in turn increases the risk of diabetes-related complications (1). Causal associations between psychological difficulties and metabolic control are difficult to disentangle (65). In some individuals, neurohormonal changes related to stress and mental illness may directly influence metabolic control through endocrine pathways (87–89). There is a temporal association of insulin resistance at puberty, as well as increased insulin dose, increased appetite, increased weight, disturbance in body image, and adolescent nonadherence, suggesting a link between physiology and psychological health (90). More commonly, it is assumed that psychiatric symptoms adversely affect metabolic control indirectly by preventing or disrupting the behaviors necessary for optimal self-care. For example, 56% of children with psychiatric disorders in the sample studied by Kovacs et al. (91) failed to comply with their medical regimen compared with 17% of those without a diagnosis, while Goldston et al. (75) found that the presence of a psychiatric disorder and family breakdown were

both associated with noncompliance. In a cohort of diabetic youth aged 8–17 years, Hassan et al. (61) noted that those with poor metabolic control were three times more likely to be depressed than those with good control and that for each 1% rise in A1C, there was a 27% increased probability of depression. Maronian et al. (81) also found depression to be associated with poorer control but anxiety was not. Leonard et al. (80) observed that youth exhibiting higher levels of aggression, delinquent behaviors, and attention problems were more than twice as likely to have glycosylated hemoglobin levels >9%, while disengagement and aggressive coping were associated with poorer control in another report (42). Furthermore, depression and behavior problems have been associated with increased risk of multiple diabetes-related hospitalizations (92–94), while adolescents with eating disorders have been found to omit or reduce their insulin dose to produce glycosuria as a method of weight control (95,96). In contrast, some studies do not report positive associations between mood disorders or behavior problems and metabolic control (26,30,97). Multicollinearity between variables and the role of mediating factors such as coping style, locus of control, social supports, and parental psychopathology may explain discrepant findings.

Relationships between metabolic control and psychological well-being in the child are further complicated by evidence that efforts to achieve tight metabolic control may also be associated with psychological symptoms in the child. For example, associations between high anxiety levels and better treatment adherence (72) and between internalizing problems and better glycemic control (33,66,71) have been reported, raising the possibility that neurotic symptoms may either contribute to or result from obsessive preoccupation with the demands of the diabetes treatment regimen. These findings raise the possibility that optimal disease management may have a psychological cost for some children.

**Family dynamics.** The mental health of children and adolescents with diabetes is to some extent dependent on the attitudes and mental health of their parents or caregivers, as well as family functioning (27,31,76,98,99). Diabetes-specific family conflict has been recognized for some time as a critical determinant of metabolic outcome in children and adolescents with type 1 diabetes (100–103). The overall

burden that type 1 diabetes places on families is significant. The areas most impacted appear to be family cohesion, parent/child communication, and family activities (40,41). Among caregivers, it is the mothers of diabetic children who appear to be most at risk of psychological maladjustment after their child is diagnosed. In a large representative European cohort, 20.4% of mothers and 8.3% of fathers exhibited persistent signs and symptoms of posttraumatic stress disorder 1 year after diagnosis of their child (104). Other family members such as nondiabetic siblings do not appear to be at increased risk of poor mental health outcomes (105), at least under contemporary management regimens. In one report, father involvement in diabetes management was associated with a lower number of maternal psychiatric symptoms and with less perceived impact of the disease on family functioning, highlighting the importance of a “team” approach to home management of type 1 diabetes (106).

Communication patterns and relationships within the family may be important influences on metabolic control through impact on treatment adherence in the affected child. Greater parent-child disagreement or lower parental involvement in diabetes care has been shown to predict poorer metabolic control (107). Studies have consistently found that high family conflict is related to poorer diabetes self-care behaviors and poorer metabolic control, while positive family attributes such as support, warmth, and cohesion are associated with better diabetes self-care behaviors and metabolic control (31,33,108–110). Data from several studies indicate that parental (predominantly maternal) psychological well-being correlates positively with all diabetes metabolic outcomes in their children (i.e., happier mother and better outcomes) (111,112). This finding is similar to a study of patient-perceived family stress in adults by Parkerson et al. (113) but is at odds with a more recent study of diabetes-related stress by Stallwood (114). In Stallwood's cross-sectional analysis of caregiver stress using a cohort of 73 caregivers of children aged <9 years, higher levels of both measured and perceived diabetes-related stress by predominantly maternal caregivers were associated with lower A1C levels in diabetic children (114). These interstudy differences may reflect differences in the respondent (caregiver or child), the age of



the child, and the content of the questionnaire. Alternatively, discrepancies may reflect the fact that a certain amount of stress is required to motivate caregivers to adopt some aspects of diabetes care and optimize control, whereas too much stress can lead to a lack of motivation and a sense of helplessness. This is exemplified as parents struggle to find a middle ground between “uninformed carelessness and frantic over-solicitude” (115). The mediating variable between caregiver stress and diabetes outcomes may be the circumstances around blood glucose monitoring (BGM). Disagreement about responsibility of BGM and the level of affect surrounding BGM have both been found to be associated with metabolic outcome (112).

Overall, there is compelling empirical evidence that supports the hypothesis that psychological disorders in the child, as well as family dysfunction, are associated with the neglect or rejection of diabetes treatment requirements and, over time, leads to chronic poor control. This has important implications for clinical management, highlighting the fact that gold-standard medical management must be combined with sensitive attention to psychological well-being in the child as well as adaptive functioning within the family. In addition, good metabolic control may not be synonymous with optimal psychological adjustment, and clinicians should also be alert to symptoms of lowered mood, anxiety, and obsessive tendencies in their young patients with well-controlled diabetes.

#### **Do the tests used by the screening program have sufficient specificity and sensitivity to allow appropriated detection of true positive cases?**

Clinical mental health services cannot be provided for all young people, nor is it necessary; nonetheless, timely and effective intervention with at-risk children and families is essential if they are to avoid the “double jeopardy” of combined adverse physical and mental health outcomes. Subgroups of children at particular risk for adverse outcomes are beginning to emerge from the research to date. Adjustment problems at diagnosis have been found to predict later psychological difficulties (19,23,93,116). Specifically, children already exhibiting externalizing behavior problems at the time of diagnosis were at increased risk of psychiatric diagnoses 10 years later, as well as having

a history of poorer metabolic control (23). This finding is consistent with the developmental psychopathology literature (117–119) that suggests that untreated early-onset behavior problems tend to persist and generalize to broader and more serious forms of psychopathology. However, such problems are easily identifiable and effective; evidence-based treatments are available, particularly if instituted early (120–122) and targeted to the specific characteristics of the individual child and family (123). Sequential use of validated functional health and behavioral questionnaires can be used in a stepwise fashion to screen for children and families that are exhibiting latent or overt behavioral difficulties (48). The CHQ (39) is a simple-to-use questionnaire that has a sensitivity of 73% and specificity of 82% to detect behavioral problems in children with diabetes (48). Although this means that a proportion of children at borderline risk will not be identified, these children return to clinics regularly, which provides regular opportunities for ongoing monitoring. Patients positively identified by the CHQ or other tools with good reliability could then be further and more definitively investigated by discussion with the child and parents, as well as administration of a formal mental health instrument such as the Behavior Assessment System for Children (124). This instrument generates subscale scores (e.g., depression, anxiety, conduct problems) and global scores that would help identify the specific nature of the mental health problem to be addressed.

It is neither feasible for most diabetes clinics to offer routine mental health screening for all parents, nor is it acceptable to all parents. However, given the associations between psychological well-being in diabetic youth and the mental health of their parents (27,76,87,111,112), as well as the associations between family conflict and metabolic control (100–103), it would also be important to address parental psychopathology and family functioning in at-risk children. Optimal clinical care should incorporate routine mental health screening of all children soon after diagnosis and thereafter, with further parent/family assessment and active evidence-based interventions addressing both psychological well-being and adherence issues offered to at-risk children and families.

#### **Is there an adequate intervention strategy for those patients detected by the screening process?**

Recent reviews of the efficacy of behavioral and psychological interventions to improve outcomes in type 1 diabetes have noted the inconsistent findings in this area (125–127). Much of the confusion derives from methodological deficiencies such as small unrepresentative samples and nonstandardized measures of poorly defined constructs (128–132). Selection bias has also been an issue. Methods and instruments used have varied widely, making it difficult to compare findings across studies. Some interventions have not used comparison groups (131,132), or if used, experimental and comparison groups have been unequal in terms of pre-intervention characteristics (122,123). Most studies have used unstandardized interventions involving increased contact and support, psychoeducation, and/or cognitive behavior techniques to elicit behavior change around diabetes management rather than targeting underlying feelings of anger or dysphoria. Psychological distress unrelated to noncompliance has largely been ignored, and it is notable that no intervention to date has targeted a specific psychological disorder such as depression or behavior problems. It is possible that an intervention specifically addressing underlying dysphoria may be more effective than one targeting the secondary manifestation of the primary symptom, i.e., reduced treatment adherence. Empirical support for this view is currently lacking, but the limited evidence for the efficacy of interventions focused on diabetes management alone suggests that such an approach is worthy of consideration. Finally, most interventions to date have been implemented with adolescent cohorts, and little attention has been paid to younger children, in whom preventive interventions may have their greatest benefit. As noted above, behavior problems in young children are easily identifiable and tend to persist if untreated (117–119), but they respond positively to intervention if treatment is implemented early (120).

Currently, there is no universally recommended intervention strategy for behavioral or psychological distress in children with diabetes (126). In the U.K., the Development and Evaluation of a Psychosocial Intervention for Children and Teenagers Experiencing Diabetes (133) Study is currently attempting to construct such a psychosocial intervention. Psycho-

social interventions however may not need to be diabetes specific. There is empirical evidence that standardized non-diabetes-specific tools (such as the "Triple P-Positive Parenting Program" [134]) used in at-risk children from the time of diagnosis may be of benefit. Parental psychopathology and family conflict may be best addressed using standard therapeutic approaches, such as individual and family therapy, as an adjunct to specific interventions for the child with type 1 diabetes. The next challenge is to test the efficacy of these interventions in well-constructed and adequately powered randomized control trials.

### Is the screening process cost-effective?

Given that routine mental health screening and intervention therapies are yet to be undertaken in diabetes clinics, this question cannot be fully answered. Two salient points should be noted, however. First, self-administered questionnaire tools are relatively inexpensive, and second, they can and, we argue, should be used sequentially with other clinical tools/interviews. Thus, a step-wise screening process that does not require every patient to be seen by a mental health professional should not be unwieldy or expensive. In addition, if one accepts the premise that all patients with overt or latent mental health difficulties will need to be seen by a mental health professional at some stage, then formal health care professional involvement should be cost neutral compared with current models of care. On the other hand, benefits of improved mental health, improved treatment adherence, and subsequent improved diabetes outcomes have the potential to greatly reduce overall diabetes-related health expenditure. What is clear from vast clinical experience is that failure to recognize psychosocial/psychological distress inevitably leads to ineffective and often inappropriate efforts to intensify therapy, which may compound the distress and in fact worsen diabetes outcomes.

### Conclusions

A key element in the proactive approach to diabetes management is complications screening. Consensus guidelines have largely focused on detecting early microvascular pathology (3–7). Current therapeutic approaches in youth with type 1 diabetes have led to low ascertainment rates of microvascular pathology (15–18).

Current rates of psychological ill health in diabetic youth on the other hand appear to be disturbingly high (19,20,23,26). The combined longitudinal data published by Kovacs et al. (30), Northam et al. (23), and Bryden et al. (22,46,135) indicate that mental health issues in childhood are likely to persist into early adulthood and possibly beyond. Importantly, such mental health issues appear to be prognostic of maladaptive lifestyle practices, long-term problems with diabetes control, and earlier-than-expected onset of complications.

We argue therefore that mental health should be given equivalence to, and perhaps precedence over, other complication screenings used in diabetes clinics. Routine screening for behavioral disturbance should begin in children at the time of diabetes diagnosis, with further assessment of parental mental health and family functioning for at-risk children. Interventions can then be targeted based on the specific needs of individual children and families. In addition, physicians should be alert to the possibility of cognitive changes and learning difficulties in children with diabetes and request assessment early to minimize any negative effects on academic progress.

The desired outcomes of optimal physiological, cognitive, and emotional development are interrelated and should not be seen as independent of one another. The term diabetes complications should encompass not only microvascular and autoimmune pathologies but also the more common psychological ill health seen in the young. Thus, complication screening programs should include a mental health component, potentially with screening from the point of diabetes diagnosis. Given the universal experience of diminishing or static health resources per patient, this means a realignment of priorities within the overall screening process. Consideration should be given to simplifying screening for the relatively rare microvascular and autoimmune disorders in order to release resources for screening for the relatively common psychological disorders. Ultimately, improvements in psychological outcomes are desirable both in their own right and because of the potential benefits in the adoption of adaptive lifestyle choices and improvement of disease control.

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