Updated and Revised Diabetes Family Conflict Scale

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OBJECTIVE — The purpose of this study was to update the Diabetes Family Conflict Scale (DFCS) in the era of intensive diabetes management and provide an indication of its psychometric properties.

RESEARCH DESIGN AND METHODS — The revised DFCS and measures of negative emotions around blood glucose monitoring (BGM), quality of life, and perceived parental burden from diabetes management were completed by 202 children and adolescents with type 1 diabetes and their primary caregivers. Insulin regimen, adherence, and glycemic control were also assessed.

RESULTS — The revised DFCS demonstrated strong psychometric properties. There was acceptable internal consistency for child and caregiver forms of the DFCS. Factor analysis revealed two factors related to direct and indirect management tasks. Both child ($r = 0.27$, $P < 0.01$) and caregiver ($r = 0.26$, $P < 0.01$) DFCS scores were correlated with A1C values. Multivariate analysis of factors usually associated with A1C values showed an additive, independent contribution of diabetes-specific family conflict to the prediction of glycemic control: F $(12,189) = 6.17$, $P < 0.01$, $R^2 = 0.28$. Conflict around direct management tasks (e.g., BGM) was a more important predictor of higher A1C levels than conflict around indirect management tasks (e.g., telling friends about diabetes).

CONCLUSIONS — The revised and updated DFCS demonstrates strong psychometric properties and can be used as a tool for measuring the level of diabetes-specific conflict in families with children and adolescents with type 1 diabetes.

The management of type 1 diabetes in children and adolescents involves caregiver-child interactions to coordinate blood glucose monitoring (BGM), timing of insulin administration, and preparation for daily activities including caloric intake and expenditure (1). In the context of these interactions, diabetes-specific family conflict can arise and challenge adherence and glycemic outcomes (2–6). Investigations of the specific nature of this association reveal that discrepancies in level of autonomy and follow-

through with diabetes-related decisions (7) and adolescent views about caregivers' lack of understanding or intrusive behavior (8) can co-occur with or predict diabetes-specific family conflict. Further, behavioral and psychoeducational interventions aimed to improve communication or problem-solving around diabetes management show promising results for diminishing levels of caregiver-child conflict around diabetes (9–13). Together, these findings highlight the family-oriented nature of diabetes management,

the critical nature of effective diabetes-specific communication unencumbered by conflict, and the responsiveness to change in this construct.

The most widely used measure of diabetes-specific family conflict was developed by Rubin et al. in 1989 (6). Since that time, the Diabetes Control and Complications Trial (DCCT) (14,15) established intensive insulin therapy as standard management, and subsequently, clinical practice has focused on intensification of diabetes management to promote optimal glycemic control and prevent complications. Additionally, significant technologic advancements for diabetes, including more physiologically exact replacement methods with basal-bolus therapy or continuous subcutaneous insulin infusion, insulin analogs, and continuous glucose monitoring, promote more optimal glycemic control while adding to the burden of care for youths and their families. Although these approaches offer significant opportunities for improved diabetes management, the increased demands placed upon patients and families associated with these therapies provide an environment rich for conflict. Whereas general family conflict is unavoidable and in fact some general family conflict is normal (16), diabetes-specific conflict is counterproductive to effective diabetes management. To assess diabetes-specific family conflict in the post-DCCT era, we modified the Diabetes Family Conflict Scale (DFCS) (6) and evaluated its psychometric properties.

RESEARCH DESIGN AND METHODS

— Study participants included 202 youth and their caregivers receiving care at a tertiary pediatric diabetes center from a multidisciplinary team. These participants were part of two separate waves of data collection from longitudinal studies investigating family factors associated with diabetes management. All participants had to meet the following eligibility criteria and were not part of the active phase of intervention studies. Eligibility criteria included type 1 diabetes diagnosed according to the American Diabetes Association practice guidelines (1), age 8–18 years, duration of type 1 diabetes of at least 6 months, at

Table 1—*Revised DFCS—Child Version*

During the **PAST MONTH,** I have argued with my parent(s) about…	Almost never	Sometimes	Almost always
*1. Remembering to give shots or to bolus (pump)**	①	②	③
*2. Taking more or less insulin depending on results**	①	②	③
*3. Remembering to check blood sugars**	①	②	③
4. Remembering clinic appointments**	①	②	③
*5. Giving shots or boluses (pump)**	①	②	③
6. Meals and snacks	①	②	③
*7. Results of blood sugar monitoring**	①	②	③
*8. The early signs of low blood sugar**	①	②	③
9. What to eat when away from home	①	②	③
10. Making appointments with dentists and doctors**	①	②	③
11. Telling teachers about diabetes**	①	②	③
12. Telling friends about diabetes	①	②	③
13. Carrying sugar/carbs for reactions**	①	②	③
14. School absences**	①	②	③
15. Supplies	①	②	③
16. Telling relatives about diabetes**	①	②	③
*17. Rotating injection sites or infusion sets (pump)***	①	②	③
*18. Changes in health (like weight or infections)***	①	②	③
*19. Logging blood sugar results***	①	②	③

Factor 1 (direct management tasks) items are italicized; factor 2 (indirect management tasks) are not. *Designates a revised item; **designates an added item.

least three outpatient visits in the past 2 years (or at least two visits if the patient had type 1 diabetes for <1 year), residence in the northeastern U.S., and fluency in English. Exclusion criteria included major psychiatric or neurocognitive disorder (e.g., bipolar disorder, severe eating disorder, or mental retardation), significant medical disease other than type 1 diabetes or treated thyroid disorders or celiac disease, and multiple home environments for the youth (e.g., department of social services or department of youth services involvement).

Of the 235 families who met the eligibility criteria, 206 (88%) agreed to participate. Of the families who declined participation, most did so because of lack of time or interest in study participation. Four families were subsequently removed from data analyses because of missing or incomplete data. The institutional Committee on Human Studies approved the protocol. A research assistant obtained written informed consent from participating caregivers and assent from the youth and then administered the questionnaires in the waiting room of the pediatric and adolescent clinic.

Measures
DFCS. Each child and a caregiver completed an updated version of the DFCS (6). The original conflict scale included 15 management tasks, responded to along a 5-point Likert scale. The original DFCS has been shown to have excellent reliability and validity for both child and parent responses (6,17). The revised version includes updated language about diabetes management and technology and new or expanded items across a number of relevant areas (e.g., logging blood glucose results, carrying food with fast-acting carbohydrates, and being absent from school). We removed two items related to urine testing and exercising. The changes to the DFCS were made to reflect the post-DCCT approach to diabetes management and the implications of that approach on family communication and support. The changes were guided by solicited comments during group sessions with parents and other caregivers of children and adolescents with type 1 diabetes as well as solicited reactions from experienced diabetes nurses, physicians, and behavioral scientists. The child version of the revised DFCS is presented in Table 1 with new items indicated by a double asterisk and revised items indicated by a single asterisk. The original response set was revised so that level of family conflict related to diabetes-specific tasks was rated on a 3-point Likert scale (1 = never argue, 2 = sometimes argue, and 3 = always argue), yielding a scale range of 19 to 57 (19 = no conflict to 57 = high level of conflict).

This change was made to provide consistency across survey administration with the Diabetes Family Responsibility Questionnaire (18), which includes a response set from 1 to 3. When parents complete their version, items remain the same, but parents are asked to indicate how much they (as parents) argue with their children across these tasks of diabetes management. This questionnaire is completed in <5 min. All 202 participating families completed the revised DFCS.

Blood Glucose Monitoring Communication Questionnaire. The Blood Glucose Monitoring Communication (BGMC) questionnaire was designed to evaluate emotional responses to BGM results experienced by youth and their caregivers (19). Youth and their caregivers were asked to report their emotional responses to high and low blood glucose levels. The BGMC questionnaire has eight items with corresponding responses on a 3-point Likert scale (1 = almost never, 2 = sometimes, and 3 = almost always). Total scores can range from a minimum of 8 (indicating no negative affect) to 24 (indicating a high level of negative affect). This survey shows strong psychometric properties with regard to internal consistency and predictive validity (19). It can be completed in <5 min. Of the 202 families in this study, 49 were not administered this survey, as they were part of the first wave of data collection that did not include this measure.

Pediatric Quality of Life Inventory. The Pediatric Quality of Life Inventory (PedsQL) evaluates youth and caregiver perceptions of the child's health-related quality of life. The PedsQL has demonstrated good reliability and validity (20). It consists of 23 items (encompassing physical and psychosocial subscales) scored on a 5-point Likert scale (0 = never a problem to 4 = almost always a problem). Responses were scored as follows: 0 scored as 100, 1 as 75, 2 as 50, 3 as 25, and 4 as 0. Total quality-of-life score and subscale scores result from averaging all items. The psychosocial subscale (15 items), which encompasses emotional, school, and social quality of life, was used in this study. The time to complete the entire questionnaire is <5 min. All 202 participating families completed this survey.

Problem Areas in Diabetes–Parent Version. To assess caregiver's perceived burden related to the child's diabetes care and parental diabetes specific quality of life, caregivers completed the Problem Areas in Diabetes (PAID)–P (21), the PAID scale

Table 2—Participant characteristics

Characteristic	Youth
n	202
Age (years)	13.3 ± 2.4 (8.2–18.7)
Sex (% female)	54 (—)
Ethnicity (% white, not of Hispanic origin)	91 (—)
Socioeconomic status*	3.0 ± 1.5 (1–6)
Family status (% two parent family)	81 (—)
Type 1 diabetes duration (years)	6.0 ± 3.2 (0.8–14.3)
A1C	8.5 ± 1.5 (5.9–14.3)
Insulin (units $\cdot$ kg^{-1} $\cdot$ day^{-1})	1.0 ± 0.2 (0.4–1.8)
BGM	4.2 ± 1.6 (1–11)
≤3 times/day (%)	25 (—)
4 times/day (%)	43 (—)
≥5 times/day (%)	32 (—)
Insulin injections	—
2/day (%)	17 (—)
3/day (%)	51 (—)
4+/day (%)	11 (—)
Continuous subcutaneous insulin infusion (%)	21 (—)

Scores are shown as mean ± SD (range). *Shown as mean on Hollingshead Index scale from 1 to 6: 1, major professional (e.g., physician, lawyer); 3, skilled worker (e.g., administrative personnel); 6, unemployed/retired/student.

(22), revised for parents. On a 5-point Likert scale, caregivers rate their level of agreement with 20 statements related to their feelings of burden regarding their child's diabetes management (e.g., "I feel 'burned out' by the constant effort to manage diabetes"). Responses were reverse-scored so that total scores could range from 0 to 100, with higher scores reflecting less parental perceived burden or greater parental diabetes-specific quality of life. The PAID has been shown previously to have high reliability and strong psychometric properties (22). The time to complete the PAID–P is ~5 min. Of the 202 families in this study, 49 were not administered this survey as they were part of the first wave of data collection that did not include this measure.

Glycemic control
On the day that families completed the in-clinic questionnaires, each child provided blood for A1C, measured by high-performance liquid chromatography (reference range 4.0–6.0%, Tosoh 2.2 analyzer; Tosoh Medics, Foster City, CA).

Statistical analysis
Statistical analysis was performed with SAS (version 8.02 for Windows; SAS Institute, Cary, NC). Means ± SD are presented unless otherwise indicated. The psychometric properties of the revised survey were examined by Pearson bivariate correlations and Cronbach's α. Further exploratory factor analysis was conducted to determine the factor structure of the scale. Multivariate analyses provided a means to assess the contribution of diabetes-specific conflict on the child's level of glycemic control.

RESULTS

Participant characteristics
Table 2 presents demographic and diabetes-specific characteristics of the patient sample. These 202 youths with a mean ± SD age of 13.3 ± 2.4 years were predominantly white (91%), and the majority (81%) resided in two-parent families. Youth had a mean duration of type 1 diabetes of 6.0 ± 3.2 years. The majority (75%) monitored blood glucose levels ≥4 times daily. Twenty-one percent received insulin via continuous subcutaneous insulin infusion. Caregivers included 153 mothers (76%), 47 fathers (23%), and 2 individuals who identified themselves as "other caregiver" (1%). There were no significant differences in caregiver reports of DFCS scores by sex of parent.

Psychometric properties of the revised DFCS
Construct validity was determined through exploratory factor analysis and revealed two factors (eigenvalues >1.0). An orthogonal transformation (Varimax rotation) showed two distinct factors: factor 1 seems to represent direct management tasks (items italicized in Table 1), whereas factor 2 represents indirect management tasks. Final communality estimates for these two factors totaled 4.63, indicating a 24% explanation of the variance across all 19 items (4.63/19). Elimination of items with lower factor loadings and communality estimates did not improve the variance accounted for and detracted from the predictive validity of the DFCS with regard to glycemic control. Thus, all 19 items were retained.

Item analysis revealed that all items are skewed to the left, with the majority of item means across both youth and caregiver participants in the 1.2–1.4 range. This skewing is further highlighted by the mean ± SD total scores for child-reported diabetes-specific conflict of 24.4 ± 5.0 and caregiver-reported conflict of 24.0 ± 3.9. Subscale mean scores were as follows: factor 1 mean of 12.3 ± 3.0 and factor 2 mean of 12.1 ± 2.7. These scores illustrate equal contribution to the total score. Overall, these scores indicate that most families reported minimal conflict. Within the same family, child and caregiver reports of diabetes-specific family conflict (total score) showed a modest, but significant, correlation ($r = 0.26$, $P < 0.01$).

Rates of internal consistency (Cronbach's α) for the revised DFCS were calculated: youth report of diabetes-specific conflict, $\alpha = 0.85$; and caregiver report of diabetes-specific conflict, $\alpha = 0.81$. These rates demonstrated acceptable internal reliability for both youth report and caregiver report, as each of the 19 items consistently contributed to the total score. The subscales of the revised DFCS revealed lower levels of internal consistency, yet they still fell in the acceptable range: factor 1, $\alpha = 0.75$; and factor 2, $\alpha = 0.69$.

Concurrent validity was evaluated by comparing youth responses on the revised DFCS to youth responses on the BGMC and PedsQL questionnaires and parental responses on the revised DFCS to parental responses on the BGMC, parent proxy report of the PedsQL, and the PAID–P. We hypothesized that diabetes-specific family conflict would be correlated with more negative affect around BGM, lower quality of life, and greater parental burden. This was confirmed as youth-reported conflict correlated with negative affect around BGM ($r = 0.35$, $P < 0.01$) and poorer quality of life ($r = -0.36$, $P < 0.01$). Both factors were significantly correlated with these two mea-

sures; however, factor 1 was correlated to a greater magnitude with negative affect around BGM ($r = 0.36$, $P < 0.01$) than factor 2 ($r = 0.24$, $P < 0.01$). Factors 1 and 2 showed similar patterns of correlation with quality of life. Caregiver-reported conflict was correlated with the report of their own negative affect around BGM ($r = 0.46$, $P < 0.01$), their proxy report of poorer quality of life in the youths ($r = -0.35$, $P < 0.01$), and greater perceived caregiver burden ($r = 0.45$, $P < 0.01$).

Evaluation of predictive validity revealed that both child ($r = 0.27$, $P < 0.01$) and caregiver ($r = 0.26$, $P < 0.01$) reports of diabetes-specific family conflict were correlated with A1C values, indicating that higher levels of diabetes-specific conflict were associated with poorer glycemic control. Factor 1 showed a slightly higher correlation with A1C than did factor 2 ($r = 0.25$ vs. $r = 0.22$). To assess the independent contributions of diabetes-specific family conflict to the youth's glycemic control, we performed a multivariate analysis with factors usually associated with A1C values (e.g., demographic, family, and individual variables). This model was significant, $F(10,191) = 5.49$, $P < 0.01$, and included five independent predictors of glycemic control; higher A1C was significantly associated with greater daily insulin dosing (units per kilogram per day) ($P = 0.03$), lower frequency of BGM ($P = 0.01$), fewer injections per day ($P = 0.01$), single-parent family status ($P = 0.03$), and lower parental education ($P = 0.01$). This model accounted for 22% ($R^2 = 0.22$) of the variance in A1C. Nonsignificant variables in this model included age, duration of diabetes, and sex.

The second model included these same variables with the addition of the two factor scores on the revised DFCS. This significant model predicted 28% of the variance in A1C ($R^2 = 0.28$). In the model, $F(12,189) = 6.17$, $P < 0.01$; higher A1C was significantly associated with greater daily insulin dosing ($P = 0.03$), lower frequency of BGM ($P = 0.02$), fewer injections per day ($P = 0.01$), lower parental education ($P = 0.02$), and higher levels of diabetes-specific family conflict around direct management tasks reported by the child ($P < 0.01$). Thus, diabetes-specific family conflict makes an additive and independent contribution to glycemic outcomes, accounting for an additional 6% of the variance in A1C values. Interestingly, conflict around indirect management tasks

was not significantly associated with glycemic control. Nonsignificant variables in this model included age, duration of diabetes, sex, and single-parent family status.

CONCLUSIONS — The purpose of this study was to update and evaluate the DFCS, the most widely used measure of diabetes-specific family conflict (6). This updated version of the DFCS includes current terminology around diabetes management as well as more questions about BGM and prevention of hypoglycemia, which are both important factors in the present, post-DCCT era of intensive diabetes management. Our data indicated that this revised, 19-item version of the DFCS has strong psychometric properties. Rates of internal consistency were high, and the revised DFCS was associated with expected constructs: affect around BGM, health-related quality of life, and caregivers' perceived burden from diabetes care. Further, the structure of the revised DFCS included two factors: diabetes-specific family conflict around direct management tasks and conflict around indirect management tasks.

Further analysis revealed an association between the revised DFCS and glycemic control. In a multivariate analysis, the revised DFCS provided independent and additive predictive value to factors associated with glycemic control in this sample and factors associated with glycemic control in other populations (23–26). Higher levels of diabetes-specific family conflict were associated with poorer glycemic control, and, likewise, absent or minimal levels of conflict were associated with more optimal control. It is noteworthy that only the first factor, conflict around direct management tasks, was associated with glycemic control. Further, when the total score on the DFCS was included in an alternative model without the factor scores (results not shown), there was no additional benefit in predicting A1C values. These findings suggest that diabetes-specific family conflict around direct management tasks is more important with regard to glycemic control, and, thus, attention to those items may be sufficient when one is looking at biological outcomes. However, the indirect management tasks were clearly associated with other important variables (affect around BGM and quality of life), suggesting that these items are instructive when one is looking at broader psychosocial outcomes. Of course, given the cross-sectional nature of data, we cannot

determine the direction of these relationships. It is likely that these findings illustrate the bidirectional nature of these variables with poor diabetes control breeding diabetes-specific family conflict and the latter promoting higher glycemic levels (7–9).

Of note are the individual, family, and diabetes-specific variables associated with glycemic control in this population. The diabetes-specific factors associated with glycemic control included a higher daily dose of insulin normalized by weight, fewer daily insulin injections, and less frequent BGM. Our findings also indicate that family variables (single-caregiver families and caregivers with lower levels of education) affect glycemic control. Prior studies have shown a link between these (and other family factors) and higher A1C values along with poorer disease management (26–28). Our findings are consistent with these studies and highlight the fact that family-specific variables play a key role in diabetes management in children and adolescents. Thus, it is important to consider these family-specific factors in conjunction with the degree of diabetes-specific conflict when one is attempting to provide intervention for diabetes management and control.

The sample included in this study appears to be representative of the larger population of children and adolescents with type 1 diabetes, given the mean and range of A1C values. However, our sample is made up of predominantly white, two-caregiver families, potentially limiting its generalizability to individuals and families of ethnic minority or single-caregiver status. Thus, it is important to consider an individual DFCS score within the broader context of the family system (e.g., single-parent family) and those variables that are clinically relevant (e.g., adherence and insulin regimen). The revised DFCS appears to be an appropriate measure of diabetes-specific family conflict across patient populations, and it will be important to further validate the revised DFCS across diverse samples of children and adolescents with type 1 diabetes and their families.

This article presents the first published findings on the factor structure of the DFCS. Although diabetes-specific family conflict is an important construct in relation to glycemic control, the two factors of the revised DFCS accounted for only a small portion of variance in the items (24%). This result may be partly due to the restricted range of possible re-

sponses (i.e., changing the response set from 1 to 5 to 1 to 3). In addition, this illustrates that the construct of family conflict is probably broader than what is assessed with the DFCS. For example, do "general" areas of family conflict such as gaining independence or decision making around activities actually have a diabetes-specific quality to them as diabetes management cuts across all aspects of the youth's and family's life? When family functioning around diabetes is assessed by using the revised DFCS, it will be important to consider these additional areas of conflict along with other areas of family functioning (e.g., communication patterns). Future studies should address potential additions to the revised DFCS in terms of both diabetes-specific and general areas of family conflict. Additionally, future revisions of the DFCS are encouraged and can address the need to reexpand the response scale. Nonetheless, the present adaptation of the DFCS represents the most up-to-date and validated survey that assesses diabetes-specific family conflict in the current era of intensive diabetes management.

The management of type 1 diabetes in children and adolescents is a complex and difficult process, and the recognition of family conflict around management tasks probably identifies youths with suboptimal glycemic control. Our findings illustrate that the revised DFCS is a tool that can be easily administered during routine clinic visits to identify a potentially modifiable and potent area of family functioning.

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