Short-Term Effects of Coping Skills Training as Adjunct to Intensive Therapy in Adolescents

MARGARET GREY, DRPH, FAAN
ELIZABETH A. BOLAND, MSN, PNP
MARYANNE DAVIDSON, MSN, PNP
CHANG YU, MA
SUSAN SULLIVAN-BOLYAI, MS, RN
WILLIAM V. TAMBORLANE, MD

OBJECTIVE — Given the urgent need to develop effective programs that improve the ability for adolescents to achieve metabolic control equivalent to programs studied in the Diabetes Control and Complications Trial, we have undertaken a clinical trial to determine if a behavioral intervention (coping skills training [CST]) combined with intensive diabetes management can improve metabolic control and quality of life in adolescents implementing intensive therapy regimens.

RESEARCH DESIGN AND METHODS — A total of 65 youths between the ages of 13 and 20 years, who elected to initiate intensive insulin therapy, were randomly assigned to one of two groups: the intensive management with CST group and the intensive management without CST group. CST consists of a series of small group efforts designed to teach adolescents the coping skills of social problem-solving, social skills training, cognitive behavior modification, and conflict resolution. Data were collected at pre-intervention and at 3 months following the use of the Self-Efficacy for Diabetes scale, Children's Depression Inventory, Issues in Coping with IDDM scale, and the Diabetes Quality of Life: Youth scale. Clinical data (HbA_{1c}, adverse effects) were collected monthly.

RESULTS — The experimental and control groups were comparable on all measures at baseline. Results show that adolescents who received CST had lower HbA_{1c} and better diabetes self-efficacy and were less upset about coping with diabetes than adolescents receiving intensive management alone. In addition, adolescents who received the CST found it easier to cope with diabetes and experienced less of a negative impact of diabetes on quality of life than those who did not receive CST.

CONCLUSIONS — CST is useful in improving not only an adolescent's metabolic control, but also their quality of life. As more pediatric providers aim for improved control in adolescents with diabetes, the addition of this behavioral intervention may be helpful in achieving metabolic and life goals.

The Diabetes Control and Complications Trial (DCCT) (1) demonstrated that for patients age ≥13 years, intensive therapy and better metabolic control can reduce the incidence and progression of microvascular and neuropathic complications by 27–76%. Consequently, the DCCT results indicate that achievement of glycemic control as close to normoglycemia as possible with intensive treatment should be the goal of therapy for most patients with IDDM age ≥13 years. Translating this recommendation into the clinical practice setting places a particular burden on pediatric health care providers. The DCCT study included only a small number of highly selected adolescent patients (<10% of patients recruited after the feasibility phase of the study), and these patients required a disproportionate amount of staff time and effort (2). Despite such efforts, HbA_{1c} levels remained substantially higher in intensively treated adolescent patients than corresponding values in adults. Further, quality-of-life measures in the DCCT were not specific for adolescents, so little is known about the psychosocial impact of such intensive therapy in this age-group.

How individuals cope with the burdens of a long-term illness has an important influence on the effectiveness of therapy (3). Coping with the demands of self-management of IDDM in adolescence can be a formidable task. These demands include both the physical demands of management as well as the emotional and social demands of adjustment (4). A variety of studies have demonstrated that psychosocial factors, such as stressors and coping styles, during the period of adolescence are often associated with neglect of self-monitoring, dietary recommendations, and insulin injections (4–7). Thus, adolescents are at high risk for poorer metabolic control, hospitalization, and eventually the development of long-term complications. Our recent studies suggest that adolescents who respond to diabetes with depression and who cope by avoiding their problems are at particular risk for difficulties with both psychosocial well-being and metabolic control (8,9).

Coping skills training (CST) as an intervention to improve the efficacy of treatment

While it is difficult to engage adolescents to undertake and maintain intensive insulin regimens, it is possible that simultaneous interventions designed to increase their coping skills with such therapies will increase an adolescent's success with intensive therapy. Training in interpersonal and coping skills has been shown to be an effective strategy to improve performance in a wide variety of problems. The technique

From the Department of Pediatrics, School of Medicine, the Children's Clinical Research Center, Yale University School of Nursing, New Haven, Connecticut.

Address correspondence and reprint requests to Margaret Grey, DrPH, FAAN, Independence Foundation Professor of Nursing, Associate Dean for Research and Doctoral Studies, Yale University School of Nursing, 100 Church St. South, P.O. Box 9740, New Haven, CT 06536-0740. E-mail: margaret.grey@yale.edu.

Received for publication 24 September 1997 and accepted in revised form 15 December 1997.

Abbreviations: ABCs of Diabetes, Adolescents Benefit from Control of Diabetes; ANOVA, analysis of variance; CDI, Children's Depression Inventory; CSII, continuous subcutaneous insulin infusion; CST, coping skills training; DCCT, Diabetes Control and Complications Trial; DQOLY, Diabetes Quality of Life for Youth; MDI, multiple daily injection.

Table 1—*Comparison of clinical and psychosocial factors in subjects at baseline*

Variable	Coping skills	Control subjects
n	34	31
Age (years)	15.8 ± 2.1	15.0 ± 2.3*
Diabetes duration (years)	7.6 ± 3.9	8.6 ± 3.6*
Sex		
Girls	19	18†
Ethnic group		
White	31	29
Black/Hispanic	3	2†
Family income		
<$29,999	7	8†
$30,000–74,999	11	18
≥$75,000	11	8
Treatment regimen at study entry		
Twice a day	16	15†
Overweight	2	4
HbA_{1c}	8.9 ± 1.8	9.0 ± 1.6*

Data are *n* or means ± SD. *Difference on *t*-test, $P > 0.05$; †difference on χ^2, $P > 0.05$.

has been used with alcoholics (10), dysfunctional families (11), and weight loss (12) in studies with adults. Forman (13) has reviewed the literature on coping skills training (CST) for children and adolescents and has concluded that teaching them personal and social coping skills can assist in dealing with potential stressors encountered in their daily lives and with the stress reactions that may result from these situations (13). In children and adolescents, CST has been demonstrated to reduce substance abuse (14), improve social adjustment (15), prevent smoking (16), and reduce responses to stressors (17).

Although preliminary results of CST programs for adolescents with diabetes have generally been positive (18–21), many of the studies reported, to date, have used nonexperimental designs, and all have used small samples. Further, the impact of such behavioral interventions, in combination with the implementation of aggressive, intensive management in the high-risk adolescent age-group has not been determined. The Adolescents Benefit from Control (ABCs) of Diabetes Study is a prospective randomized controlled trial that has been undertaken to examine whether a behavioral program of CST in combination with intensive diabetes management will lead to improved metabolic and psychosocial outcomes in our patients. This report summarizes the short-term (3-month) results of the study in a large, representative group of adolescents at our center.

RESEARCH DESIGN AND METHODS

— A randomized, prospective two-group experimental design was used. Patients included in the study were drawn from the Yale Children's Diabetes Clinic, which cares for >500 children, adolescents, and young adults with type 1 diabetes. A goal of therapy in this clinic is to translate the DCCT recommendations (1,2) to all patients in the context of regular quarterly visits. Adolescents attending the clinic were eligible for inclusion in the ABCs of Diabetes Study if they met the following criteria: *1*) were between the ages of 12 and 20 years; *2*) had no other health problem except for treated hypothyroidism; *3*) had been treated with insulin for at least 1 year; *4*) had a recent HbA_{1c} between 7.0 and 14% (normal, 4.0–6.2%); *5*) had no severe hypoglycemic events within the past 6 months; and *6*) were in school-grade appropriate to age within 1 year. Eligible adolescents were offered the opportunity to participate in the study by their usual diabetes care provider at the Children's Diabetes Clinic. Between 1 November 1995 and 1 June 1997, 92 patients who met the criteria were invited to participate, and 65 (28 boys, 37 girls) agreed to do so. The patients and their parents gave written, informed consent for inclusion in the study, which was approved by the Yale School of Nursing Human Subjects Research Review Committee. Only 27 potential subjects (29%) refused participation, and the refusers were not significantly different in sex ($\chi^2 = 1.35$, df = 1, $P = 0.25$), ethnicity ($\chi^2 = 2.18$, df = 1, $P = 0.14$), age ($t = -0.38$, $P = 0.71$), and metabolic control ($t = -0.41$, $P = 0.70$) than those who enrolled.

Eligible patients attended a recruitment presentation where it was explained that all patients enrolled in the study would receive intensive management consisting of three or more daily insulin injections or an external insulin pump, self-monitoring of blood glucose at least four times daily, monthly outpatient visits, and interim telephone contacts, as described in the DCCT (1,2). They were also informed that they would be randomly assigned to one of two treatment groups: The experimental group who would receive CST and intensive management and the control group who would receive intensive management alone. Patients who consented to participate were randomized to study group and admitted to the Children's Clinical Research Center (CCRC) for 1 day to obtain baseline measures and to review treatment goals and methods. Of the subjects, 34 were randomized to the CST group and 31 to the intensive management (control) group. There were no dropouts from the study. There were no differences between the experimental and control group on demographic and clinical variables, as shown in Table 1. Sex, ethnicity, family income, age, duration of diabetes, and treatment regimen at study entry were similar between the two groups. Both groups received intensive diabetes team management, with the diabetes care providers (physician, nurse practitioners/certified diabetes educators, dietician, social worker) blind to study group assignment. All data were collected by trained research assistants who were also blind to the study group of the participants.

CST intervention

The goal of CST is to increase a teenager's sense of competence and mastery by retraining inappropriate or nonconstructive coping styles and forming more positive styles and patterns of behavior. It is thought that such a program will help adolescents not only adapt to diabetes, but will also generalize to other life experiences, and thereby influence self-efficacy (18–20). Researchers hypothesize that CST may increase the ability of adolescents with diabetes to cope with the problems they face on a day-to-day basis and to be more effective in achieving therapeutic goals, particularly when CST is linked to ongoing follow-up care. To teach the coping skills of social problem-solving, social skills training, cognitive behavior modifica-

tion, and conflict resolution, scenarios were developed empirically by identifying a set of social situations that young adult patients with diabetes identified as problematic during adolescence (22). Four to eight situations rated as being most difficult have been used in the training sessions in previous studies.

In this study, CST consisted of role-playing various social situations (using the scenarios to practice new coping skills) so that the trainer (master's-prepared nurse practitioner with experience in pediatric psychiatry and diabetes) could model appropriate coping behavior. The participants were given feedback on their response to the situation, and the scene was presented repeatedly until the criterion behavior (e.g., appropriate assertive verbal response) was identified. Scenarios were used to assist teenagers to role-play difficult situations such as managing food choices with friends, decision-making about drugs and alcohol, and independence/dependence conflicts. Emphasis was placed on developing the coping skills of social problem-solving, social skills training, cognitive behavior modification, and conflict resolution (23). Training occurred in small groups of two to three subjects with the trainer, so that participants could learn from each other as well as from the trainer. Follow-up role-play with peers as trainers was continued for 3–5 weeks to solidify the new behaviors. Sessions lasted 1–1.5 hours, and all adolescents randomized to CST participated in a minimum of four and a maximum of eight weekly sessions, followed by monthly visits. Subjects were enrolled sequentially into a total of 10 CST groups. Our protocol required all subjects randomized to CST to complete a minimum of four group sessions. The majority of coping skills groups met for six sessions, but two groups met for eight sessions to assure that all of the coping skills were taught. Attendance at the sessions was 98%. All CST groups were audiotaped and reviewed to assure that coping skills were taught consistently across the groups.

Measures of the dependent variables

All scales were thoroughly tested for reliability in the current sample, with data consistent with previous reports. Data were collected at baseline and at 3 months for all variables, with the exception of coping and clinical information, which were also collected at 1 month.

Grossman, Brink, and Hauser (24) developed the Self-Efficacy for Diabetes scale to measure the "self-perceptions or expectations held by persons with diabetes about their personal competence, power, and resourcefulness for successfully managing their diabetes." The construct measured focuses on an adolescent's estimate of their own ability to cope with their illness, based on Bandura's conception of self-efficacy (25,26). The scale consists of 35 items in three subscales: diabetes-specific self-efficacy (24 items), medical situations self-efficacy (5 items), and general situations (6 items). To evaluate the intensity of self-efficacy, subjects are asked to rate their degree of confidence for all items on a 5-point scale ("very sure I can't" to "very sure I can"). The scale was developed using adolescent subjects. Kuder-Richardson reliability coefficient α ranged from 0.90 to 0.92 for the total scale and the diabetes-specific subscale to 0.60 for the general situations subscale.

The Children's Depression Inventory (CDI) was developed by Kovacs (27) to measure self-reported depressive behavior in children and adolescents. The inventory assesses a variety of depressive symptoms including disturbance in mood and hedonic capacity, self-evaluation, vegetative functions, and interpersonal behaviors. It contains 27 multiple choice items that yield total scores from 0 to 54. Higher scores reflect greater symptomatology. Reliability estimates have been high, with internal consistency reliability between 0.71 to 0.87 (in our data with this population, 0.88) and test-retest reliability at 0.80 to 0.87. Kovacs and colleagues established that the inventory has concurrent and discriminant validity and that the score of 13 may be interpreted as the criterion score for identifying clinical depression when the CDI is not followed by a clinical evaluation (28). As in other studies, because depression is not normally distributed, CDI scores are treated with a logarithmic transformation before analysis.

The Issues in Coping with IDDM scale was developed by Kovacs and colleagues to assess what IDDM-related issues children and adolescents with IDDM find hard or difficult to handle or experience as upsetting (29). The items were based on those areas felt by clinicians and/or were indicated in the literature to be coping challenges to adolescents with IDDM. The tool is a standardized, self-report questionnaire with two scales: how hard activities are and how upsetting the tasks are. The How Hard subscale consists of 15 diabetes tasks to which the respondent indicates how difficult that task is to do on a 0- to 4-point Likert scale. There are 13 items in the Upset scale, to which the respondent indicates how upsetting the activities or thoughts about diabetes are. Both parts yield two scores: the number of items endorsed and a total score based on the sum of the item scores. Higher scores indicate more difficulty or upset with total scores ranging from 0 to 45 on the first scale and 11 to 33 on the second scale.

The DCCT researchers developed the Diabetes Quality of Life scale to assess subjects' perceptions of the impact of this intensified regimen on their general satisfaction with life, and on concerns over social and vocational issues related to diabetes (30). Ingersoll and Marrero (31) found that many of the items were of limited relevance to the lives of children and adolescents and modified the instrument for use with youth populations. The resultant instrument, the Diabetes Quality of Life: Youth (DQOLY) scale consists of three subscales: 17-item Diabetes Life Satisfaction scale; 23-item Disease Impact Scale; and, 11-item Disease-Related Worries scale. Cronbach's α for each scale in psychometric testing by the authors was as follows: Satisfaction −0.85; Impact −0.83; and Worries −0.82. Each item is answered in a 5-point Likert scale, so that total scores can range from 17 to 85 in the Satisfaction scale, 23 to 115 on the Impact scale, and 11 to 55 on the Worries scale. On the Impact and Worries scales, higher scores indicate lower quality of life, and on the Satisfaction scale, higher scores indicate higher quality of life. The authors reported that all three scales were associated with adolescent's self-rated health status.

HbA_{1c} was measured monthly in all patients. All subjects in the study had four assessments during the study period (baseline, 1, 2, and 3 months). Analyses were performed by trained study staff using the Bayer DCA2000 (normal = 4.0–6.2%), and controls were performed at least bimonthly.

Adverse events

Severe hypoglycemia was defined as an episode in which the patient required assistance with treatment from another person in order to recover. Patients were instructed to report severe hypoglycemia immediately and were asked about the occurrence of any hypoglycemia at each visit. Rates of hypoglycemic events were calculated by summing the number of events over the total number of patient-years of follow-up. Overweight was defined similarly to the DCCT

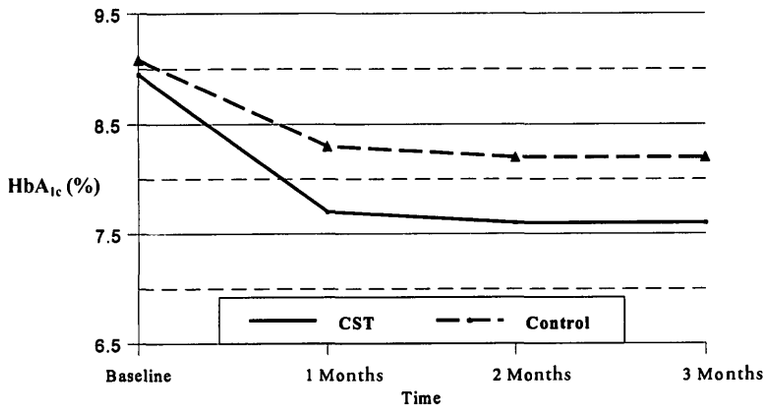

Figure 1—*HbA_{1c} over 3 months.*

definition (2). Weight and height (using a wall-mounted stadiometer) measurements obtained at baseline and at 3 months were used to calculate BMI. Boys were considered overweight when BMI was ≥27.8 kg/m², and girls were considered overweight when BMI was ≥27.3 kg/m² (2).

Data analytic methods

All data were double-entered in a database and checked for accuracy. Analyses were performed using the SAS System (version 6.11) and SPSS (version 7.5). Analysis of variance (ANOVA) for repeated measures was used to test the hypotheses that adolescents who participated in CST would have better metabolic control and quality of life than those who received routine intensive management. Comparisons of the risks of intensive management were performed using χ^2. The sample of 30–34 subjects per group yields a statistical power of >0.80 for a decrease in HbA_{1c} of 0.75%, one-tailed test using repeated measures ANOVA (32). Data are presented as means ± SD.

RESULTS — The randomization procedure resulted in groups that were comparable at baseline on all measures (Table 1). Therefore, any differences between the CST group and the comparison group after randomization are likely to be due to the CST program.

Metabolic control was measured at each monthly visit, and data are shown in Fig. 1. As with demographic and psychosocial variables, HbA_{1c} levels were virtually identical at entry in the adolescents randomized to CST (8.9 ± 1.8) and in the control group (9.0 ± 1.6). In the entire sample, intensification of therapy in association with increased outpatient visits resulted in a significant fall in HbA_{1c} levels (to 7.9 ± 1.3%, $P < 0.01$ vs. baseline) after 3 months. However, HbA_{1c} fell faster and to a greater extent in the CST group as compared with the control group, with the largest difference between the groups at 1-month postinitiation of intensive therapy (7.7 ± 1.2 CST vs. 8.2 ± 1.3 control at 1 month) and maintained to 3 months (7.6 ± 1.3 CST vs. 8.1 ± 1.3 control at 3 months). Overall differences are statistically significant for time ($F = 13.12$, df = 3, $P < 0.001$), and for time × group ($F = 2.56$, df = 2, $P = 0.04$), suggesting that intensive management alone improves metabolic control, but metabolic control can be significantly enhanced by CST provided simultaneously with the intensive management. Thus, CST has an immediate beneficial effect on the ability of adolescents to attain better metabolic control over the short term.

As shown in Table 2, treatment regimens employed were not significantly different between the groups, either at baseline or during the study. During the study, there were 9 adolescents on continuous subcutaneous insulin infusion (CSII) and 26 on multiple daily injection (MDI) in the CST group, and 11 on CSII and 23 on MDI in the control group ($\chi^2 = 0.91$, df = 1, $P = 0.34$). Further, the total daily doses of insulin (units per kilograms per day) were not significantly different between the groups at baseline or at 3 months ($F = 1.19$, $P = 0.28$). On average, subjects in both groups performed 3.4 ± 0.8 blood glucose tests per day.

CST was not effective in reducing the acute complications of intensive therapy. The overall rate of severe hypoglycemia (11 per 16.25 patient-years) and diabetic ketoacidosis (1 per 16.23 patient-years) was similar to the adolescent cohort in the DCCT (2), and these rates were not affected by participating in CST. Six episodes of moderate-to-severe hypoglycemia (requiring assistance or resulting in a seizure) occurred in the CST group versus five in the control group ($\chi^2 = 0.03$, df = 1, $P = 0.96$), and one episode of diabetic ketoacidosis occurred in the CST group ($\chi^2 = 0.87$, df = 1, $P = 0.35$). As shown in Table 1, only six (two CST, four control) children were classified as overweight by BMI criteria on entry into the study. However, after 3 months, there were six cases in the CST group and seven in the control group ($\chi^2 = 0.44$, df = 1, $P = 0.51$) who were overweight.

Table 3 shows the data on the psychosocial outcomes for these adolescents. Even though scores on these measures were similar at baseline, after 3 months of follow-up, adolescents receiving CST had significantly better diabetes self-efficacy and were less upset about coping with diabetes than adolescents receiving intensive management

Table 2—*Comparison of clinical diabetes between CST and control groups at baseline and 3 months*

	CST (n = 34)		Control (n = 31)	
	Baseline	3 months	Baseline	3 months
Treatment regimen*				
2 injections	16	0	14	0
≥3 injections	15	25	19	20
3 injections	0	15	18	11
≥4 injections	0	10	1	9
CSII	0	9	1	11
Total daily dose†				
($U \cdot kg^{-1} \cdot day^{-1}$)	1.29 ± 0.41	1.36 ± 0.42	1.17 ± 0.42	1.21 ± 0.54
Self-monitored blood glucose†				
Tests reported	2.81 ± 0.32	2.92 ± 0.28	3.43 ± 1.3	3.51 ± 1.5

Data are n or means ± SD. *Difference on χ^2, $P > 0.05$; †difference on repeated measures ANOVA, $P > 0.05$.

Table 3—*Comparison of subjects in coping skills training versus routine intensive care over 3 months*

	CST		Control		Group × time		Group		Time	
Variable	Baseline	3 months	Baseline	3 months	*F**	*P* value	*F*†	*P* value	*F**	*P* value
Self-efficacy										
General	25.5 ± 2.6	28.3 ± 3.0	26.0 ± 2.7	24.7 ± 2.5	0.34	0.71	0.03	0.96	1.01	0.32
Diabetes	95.4 ± 9.5	102.5 ± 12.1	100.4 ± 8.7	100.4 ± 10.0	2.64	0.05	0.84	0.44	4.11	0.02
Medical	20.1 ± 2.7	22.7 ± 2.7	21.6 ± 2.3	21.7 ± 2.6	0.94	0.39	2.54	0.06	10.11	0.01
Coping										
Hard	18.8 ± 3.3	15.4 ± 3.7	18.7 ± 2.9	17.8 ± 2.5	4.39	0.01	0.31	0.57	7.74	0.01
Upset	18.1 ± 3.6	15.4 ± 2.3	16.9 ± 3.4	16.8 ± 3.4	7.93	0.001	2.69	0.04	14.45	0.001
Quality of life										
Impact	50.8 ± 11.5	46.1 ± 11.0	47.3 ± 9.0	43.6 ± 11.2	3.23	0.04	1.16	0.28	12.01	0.001
Satisfaction	64.0 ± 13.4	67.8 ± 11.3	66.3 ± 11.5	67.0 ± 13.5	1.20	0.28	0.06	0.80	2.52	0.12
Worry	21.8 ± 7.5	20.7 ± 6.7	19.8 ± 5.0	19.5 ± 7.4	1.36	0.25	1.87	0.10	1.31	0.26
Depression	7.9 ± 1.3	6.3 ± 1.3	6.6 ± 1.8	6.0 ± 1.2	0.53	0.46	0.26	0.61	2.59	0.11

Data are means ± SD. *df = 2, 98; †df = 1, 49.

without CST. Adolescents who received CST also found diabetes less hard to cope with and to have less of a negative impact on quality of life after 3 months than did the adolescents who received intensive management without CST. Thus, CST is useful in improving not only an adolescent's metabolic control, but also self-efficacy and quality of life early in the course of intensive management. In addition, Table 3 shows that for the sample as a whole, initiation of intensive therapy did not have an adverse effect on quality of life.

CONCLUSIONS — The results of the DCCT indicate that most adolescents with IDDM should receive intensive diabetes management, since the long-term benefits of reducing complications outweigh the risks of severe hypoglycemia and weight gain, even in young patients (2). The ability of pediatric practitioners to translate this recommendation in the management of large numbers of teenagers with IDDM was greeted with some skepticism, even by the DCCT investigators themselves (33). In the DCCT, only 92 highly selected adolescents were randomized to intensive therapy in the 29 treatment centers, or approximately three patients per center. In contrast, this study included 65 relatively unselected adolescents from a single tertiary care center. Thus, the finding that HbA_{1c} levels could be lowered to levels that were comparable to those in adolescents in the DCCT in our patients with or without CST is particularly noteworthy. Indeed, it can be argued that a substantial number of our patients had already incorporated many of the aspects of intensive therapy into their prestudy treatment regimens, since less than half were taking only two injections per day and HbA_{1c} levels at baseline (~9.0%) were lower than HbA_{1c} levels in conventionally treated adolescents in the DCCT (~9.8%) (2).

Although HbA_{1c} levels fell during the 3 months of follow-up in the adolescents who received intensive management alone, HbA_{1c} values (7.9 ± 1.3%) remained well above the normal range. This study was designed to examine whether a training program that focuses on managing life in the context of diabetes, rather than managing diabetes, might provide treatment teams with a relatively simple and inexpensive behavioral approach to further improve diabetes control in adolescents. By combining CST with intensive diabetes management, our adolescents were able to rapidly lower HbA_{1c} levels to <8.0%, a value considered by many as a target that best balances the benefits against the risks of intensive treatment (34,35). While increased patient contacts may have played some role in this improvement in control, lower HbA_{1c} levels in the CST group were not the result of systematic differences in diabetes management. Diabetes care providers in the study were masked to group assignment, and there were no differences in the insulin or monitoring regimens that were employed.

The most common approach in working with young patients with IDDM is education. Most educational programs for youth with diabetes emphasize factual knowledge about the disease process and have had disappointing results in improving psychosocial well-being or metabolic control (36). However, a recent study in patients with newly diagnosed diabetes suggests that educational programs can be effective when combined with supportive training in self-management (37). Other studies have found behavioral interventions, such as behavior modification, to be effective at improving self-care and knowledge (38,39); but for the most part, they have not been found to improve metabolic control. In the present study, we provided CST in the context of intensified diabetes treatment by an established diabetes treatment team. This approach may have been more effective in achieving metabolic goals than a behavioral intervention applied independently of diabetes care.

Another aim of the study was to examine the effect of intensive management and CST on psychosocial well-being and quality of life. As in adolescents in the DCCT (30), intensive therapy alone did not adversely affect scores on the DQOLY scale, even using the improved instrument of Ingersoll and Marrero (31). In addition, scores on the self-efficacy, coping, and depression scales were unchanged or modestly improved in the subjects in the control group. In contrast, adolescents who received CST in the context of intensive management showed gains in several areas. As might be expected, the teenagers in the CST group found it less difficult and less upsetting to deal with diabetes after CST. Bandura (26) has suggested that when a person can practice and rehearse a new behavior, such as learning how to cope successfully with a problem situation, self-efficacy or self-concept can be enhanced. This construct is consistent with the gains in self-efficacy shown by our subjects in the CST group. Although Satisfaction and Worry scores on the DQOLY scale improved in our patients after CST, the dif-

ferences from baseline were not statistically significant. It may be that the effect on diabetes management is more immediate, but that effects on quality of life will take longer to be reinforced and incorporated. Other studies of behavioral interventions have led to the conclusion that such effects may take longer to occur (37).

Unlike the majority of studies of behavioral interventions in youth with diabetes, our study used an experimental design with a substantial number of patients to demonstrate improvements in both metabolic control and quality of life over 3 months. Unfortunately, our sample, while representative of our larger clinic population, may underrepresent youth of ethnic minorities and/or lower socioeconomic status who may have diabetes. Further, these data represent improvements over only 3 months of follow-up, and maintenance of these effects over time is critical to improving long-term outcomes for youth with diabetes. It is, therefore, important to continue to follow these youths to determine if early positive effects of CST are sustainable.

In conclusion, our data suggest that CST adds important coping skills to an adolescent's repertoire of abilities to initiate and maintain intensive treatment of diabetes. Diabetes treatment teams need to be aware of the skills that adolescents use to manage not only their diabetes and its treatment, but also their lives. Skill in negotiation with family members over treatment responsibilities (40) and the ability to negotiate treatment goals with the diabetes team (41), as has been demonstrated in previous studies, may be particularly helpful in achieving the goals of intensive therapy. These skills are different than those skills of simply managing diabetes, and they need to be addressed in the context of diabetes care. The psychosocial benefits of CST may also contribute directly to improved diabetes control. By teaching patients how to deal effectively with stressors encountered in daily life, fewer stress reactions from difficult situations (13) should result, leading to better overall diabetes control.

Acknowledgments — This research was supported by grants from the National Institute of Nursing Research (RO1-NR04009) and the Culpeper Foundation to M.G., and the Yale Children's Clinical Research Center (grant MO1-RR06022, General Clinical Research Centers Program, National Center for Research Resources, National Institutes of Health).

We wish to acknowledge the work of the following people who participated in the clinical care of these patients: JoAnn Ahern and Patricia Gatcomb (diabetes nurse educators), Mary Savoye (dietitian), and Sylvia Lavietes (social worker), as well as the following members of the research team who participated in the data collection and analysis: Joanne Mezgar, Delia Lakish, Ellen Shaw, Kelley Muldoon, Allison Oesterle, and Elizabeth Perrone.

References

1. Diabetes Control and Complications Trial (DCCT) Research Group: The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med* 329:977–986, 1993
2. Diabetes Control and Complications Trial (DCCT) Research Group: Effect of intensive insulin treatment on the development and progression of long-term complications in adolescents with insulin-dependent diabetes mellitus: Diabetes Control and Complications Trial. *J Pediatr* 125:177–188, 1994
3. Lazarus RS, Folkman S: Coping and adaptation. In *The Handbook of Behavioral Medicine,* Gentry WD, Ed. New York, Guilford, 1984, p. 282–325
4. Hanson CL, Harris MA, Relyea G, Cigrang JA, Carle DL, Burghen GA: Coping styles in youths with insulin-dependent diabetes mellitus. *J Consult Clin Psychol* 57:644–651, 1989
5. Charron-Prochownik D, Arslanian S: Women with diabetes: the adolescent years: a case study and review. *Diabetes Spectrum* 10:180–184, 1997
6. Delamater AM, Kurtz SM, Bubb J, White NH, Santiago JV: Stress and coping in relation to metabolic control in adolescents with type I diabetes. *Dev Behav Pediatr* 8:136–140, 1987
7. LaGreca AM, Follansbee D, Skyler JS: Developmental and behavioral aspects of diabetes management in youngsters. *Child Health Care* 19:132–139, 1990
8. Grey M, Cameron ME, Thurber FW: Coping and adaptation in children and adolescents with diabetes. *Nurs Res* 40:144–149, 1991
9. Grey M, Cameron ME, Lipman TH, Thurber FW: The relationship of initial coping behaviors to adjustment one year later in children with IDDM. *Nurs Res* 46:312–317, 1997
10. Marlott GA, Gordon JR: *Relapse Prevention: Maintenance Strategies in Addictive Behavior Change.* New York, Guilford, 1985
11. Eisler RM, Miller PM, Herson M: Effects of assertive training on marital interaction. *Arch Gen Psychiatr* 39:643–649, 1974
12. Kayman S, Arnold L, King AC, Stefanick ML, Wood PD: *Preventing Relapse after Weight Loss: Problem Solving Skills Training Approach to Weight Management.* New York, American Public Health Association, 1990
13. Forman SG: *Coping Skills Interventions for Children and Adolescents.* San Francisco, Jossey-Bass, 1993
14. Forman SG, Linney JA, Brondino MJ: Effects of coping skills training on adolescents at risk for substance abuse. *Psychol Addictive Behav* 4:67–76, 1990
15. Bierman KL, Furman W: The effects of social skills training and peer involvement on the social adjustment of preadolescents. *Child Dev* 55:151–162, 1984
16. DelGreco L, Breitbach L, Rumer S, McCarthy RH, Suissa S: Four-year results of a youth smoking prevention program using assertiveness training. *Adolescence* 21:631–640, 1986
17. Elias MJ, Gara M, Ubriaco M, Rothbaum DA, Clabby J, Schuyler T: Impact of a preventive social problem solving intervention on children's coping with middle-school stressors. *Am J Comm Psychiatr* 14:259–275, 1986
18. Gross AM, Johnson WG, Wildman H, Mullett N: Coping skills training with insulin-dependent preadolescent diabetics. *Child Behav Therapy* 3:141–153, 1982
19. Gross AM, Heiman L, Shapiro R, Schultz RM: Children with diabetes: social skills training and hemoglobin A_{1c} levels. *Behav Modif* 7:151–165, 1983
20. Kaplan RM, Chadwick MW, Schimmel LE: Social learning intervention to promote metabolic control in type I diabetes mellitus: pilot experimental results. *Diabetes Care* 8:152–155, 1985
21. Boardway RH, Delameter AM, Tomakowsky J, Gutai JP: Stress management training for adolescents with diabetes. *J Pediatr Psychol* 18:29–45, 1993
22. Johnson WG, Gross AM, Wildman HE: Developing coping skills in adolescent diabetics. *Corr Soc Psychol J Behav Techniques Methods Theory* 28:116–120, 1982
23. Davidson M, Boland EA, Grey M: Teaching teens to cope: coping skills training for adolescents with diabetes mellitus. *J Soc Pediatr Nurses* 2:65–72, 1997
24. Grossman HY, Brink S, Hauser ST: Self-efficacy in adolescent girls and boys with insulin-dependent diabetes mellitus. *Diabetes Care* 10:324–329, 1987
25. Bandura A: *Self-Efficacy: The Exercise of Control.* New York, WH Freeman, 1997
26. Bandura A: *Social Foundations of Thought and Action: A Social Cognitive Theory.* Englewood Cliffs, NJ, Prentice-Hall, 1986
27. Kovacs M: The Children's Depression Inventory (CDI). *Psychopharmacol Bull* 21:995–998, 1985
28. Smucker MR, Craighead WE, Craighead LW, Green BJ: Normative and reliability data for the Children's Depression Inventory. *J Abnorm Child Psychol* 14:25–29, 1986
29. Kovacs M, Brent D, Feinberg TF, Paulauskas

S, Reid J: Children's self-reports of psychologic adjustment and coping strategies during the first year of insulin-dependent diabetes mellitus. *Diabetes Care* 9:472–479, 1986
30. Diabetes Control and Complications Trial (DCCT) Research Group: Influence of intensive diabetes treatment on quality-of-life outcomes in the Diabetes Control and Complications Trial. *Diabetes Care* 19:195–203, 1996
31. Ingersoll GM, Marrero DG: A modified quality of life measure for youths: psychometric properties. *Diabetes Educ* 17:114–118, 1991
32. Elashoff JP: *nQuery Advisor* (software program), v.1.0. Boston, MA, Statistical Solutions, 1995
33. Santiago JV: Lessons from the Diabetes Control and Complications Trial. *Diabetes* 42:1549–1554, 1993
34. Krolewski AS, Laffel LM, Krowlewski M, Quinn M, Warram JH: Glycosylated hemoglobin and the risk of microalbuminuria in patients with insulin-dependent diabetes mellitus. *N Engl J Med* 332:1251–1255, 1995
35. Warram JH, Manson JE, Krowlewski AS: Glycosylated hemoglobin and the risk of retinopathy in insulin dependent diabetes mellitus. *N Engl J Med* 332:1305–1306, 1995
36. Bloomgarden ZT, Karmally W, Metzger J, Brothers M, Nechemias C, Bookman J, Faierman D, Ginsberg-Fellner F, Rayfied E, Brown WV: Randomized, controlled trial of diabetic patient education: improved knowledge without improved metabolic status. *Diabetes Care* 10:263–272, 1987
37. Delamater AM, Bubb J, Davis SG, Smith JA, Schmidt L, White NH, Santiago JV: Randomized, prospective study of self-management training with newly diagnosed diabetic children. *Diabetes Care* 13:492–498, 1990
38. Brown SA: Effects of educational interventions in diabetes care: a meta-analysis. *Nurs Res* 37:223–230, 1988
39. Rubin RR, Peyrot M, Caudek CD: Differential effect of diabetes education on self-regulation and lifestyle behaviors. *Diabetes Care* 14:335–338, 1991
40. Wysocki T, Greco P, Harris M, Bubb J, Elder C, Harvey L, Mcdonnell K, Taylor A, White N: Behavior therapy for families of adolescents with IDDM: maintenance of treatment effects (Abstract). *Diabetes* 46 (Suppl. 1):89A, 1997
41. Gedmin J, Weissberg-Benchell J, Rohrbeck C: Relationships between goals and health outcomes in youth with IDDM (Abstract). *Diabetes* 46 (Suppl. 1):89A, 1997