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Facilitating Healthy Coping in Patients with Diabetes: A Systematic Review

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Abstract

Purpose—The purpose of this study is to summarize recent literature on **approaches to supporting** healthy coping in diabetes, in two specific areas: 1) impact of different approaches to diabetes treatment on healthy coping; and 2) effectiveness of interventions specifically designed to support healthy coping.

Methods—A PubMed search identified **129** articles published August 1, 2006 – April 30, 2011, addressing diabetes in relation to emotion, quality of life, depression, adjustment, anxiety, coping, family therapy, behavior therapy, psychotherapy, problem-solving, couples therapy, or marital therapy.

Results—**Evidence suggests that** treatment choice may significantly influence quality of life, with treatment intensification in response to poor metabolic control often improving quality of life. The recent literature provides support for a variety of healthy coping interventions in diverse populations, including diabetes self-management education, support groups, problem-solving approaches, and coping skills interventions for improving a range of outcomes, Cognitive Behavior Therapy and collaborative care for treating depression, and family therapy for improving coping in youths.

Conclusions—Healthy coping in diabetes has received substantial attention in the past five years. A variety of approaches show positive results. Research is needed to compare effectiveness of different approaches in different populations and determine how to overcome barriers to intervention dissemination and implementation.

In recognition of the wide range of coping challenges presented by diabetes across genetic, behavioral, family, social, community, organizational, and political contexts, the American Association of Diabetes Educators (AADE) has identified healthy coping as one of the key AADE7™ Self-care Behaviors **and defined it as the following:**

“Health status and quality of life are affected by psychological and social factors. Psychological distress directly affects health and indirectly influences a person’s motivation to keep their diabetes in control. When motivation is dampened, the commitments required for effective self-care are difficult to maintain. When barriers seem insurmountable, good intentions alone cannot sustain the behavior. Coping becomes difficult and a person’s ability to self-manage their diabetes deteriorates.”

From this definition, it is clear that the construct of “healthy coping” includes a number of related but distinct domains of psychosocial outcomes. In addition to avoiding specific psychological problems such as depressive and anxiety disorders, high levels of perceived stress and other negative emotions, and diabetes-specific distress, healthy coping also involves positive attitudes toward diabetes and its treatment, positive relationships with others, and high perceived health-related quality of life (QOL). That is, healthy coping extends beyond the mere avoidance of psychiatric morbidity to encompass high levels of psychosocial functioning and a positive outlook on the illness and overall quality of life. Table 1 provides more detail on specific healthy coping domains that are commonly examined in the diabetes literature.

As awareness of the inter-relationships between diabetes, its management, and these outcomes has grown, interest in intervening to facilitate healthy coping in diabetes patients has also expanded. The purpose of this paper is to systematically review literature on healthy coping in diabetes published in the past five years, with a focus on identifying evidence for effective interventions that has emerged since a prior review ¹. **Two** questions within this broad topic area are addressed: 1) What are the effects of different diabetes treatment approaches on healthy coping outcomes? 2) What is the effect of different interventions designed to improve healthy coping on psychosocial and quality of life outcomes?

Methods

Search

Parallel with the multiple domains of healthy coping, intervention approaches for addressing these concerns in diabetes patients across the lifespan are diverse, and there are relatively few well-controlled studies of any single intervention approach. Thus, this review was designed to provide a broad appraisal of promising approaches for addressing an array of healthy coping issues. The review used systematic review procedures in specifying the terms and approach to searching for and abstracting data from articles, but narrative procedures in including articles without *a priori* criteria based on methods and design.

A PubMed search of the English-language literature published between August 1, 2006 and April 30, 2011 was performed. Combinations of *diabetes* with the terms emotion, quality of life, depression, adjustment, anxiety, anxious, coping, family therapy, behavior therapy, psychotherapy, problem solving, couples therapy, or *marital therapy* were used to identify relevant studies. Figure 1 provides details on search procedures and results.

Study Selection

Titles and abstracts of articles meeting the above search criteria were reviewed as candidates for data abstraction. To be included in the final review, articles needed to report the effects of either a diabetes treatment or healthy coping intervention on at least one psychosocial

and/or quality of life outcome. Retrospective and prospective studies were included, along with narrative or systematic review articles. All articles pertaining to T1DM or T2DM were included and there were no restrictions with regard to patient age. Articles aimed at lay audiences, statements of opinion, or descriptions of programs with no research component were excluded.

Data Abstraction

Articles meeting criteria were grouped into the **two** main questions targeted for review: 1) evidence describing the impact of diabetes treatments on healthy coping constructs; and 2) interventions to promote healthy coping. Articles were then further categorized according to intervention type (see Figure 1), abstracted independently by the authors, and incorporated into the Healthy Coping Evidence Table (available as an online Appendix). Abstracted data elements included study design, original research versus review of published studies, study objectives, sample size, healthy coping outcomes assessed, other outcomes assessed (e.g., HbA1c), and principal findings, including both significant and non-significant results. **For all studies**, the American Association of Clinical Endocrinologists' (AACE) evidence ratings² corresponding to their study designs were also determined.

Study Characteristics

As shown in Figure 1, **129** articles met criteria for inclusion, including **59** articles examining the effect of diabetes treatments on healthy coping domains and **70** articles examining the efficacy or effectiveness of interventions specifically designed to promote healthy coping. Cognitive behavior therapy, family therapy, diabetes self-management education, and primary care-based approaches were the most common intervention types; fewer articles were identified which focused on problem solving and coping skills, support groups or group counseling, and medication for psychological problems.

Data Synthesis

The evidence table describing studies within the **two** broad areas relevant to healthy coping in diabetes drove the organization of the narrative review accordingly: 1) effect of diabetes treatments on QOL and psychosocial outcomes; 2) evidence for the efficacy or effectiveness of healthy coping interventions in improving QOL and other psychosocial outcomes. Results summarized in the text below focus on articles reporting *original* research, with Tables 2 and 3 providing additional detail in two areas. Table 2 summarizes the large number of studies that examined the psychosocial and quality of life impacts of different methods of intensifying treatment in poorly controlled diabetes, while Table 3 summarizes original intervention research studies identified in the review. The complete Healthy Coping Evidence Table is available as an online Appendix.

Results

Part 1: Impact of Diabetes Treatments on Quality of Life

A total of **45** original research studies and **14** review articles were identified that examined psychosocial and QOL outcomes of different diabetes treatment approaches. One of the most active areas of research suggests mostly, but not entirely,³ positive effects of continuous subcutaneous insulin injection (CSII; i.e., insulin pump therapy) relative to multiple daily injections (MDI) on treatment satisfaction, emotional health, and QOL in youth with T1DM diabetes,⁴⁻⁹ their parents,^{5, 10-12} and adults with T1DM.^{13, 14} Although only the Opipari-Arrigan study involving preschoolers with T1DM and their parents¹¹ used a randomized controlled design, the remaining observational studies have the advantage of increased generalizability to real-world shared decision-making about treatments (i.e., for

patients who elect to use the pump, coping and QOL tends to improve). Insulin pump use in T2DM has been studied much less frequently. One study¹⁵ showed improved QOL and treatment satisfaction in patients switching from injections to CSII, but no effect in patients previously taking oral hypoglycemic agents (OHAs) only; another study¹⁶ reported no overall QOL differences for CSII versus MDI. Other treatment advances such as inhaled insulin,^{17, 18} continuous glucose monitoring,¹⁹⁻²¹ continuous intraperitoneal insulin infusion,²² pancreatic-kidney²³ and islet cell²⁴ transplantation, and supplemental metformin therapy²⁵ in T1DM, have demonstrated positive QOL impacts, but small numbers of studies and observational designs prohibit any firm conclusions.

Another active area has been how to intensify treatment in T2DM in a way that maximizes QOL when initial lifestyle changes and OHAs fail to adequately control blood glucose. As evidenced by studies listed in Table 1²⁶⁻³³ – all of which consisted of randomized controlled trials – treatment intensification in patients with poor glycemic control (e.g., >9.0%) typically improves both QOL and treatment satisfaction. In addition, there appears to be evidence of greater benefits when insulin or newer injectable agents (glucagon-like peptide (GLP) agonists and analogues, amylin analogues) are added to the patient's medication regimen, versus adding another OHA (e.g., adding sitagliptin or pioglitazone to metformin only). This research, along with studies documenting high prevalence of side effects associated with OHAs,^{34, 35} suggest that insulin, and particularly insulin analogues,³⁶⁻³⁸ or other injectable agents, may be preferred over complex OHA regimens in T2DM patients.

Part 2: Interventions to Promote Healthy Coping

Table 2 summarizes key original research studies published in the past five years that evaluate interventions in terms of their effects on QOL and/or other psychosocial outcomes.

Several studies were identified that found diabetes self-management education to improve QOL³⁹⁻⁴² and other psychosocial and emotional outcomes, such as depressive symptoms⁴³ and treatment satisfaction,⁴² although in some cases, beneficial healthy coping effects were short-lived⁴⁴ or not observed.^{45, 46} It is notable that of the five interventions in this category demonstrating positive effects, four focused on self-managing insulin in conjunction with diet for insulin-dependent and primarily T1DM patients.³⁹⁻⁴² The only intervention targeted at patients with T2DM showing positive effects focused on self-monitoring of blood glucose and patient motivation, but did not employ a randomized, controlled design.⁴³ This pattern of results suggests that QOL and other psychosocial outcomes in T2DM may require more intensive or coping-focused efforts beyond DSME.

Several studies suggested promising effects of **adult patients'** participation in diabetes support groups in diverse settings, including **two well-designed, randomized, controlled trials**.^{47, 48} **In the first trial**, improved QOL in four domains (physical health, psychological health, social participation, and environment) was observed among Thai patients participating in a 16-week self-help group.⁴⁷ **In the second trial**, improved perceptions of social support and willingness to initiate insulin were observed among male veterans participating in a reciprocal peer support program with supplemental group sessions, although diabetes-related distress was not significantly different across groups.⁴⁸ **Finally, a small pilot study** demonstrated improved activity and vigor levels in urban, minority adults participating in peer-led community discussion circles, although did not elicit significant changes in other aspects of well-being.⁴⁹ The diversity of the patient populations across these three studies suggest that the use of peer support may be a strategy that is potentially robust across patient subgroups, at least among adults. However, the few peer support studies identified overall, the lack of studies in youth with diabetes, and heterogeneity in the specific psychosocial outcomes assessed highlight the need for more research to understand the full potential of peer support in facilitating healthy coping.

Recent studies also provide evidence for the efficacy of problem-solving and coping skills interventions when delivered to adults with T2DM. A four-week problem-solving and cognitive reframing telephone-based intervention for older African American women was found to improve psychosocial adjustment and problem-solving, reduce uncertainty, and increase participation in physical activity in one randomized controlled trial.^{50, 51} Another intervention found that increasing one's use of acceptance and mindfulness coping strategies improved diabetes self-care.⁵² These studies suggest that an emphasis on problem-solving may benefit psychosocial outcomes in addition to self-care behavior and glycemic control, although more studies evaluating a common set of healthy coping outcomes are again needed in this area as well.

There has been substantial interest in cognitive behavioral therapy (CBT), including several studies suggesting effectiveness of CBT-based interventions on depressive symptoms and diabetes-related stress, when delivered via novel formats, such as the internet and/or telephone.⁵³⁻⁵⁵ However, evidence from recent trials is mixed, with some suggestion of less favorable results when delivered to youth and/or youth-parent dyads^{54, 56} compared to parents alone⁵⁵ or adult patients.^{53, 57-59} In addition, one recent randomized trial of group CBT suggests that CBT may be most helpful for patients who are experiencing higher versus lower levels of depressive symptoms.⁵⁷ A recent review of interventions for individuals with diabetes and depression also noted the greatest improvements in depression for CBT compared to other psychotherapeutic or pharmacological approaches.⁶⁰

Several studies of family therapy approaches applied to youth with T1DM and their families have produced good evidence of positive initial impacts on family conflict^{61, 62} and interaction,⁶³ adherence,⁶² and problem-solving⁶³. The methodological quality of these studies was high, with three of these four studies utilizing randomized, controlled designs comparing family therapy to usual care and/or education support. No family therapy interventions were identified for adults with either T1DM or T2DM, a major oversight in the literature.

Additional evidence for the efficacy of sertraline in reducing depressive symptoms among adult patients, as well as improving QOL and pain, was found in one randomized, double-blind, controlled trial with low-income minority patients with diabetes and co-morbid depression.⁶⁴ However, another trial⁶⁵ of the ability of sertraline to prevent recurrence of major depressive disorder in diabetes patients achieving initial depression recovery found evidence of efficacy only in younger patients, suggesting that non-medication approaches with older adults may be more appropriate. A notable gap in the literature is the absence of studies examining the use of antidepressant medication in conjunction with or in comparison to other non-pharmaceutical, guideline-recommended⁶⁶ depression therapies (e.g., CBT, problem-solving therapy).

Other promising intervention approaches identified in the past five years **via relatively small pilot studies** include supportive psychotherapy for adults with co-morbid depression;⁶⁷ intensive multi-therapy for improving QOL and self-care behavior;⁶⁸ telemedicine support using short-messaging service (i.e., texting) for improving QOL;⁶⁹ and far-infrared sauna treatments for improving physical health, general health, social functioning, stress, and fatigue.⁷⁰ Larger, randomized trials of these approaches are warranted. There has also been interest in the utility of yoga classes for improving QOL, but one randomized trial found difficulties in implementing such classes and no impact on QOL.⁷¹

There has been considerable interest in developing and evaluating approaches to support healthy coping in the delivery of primary care; for example, collaborative care interventions

for co-morbid depression in diabetes patients. Recent findings support the long-term maintenance of effects of collaborative care on depression,^{72, 73} and its effectiveness when applied to both younger and older patients,⁷⁴ as well as in public safety-net clinics serving primarily low-income, Hispanic adults with diabetes.⁷⁵ Other research supports the utility of the RADICAL model for eliminating rural-urban disparities in QOL among pediatric diabetes patients, which implements a co-located team consisting of a pediatrician, diabetes educator, and mental health nurse who meets regularly to discuss each patients' care and provide preference-matched therapy and emotional support to children and their families.⁷⁶ Additional research has demonstrated the feasibility of employing pharmacy students in a pharmacist-managed diabetes clinic to improve the identification of co-morbid depression in diabetes patients.⁷⁷ Thus, innovative care models which integrate mental health care into traditional diabetes care settings appear to be a feasible and effective way of supporting healthy coping across different patient populations.

Discussion, Conclusions, and Implications

Findings from studies published in the past five years, and particularly the recent proliferation of articles examining psychosocial impacts of different diabetes treatments, suggest growing appreciation within the medical and research communities of the complex relationships between diabetes treatment, psychosocial factors, and metabolic control, and the importance of explicitly considering quality of life impacts when treating diabetes patients. The findings are also encouraging in that they suggest that there is much that diabetes educators and other health care providers can do to improve coping, emotional health, and QOL in their patients:

- Treatment intensification in response to poor metabolic control often improves both clinical and quality-of-life outcomes.
- Type of diabetes treatment may have a large impact on QOL and other psychosocial outcomes, suggesting that regimen changes in light of high levels of distress and/or low health-related QOL should be considered and discussed with patients. A wide range of instruments are available for assessing psychosocial and QOL impacts of diabetes and its treatment, as described previously.¹
- Use of CSII in T1DM and other intensive therapies in diabetes generally, as well as earlier initiation of insulin and/or minimizing complexity of OHA regimens in T2DM diabetes specifically, can elicit improved emotional health and QOL.
- A variety of intervention approaches for enhancing healthy coping continue to show positive results, providing educators and program planners an opportunity to choose and implement options based on the needs and preferences of their patients and available resources.
- With regard to the treatment of co-morbid depression, CBT and collaborative care interventions have elicited some of the strongest supportive evidence for effectiveness in real-world settings.

From these conclusions, a broad pattern emerges of considerable importance. It seems now well established that, for a range of tactics and approaches to enhancing quality of diabetes care, better control of diabetes leads to better quality of life. Given the normality of multiple comorbidities in diabetes, clinicians may be hesitant to complicate regimens in a manner that adds too great a burden on patients. Also, it has long been recognized that adherence is compromised by complexity of treatment regimens.⁷⁸ Nevertheless, it appears that enhancing the intensity of treatment when glycemic control is poor is typically associated not so much with greater experienced burden and distress but with feeling better.

Research Gaps

As the number and heterogeneity of medical treatments for controlling blood glucose in diabetes continues to expand, there remains an ongoing need for research comparing the effect of these different options on healthy coping outcomes. This research should examine the possibility that psychosocial and quality of life impacts of different treatments may vary across sub-populations, reflecting the different needs and unique circumstance of these groups. For example, the impacts of treatment intensification on quality of life among older, frail adults with multiple comorbidities may be very different than among those in their 40s or 50s whose principal medical problem is diabetes. Thus, there is a need for additional research comparing the effect of different diabetes treatment regimens on healthy coping outcomes in the growing population of older, frail diabetes patients with multiple comorbidities. This is of critical importance given that in older, frail patients, given that medication-related problems, adverse events, and risk of hypoglycemia are much more common and minimizing treatment burden for patients and caregivers is of greater concern compared to intense glycemic control.⁷⁹⁻⁸¹

As noted above, a number of diverse intervention approaches to directly targeting coping outcomes in diabetes patients have at least preliminary evidence supporting their efficacy and/or effectiveness. The downside of these multiple options is that diabetes educators may be uncertain as to which options may produce the best outcomes in their patient populations. There is a need to conduct head-to-head comparisons of different approaches identified in this review for directly targeting coping outcomes in diabetes with varying amounts of evidence for efficacy and effectiveness. In addition, some approaches have very good evidence in specific sub-populations (e.g., family therapy for youth with T1DM) but have been virtually untested in other populations where they may be similar useful (e.g., older patients with reduced functional independence). Future research should examine the feasibility and effectiveness of adapting such approaches for use with a broader range of patient populations.

Finally, there is a continued need¹ for greater dissemination of approaches identified as efficacious or effective in a particular setting. The greatest challenge remains how to practically translate interventions into routine care so that more patients can benefit. More research into large-scale dissemination methods as well as intervention toolkits and guides is sorely needed. Among existing resources is “Healthy Coping in Diabetes: A Guide for Program Development and Implementation”⁸². It and other materials developed by the Robert Wood Johnson Foundation’s Diabetes Initiative (<http://diabetesnpo.im.wustl.edu/>), as well as professional and patient-education materials of the American Association of Diabetes Educators and American Diabetes Association, may be especially helpful for those in the field.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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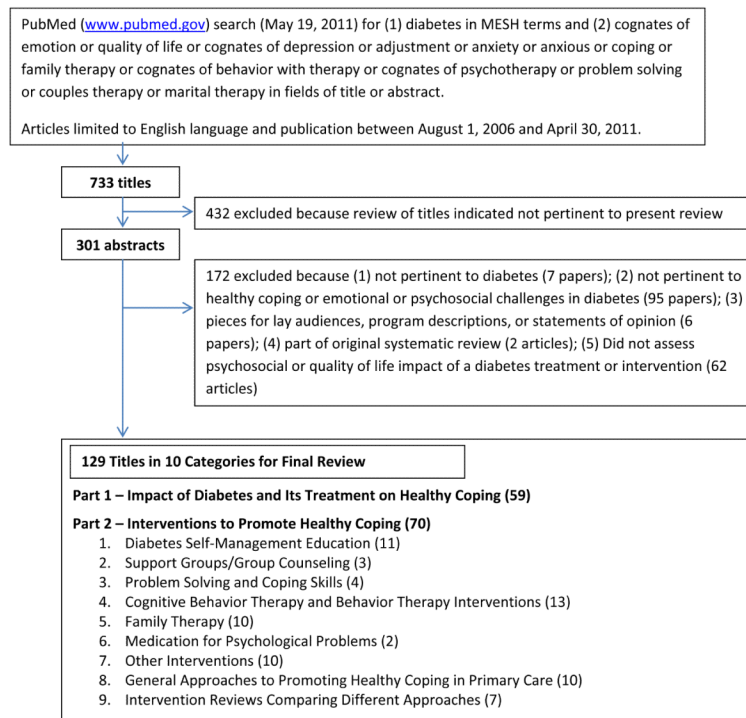


Figure 1. Outline of Search of Healthy Coping in Diabetes Management, 2006 to 2011

Table 1
Domains of healthy coping

Domain	Description
Depression	Disorder of mood characterized by feelings of sadness or emptiness, reduced interest in activities, sleep disturbances, loss of energy, difficulty concentrating or making decisions ⁸³
Anxiety disorder	Disorders characterized by abnormal or inappropriate symptoms of anxiety (e.g., increased heart rate, tensed muscles, intense worry), such as generalized anxiety disorder or panic disorder ⁸³
Perceived stress	Degree to which individuals perceived different aspects of their lives as unpredictable, uncontrollable, and overwhelming ⁸⁴
Diabetes-specific distress	Negative emotional responses and perceived burden related to diabetes ^{85, 86}
Positive attitudes and beliefs about the illness and treatment	Psychological adjustment to diabetes; ⁸⁷ treatment satisfaction; ⁸⁸
Positive relationships with others	High perceptions of general and diabetes-specific social support; family functioning
Health-related quality of life	Subjective evaluation of overall physical, mental, and social health and functioning

Table 2
Key studies on the effects of treatment intensification with different types of therapies and regimens in adults with type 2 diabetes

Reference	Study Objectives and Methods	Study Design	Sample Size	Findings
Best et al 2011(Best et al., 2011)	Compare once-weekly injections with exenatide to two different classes of OHAs (sitagliptin or pioglitazone) with regard to effects on QOL and psychological and clinical outcomes	Randomized, double-blind, double-dummy, multicenter clinical trial; poorly controlled adults with type 2 diabetes on metformin randomized to exenatide GLP-4 injectible) once weekly plus placebo oral capsule each morning, sitagliptin plus placebo once weekly injection, or pioglitazone plus placebo once weekly injection	N = 491	Addition of any of the three medications improved QOL and psychological outcomes. Greater improvements in weight-related QOL, general health utility, and treatment satisfaction were observed for exenatide once-weekly compared to one or both of the other treatments.
Peyrot et al 2008(Peyrot et al., 2008)	Compare diabetes-related distress and clinical outcomes in type 2 diabetes patients using insulin with or without meal-time pramlintide (an amylin analog)	Randomized, double-blind, placebo-controlled study; type 2 patients using insulin glargine with or without OHAs were randomized to pramlintide or placebo	N = 211	Pramlintide use resulted in decreases in total diabetes-related distress and regimen-related distress in those who were highly distressed at baseline.
Peyrot et al 2010(Peyrot et al., 2010)	Assess effect of adding mealtime pramlintide or rapid-acting insulin analog RAIAs to basal insulin therapy in patients with uncontrolled type 2 diabetes	Open-label, randomized, parallel group trial, stratified with regard to use of basal insulin prior to study enrollment	N = 112	Adding either pramlintide or RAIAs at mealtime to basal insulin improved treatment satisfaction. Pramlintide also reduced diabetes distress and improved sleep quality, weight control, and appetite control; RAIAs improved eating flexibility and perceived weight control.
Bode et al 2010(Bode et al., 2010)	Compare effect of adding a GLP-1 once daily medication (liraglutide) versus an OHA (glimepiride) to treatment regimen	Randomized, double-blind, double-dummy, parallel group, multi-center clinical trial; patients stratified by initial treatment with a single OHA vs. diet and exercise only and randomized to once-daily treatment with once-daily liraglutide (GLP-1) 1.2 mg or 1.8 mg or glimepiride (sulfonylurea)	N = 732	Liraglutide produced more favorable improvements in health-related QOL and weight concerns compared to glimepiride, with much stronger effects at the higher dosage of 1.8 mg
Ushakova et al 2007(Ushakova et al., 2007)	Compare glycemic control, weight gain, tolerability, and treatment satisfaction and QOL for 3 different regimens in insulin-naïve uncontrolled type 2 diabetes patients: 1) biphasic insulin aspart 30 alone, 2) biphasic insulin aspart 30 + metformin, and 3) OHA therapy alone	Randomized, open-label, parallel-group, multicenter trial	N = 308	The insulin regimens improved QOL and treatment satisfaction similarly to a multiple drug oral regimen.
Lingvay et al 2009(Lingvay et al., 2009)	Compare triple therapy with OHA (metformin, pioglitazone, and glyburide) to twice-daily insulin plus metformin in newly diagnosed, adult type 2 diabetes patients.	Open-label, randomized controlled trial	N = 29	There were no group differences in hypoglycemic events, weight gain, adherence, or changes in QOL, and social worries improved over time in both groups. All patients assigned to insulin reported satisfaction with insulin treatment and willingness to

Reference	Study Objectives and Methods	Study Design	Sample Size	Findings
				continue at 18 months follow-up.
Houlden et al 2007(Houlden et al., 2007)	Assess effect of insulin glargine (basal insulin) initiation with no change in OHA therapy versus optimization of OHA therapy on QOL	Randomized, controlled trial of adults aged 18-80 with type 2 diabetes and inadequate glucose control taking 0, 1, or two OHAs	N = 366	Addition of insulin glargine versus more OHAs had greater positive impact on treatment satisfaction and QOL.
Vinik et al 2007(Vinik & Zhang, 2007)	Compare effect of add-on insulin glargine versus rosiglitazone on healthrelated QOL in patients with type 2 diabetes already taking a sulfonylurea plus metformin	24-week, multicenter, randomized, open-label, parallel-group trial	N = 217	Symptom distress, mood symptoms, ophthalmologic distress, fatigue distress, and general self-rated health improved more for the insulin glargine group. Adverse events were also less frequent in the insulin glargine group.

Table 3
Summaries of Key Intervention Articles

Reference	Study Objectives and Methods	Study Design	Sample Size	Findings
Diabetes Self-Management Education				
Speight et al 2010(Speight et al., 2010)	Evaluate long-term (44-month follow-up) outcomes of Dose Adjustment for Normal Eating (DAFNE), a structured education program in intensive insulin therapy for adults with poorly controlled type 1 diabetes	Observational cohort study of all participants who were originally randomized to receive DAFNE immediately versus after a 6-month waitlist	N = 104	Improvements in QOL seen at 12 months follow-up were sustained at 44-months follow-up. Improvements in treatment satisfaction at 12-months followup decreased significantly at 44 months, but remained meaningfully higher than baseline levels.
Kempf et al 2010(Kempf et al., 2010)	Evaluate ROSSO-in-praxi, a structured 12-week motivation and education program focused on self-monitoring of blood glucose in 405 adults with type 2 diabetes	Pre-post within-group comparison	N = 405	Mental health and depressive symptoms improved from preintervention to post-intervention.
Rossi et al 2010(Rossi et al., 2010)	Compare use of a Diabetes Interactive Diary (DID) to a structured carbohydrate counting education program	Open-label, international, multicenter, randomized parallel-group trial; adults with type 1 diabetes were randomly assigned to DID versus carbohydrate counting education	N = 130	The DID group experienced greater improvements in treatment satisfaction and QOL, including greater dietary freedom, and duration of education required was also lower.
Bendik et al 2009(Bendik et al., 2009)	Evaluate training in flexible insulin therapy on psychological and metabolic outcomes in type 1 diabetes patients; intervention consisted of 7 weekly group sessions	Pre-post within-group comparison of type 1 diabetes patients	N = 45	QOL, self-control, and diabetes knowledge all improved significantly.
Utz et al 2008(Utz et al., 2008)	Compare group versus individual culturally-tailored diabetes selfmanagement education in rural African Americans with type 2 diabetes	Randomized trial; patients assigned to group or individual DSME/T	N = 22	There was a non-significant trend for greater improvements in empowerment, goal attainment, diet, and foot care for Group DSME/T. Both group and individual DSME/T improved goal attainment and self-care.
Lowe et al 2008(Lowe et al., 2008)	Evaluate intensive insulin management to help type 1 and type 2 diabetes patients match insulin dose to carbohydrate intake	Pre-post within-group comparison; patients with type 1 diabetes and type 2 diabetes assessed at 4-months and 12-months	N = 137	The program improved diabetesrelated QOL and problem-solving skills.
Nansel et al 2007(Nansel et al., 2007)	Assess outcomes of a diabetes self-management education utilizing a "diabetes personal trainer" (i.e., trained nonprofessionals) in youth with type 1 diabetes	Randomized, controlled trial; adolescents with type 1 diabetes assigned to personal trainer intervention or usual care	N = 81	There was no significant effect of the personal trainer intervention on QOL or adherence.

Reference	Study Objectives and Methods	Study Design	Sample Size	Findings
Tang et al 2010(Tang et al., 2010)	Evaluate a empowerment-based diabetes self-management support intervention delivered in a weekly group format	Control-intervention time series design; African Americans with type 2 diabetes first participated in a 6-month control period with weekly educational newsletters and then 6-month intervention	N = 77	No effect of the intervention was observed for diabetes-specific QOL, empowerment, or adherence.
Bastiaens et al 2009(Bastiaens et al., 2009)	Implement and evaluate a group self-management education program in primary care for adults with type 2 diabetes	Pilot study; pre-post within-group comparison	N = 44	Diabetes-related emotional distress was reduced at 12-months post-intervention, but this improvement was not sustained at 18-month follow-up.
Support Groups and Group Counseling				
Chaveepojnkamjorn et al 2009(Chaveepojnkamjorn et al., 2009)	Evaluate a 16-week self-help group program for adults with type 2 diabetes; intervention focused on building good relationships, diabetes self-management knowledge and skill, selfmonitoring, motivation in self-care, sharing experiences among group members, and improvement of training skills for group leaders as well as group structure.	Multicenter randomized, controlled trial; adult patients at 7 health care centers in Thailand assigned to self-help group program or control group receiving diabetes services	N = 146	All four domains of QOL that were assessed (physical health, psychological, social relationships, and environment) improved in the self-help group compared to the control group at 12-week and 24-week follow-up.
Heisler et al 2010(Heisler et al., 2010)	Compare a reciprocal peersupport RPS) program with supplemental group sessions to nurse case management (NCM) plus 1.5 hour-education session in older male veterans with poorly controlled diabetes	Randomized controlled trial; patients assigned to RPS or NCM	N = 244	Perceived diabetes social support improved significantly more in the RPS group compared to NCM, and more RPS patients initiated insulin therapy. No significant differences in diabetes-specific distress.
Comellas et al 2010(Comellas et al., 2010)	Evaluate peer-led community discussion circles integrating selfmanagement support with discussion of information and skills through storytelling and exercises	Pre-post within-group comparison of urban, minority adults with diabetes	N = 17	Improved some aspects of wellbeing, including feeling more active and vigorous at program completion.
Problem-Solving and Coping Skills				
Amoako et al 2008(Amoako & Skelly, 2007; Amoako et al., 2008)	Evaluate a 4-week problemsolving and cognitive reframing telephone intervention in older African American women with diabetes	Randomized, controlled trial; older African American assigned to the intervention or usual care	N = 68	The intervention increased participation in exercise, psychosocial adjustment, problem-solving, and uncertainty compared to usual care.
Gregg et al 2007(Gregg et al., 2007)	Compare acceptance and commitment therapy (ACT), a coping skills intervention plus diabetes education to diabetes	Randomized, controlled trial; adults with type 2 diabetes assigned to ACT plus education or	N = 81	After 3 months, the ACT group showed increased use of acceptance and mindfulness

Reference	Study Objectives and Methods	Study Design	Sample Size	Findings
	education alone	education alone		coping strategies and improved diabetes self-care. Changes in acceptance coping and self-care mediated the effect of ACT on glycemic control.
Cognitive-Behavior Therapy (CBT) and Behavior Therapy				
Van Bastelaar et al 2011 (van Bastelaar et al., 2011)	Evaluate a web-based CBT intervention for adults with type 1 or type 2 diabetes	Randomized controlled trial; adult patients with elevated depressive symptoms assigned to web-based intervention or wait-list control	N = 255	The web-based CBT intervention group experienced greater reductions in depressive symptoms and diabetes-specific emotional distress.
Ismail et al 2010(Ismail et al., 2010)	Compare effects of motivational enhancement therapy (MET) plus CBT to MET alone and usual care	Three-arm parallel randomized controlled trial of adults with inadequately controlled diabetes	N = 344	There was no significant effect of either MET plus CBT or MET alone compared to usual care on depression or QOL.
Lehmkuhl et al 2010(Lehmkuhl et al., 2010)	Evaluate a Telehealth Behavioral Therapy (TBT) for youths with type 1 diabetes and a parent/caregiver	Randomized controlled trial; child-parent dyads randomized to 12-week TBT or waitlist control	N = 32	Youth perception of unsupportive behaviors increased and perception of caring parental behaviors decreased in the TBT vs. control group.
Amsberg et al 2009(Amsberg et al., 2009)	Evaluate CBT intervention delivered in a combined group/individual format	Randomized controlled trial; adults with poorly controlled type 1 diabetes assigned to intervention or control group	N = 94	The CBT group experienced greater improvements in wellbeing, diabetes-related distress, perceived stress, anxiety, and depression.
Snoek et al 2008(Snoek et al., 2008)	Compare CBT delivered in a group format to blood-glucose awareness training (BGAT) in adults with poorly controlled type 1 diabetes, and examine whether effects varied by baseline depression	Randomized trial; adults assigned to CBT or BGAT	N = 86	Both CBT and BGAT improved depressive symptoms at 12-month follow-up.
Salamon et al 2010(Salamon et al., 2010)	Evaluate a 1-hour CBT-based intervention with 3 weekly followup phone calls in adolescents with type 1 diabetes; intervention focused on cognitive restructuring and problem-solving training	Pre-post within-group evaluation; adolescents with poorly controlled diabetes	N = 10	Pre-post differences in diabetes-related stress and concerns about self-care in social situations were not significant, but there was a trend toward improvement in concerns about self-care in social situations.
Monaghan et al 2011(Monaghan et al., 2011)	Evaluate feasibility and initial efficacy of a telephone intervention based on social cognitive theory and incorporating	Randomized trial treatment vs. waitlist control group); Initial analyses were for prepost changes in the 14	N = 14	Parenting stress and perceived social support improved for parents after participating in the

Reference	Study Objectives and Methods	Study Design	Sample Size	Findings
	cognitive-behavioral techniques for parents of young children with type 1 diabetes	parents assigned to the initial treatment group		intervention.
Family Therapy				
Harris et al 2009(Harris et al., 2009)	Evaluate a 10-session, homebased Behavioral Family Systems Therapy (BFST) for adolescents with poorly controlled type 1 diabetes	Pre-post evaluation with normative outcome comparison using data from adolescents with poor diabetes control included in a previous study	N = 58	The BFST intervention decreased diabetes-related family conflict by 1/3 to 1/2 of a standard deviation, and general family conflict decreased from 1/3 to 3/4 of a standard deviation.
Nansel et al 2009(Nansel et al., 2009)	Evaluate the feasibility of a family problem-solving behavioral intervention (WE*CAN) delivered by non-medical "Health Advisors"	Randomized, controlled trial; families of children with type 1 diabetes were randomized to the family problem-solving intervention or usual care	N = 122	The intervention demonstrated good feasibility. No significant changes were observed in QOL, parent-child conflict, or family responsibility sharing, but study was not powered for outcome analysis.
Ellis et al(D. Ellis et al., 2008; D. A. Ellis, Naar-King, Templin, Frey, & Cunningham, 2007; D. A. Ellis, Templin, et al., 2007; D. A. Ellis, Yopp, et al., 2007)	Evaluate Multisystemic Therapy (MST) for adolescents with poorly controlled type 1 diabetes, and examine family composition (two versus one-parent families) as a moderator of treatment effects	Randomized, controlled trial; adolescents assigned to MST or control	N = 127	There was evidence for improved family relationships in two-parent families but not single-parent families.
Wysocki et al(Wysocki et al., 2007; Wysocki et al., 2006; Wysocki et al., 2008)	Compare Behavioral Family Systems Therapy (BFST) intervention to an Educational Support (ES) group in families of adolescents with diabetes	Randomized, controlled trial; families assigned to BFST, ES, or usual care	N = 104	At treatment end, those receiving BFST had improved family conflict and adherence compared to those receiving ES or usual care, with greater effects in adolescents with very poor initial metabolic control. BFST also resulted in greater improvements in family interaction and problem-solving relative to both ES and usual care.
Medications				
Echeverry et al 2009(Echeverry et al., 2009)	Compare sertraline versus placebo for treatment of depression in low-income Hispanic and African American patients with diabetes	6-month randomized, double-blind, placebocontrolled trial	N = 87	Depressive symptoms, QOL, and pain all improved in both the sertraline and placebo groups, with no significant differences

Reference	Study Objectives and Methods	Study Design	Sample Size	Findings
				between groups.
Williams et al 2007(Williams et al., 2007)	Examine effect of sertraline maintenance therapy on time-to-recurrence of major depressive disorder in younger versus older adults with diabetes	52-week follow-up of patients achieving depression recovery after participating in a randomized, double-blind, placebo-controlled trial	N = 152	In younger patients, sertraline yielded significantly greater protection against depression recurrence than placebo, but there was no difference in recurrence for older patients treated with sertraline versus placebo.
Other Interventions				
Beever et al 2010(Beever, 2010)	Evaluate effect of 3-times weekly, 20-minute far-infrared sauna treatments on QOL in adults with type 2 diabetes	Pre-post within-group comparison		Physical health, general health, social functioning, stress, and fatigue improved from preintervention to post-intervention.
Skoro-Kondza et al 2009(Skoro-Kondza et al., 2009)	Evaluate community-based yoga classes for adults with type 2 diabetes	Randomized trial; adults with type 2 diabetes (not on insulin) were randomized to participate in twice-weekly, 90-minute yoga classes for 12 weeks or waitlist control group	N = 59	The rate of ineligible patients was high, largely due to insulin treatment or contraindications to yoga (e.g., ischemic heart disease, cerebrovascular disease), as was the rate of refusal due to lack of interest. The attendance rate at class was 50%. Intent-to-treat analyses showed no significant effects on QOL or self-efficacy.
Simson et al 2008(Simson et al., 2008)	Evaluate a supportive psychotherapy intervention with adult diabetes patients with lower extremity ulcers and co-morbid depression	Randomized, controlled trial; adult inpatients with diabetes, lower extremity ulcers, and co-morbid depression were assigned to supportive psychotherapy or standard medical care	N = 30	Symptoms of anxiety and depression and diabetes-related distress decreased in the intervention group, but not the control group.
Menard et al 2007(Menard et al., 2007)	Evaluate effect of intensive multitherapy, consisting of monthly visits including individual and group DSME/T, intensive selfcare regimens for SMBG, diet, and exercise, 2 inter-visit phone calls for therapy adjustments, motivational support, and feedback, initiation/intensification of medication/insulin therapy if needed	Randomized, controlled trial; French adult patients with poorly controlled type 2 diabetes and co-morbid hypertension and dyslipidemia assigned to intervention or standard medical care	N = 72	QOL was improved in the intervention group relative to control, along with knowledge and self-management behavior. No significant changes in attitudes about diabetes.
Benhamou et al 2007(Benhamou et al., 2007)	Evaluate a Web-based telemedicine intervention using cellular phones and short message service (SMS; i.e.	Bicenter, open-label, randomized, two-period, crossover 12-month study; adults with type 1 diabetes on pump therapy assigned to intervention	N = 30	QOL improved significantly more in the intervention group, and 76% of patients felt that the

Reference	Study Objectives and Methods	Study Design	Sample Size	Findings
	texting) compared to usual care in adults with type 1 diabetes	or waitlist control		quality of their medical care was higher during the intervention period.
Approaches in Primary Care				
Ell et al 2010(Ell, Aranda, et al., 2010)	Compare effectiveness of collaborative depression care versus usual primary care in older versus younger adults with chronic physical illnesses, including diabetes, cancer, and others	Pooled, intent-to-treat analyses of three randomized controlled trials of collaborative depression care consisting of choice of first-line depression therapy (psychotherapy, medication or both) and a structured algorithm for stepped care	N = 1,081	Both younger and older patients experienced a significant improvement in depressive symptoms and major depression rates at 6-month follow-up, with no difference in effectiveness by age group.
Katon et al 2008(Katon et al., 2008)	Evaluate the 5-year effects of the Pathways depression collaborative care intervention versus usual primary care on total health care costs	Randomized controlled trial at 9 HMO primary care practices; adults with diabetes and depression assigned to nurse depression intervention consisting of education about depression, behavioral activation, and choice of starting with antidepressant medication or problemsolving therapy in primary care + stepped care as needed	N = 329	There was a trend for reduced 5-year mean total medical costs in intervention patients (along with improved depression outcomes). The greatest cost reductions were seen in patients with most severe physical co-morbidity.
Simon et al 2007(Simon et al., 2007)	Evaluate cost and costeffectiveness of the Pathways depression collaborative care intervention versus usual primary care	Randomized controlled trial at 9 HMO primary care practices; adults with diabetes and depression assigned to nurse depression intervention consisting of education about depression, behavioral activation, and choice of starting with antidepressant medication or problemsolving therapy in primary care + stepped care as needed	N = 329	The Pathways intervention increased days free from depression and led to savings in outpatient health services costs. Both contribute to an estimated 952 saved per patient treated with the Pathways intervention.
Ell et al 2010(Ell, Katon, et al., 2010)	Evaluate effectiveness of a socioculturally adapted collaborative care intervention in 387 low-income, predominantly Hispanic adults with diabetes and depression at two public safety-net clinics	Randomized, controlled trial; low-income, primary Hispanic adults with diabetes and depression assigned to collaborative care (initial choice of problem-solving therapy or medication or both, plus stepped care as needed) or enhanced usual care (primary care plus educational pamphlets and community resource list)	N = 387	Participants receiving collaborative care experienced greater improvements in depressive symptoms, diabetes symptoms, anxiety, emotional, physical, and pain-related functioning, disability, and social stressors.
Knight et al 2008(D. E. Knight et al., 2008)	Evaluate feasibility of screening for depression and usefulness of this screening for identifying undiagnosed and undertreated depression using a student	Cross-sectional study; patients attending a diabetes care clinic were screened for depression by a student pharmacist who then abstracted additional information	N = 45	The student pharmacist's screening suggested that 75% of patients with previously diagnosed depression were being

Reference	Study Objectives and Methods	Study Design	Sample Size	Findings
	pharmacist at a pharmacist-managed diabetes care clinic for underserved, low-income, inner city adult diabetes patients	from their chart		inadequately treated, and 48% of patients with no prior depression diagnosis had significant depressive symptoms.
Goss et al 2010 (Goss et al., 2010)	Evaluate a new, interdisciplinary model of rural pediatric diabetes care called RADICAL, which involved a co-located team of pediatrician, diabetes educator, and mental health nurse who regularly meets to discuss each patient's care, provided proactive child and family emotional support, and actively attempts to match insulin regimens with the patient's lifestyle	Pre-post evaluation of children under 21 years old with type 1 diabetes	N = 61	The RADICAL model resulted in increased patient satisfaction and elimination of a previously documented rural-urban disparity in patient QOL.
Jones et al 2006 (Jones, Turvey, Torner, & Doebbeling, 2006)	Compare receipt of adequate antidepressant dosing and duration of therapy in veterans with versus without diabetes	Retrospective cohort study of patients of a Midwestern Veterans Affairs facility, including those with co-morbid diabetes	N = 2,332	In depressed veterans, dosing of antidepressants was adequate but treatment duration often fell short. A diabetes diagnosis did not adversely affect antidepressant treatment quality.