

# National Standards for Diabetes Self-Management Education Programs

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Beginning in the 1930s with the first formal Joslin Clinic diabetes teaching programs, diabetes education in the U.S. has experienced many significant developments and has served as a model for other areas of patient education (1). One significant event was the development of the National Standards for Diabetes Patient Education Programs in 1983 (2). The National Diabetes Advisory Board (NDAB), in collaboration with other diabetes-related groups (2), developed these standards in response to concerns that the quantity and quality of diabetes education varied considerably throughout the U.S. It was hoped that the application of uniform standards would increase the quality, availability, and effectiveness of diabetes education, as well as accessibility, through third party reimbursement (3). The standards were deliberately designed to be general enough to be implemented in a variety of settings and to deal largely with the processes of development and maintenance of quality diabetes education programs. The original standards consisted of 10 components, with each component divided into

elements applicable to the sponsoring institution or the educational program. Review criteria were developed as a method to measure programs' achievement of the standards (4). The review criteria were extensively pilot tested and found to be feasible, practical, and appropriately stringent (5).

Using these criteria, the American Diabetes Association (ADA) implemented a process in 1986 to officially recognize programs that meet the National Standards for Diabetes Patient Education Programs. To achieve recognition, a program must undertake an extensive self-evaluation and documentation process for each element of the standards. Based on the review criteria, applications are evaluated by two trained peer reviewers. Recognition is granted for 3 years and can be extended every 3rd year by an abbreviated application and review. The first programs were recognized in 1987, and over 375 programs have been recognized by the ADA since 1987. In addition, several states have developed mechanisms to approve programs that meet the National

Standards for Diabetes Patient Education Programs.

The National Standards for Diabetes Patient Education Programs were developed by experts in diabetes care and education more than a decade ago by an extensive consensus and expert review process (2). At that time, very little data was available related to the effectiveness or validity of the indicators selected to define a quality diabetes education program. Unfortunately, many of these issues are still unresolved. There are no reported studies that compare programs that meet the standards with those that do not. Thus, the impact of the standards on the quality of diabetes education remains undocumented.

In 1993, the NDAB charged a task force of representatives from ADA and other organizations (Table 1) to review the current standards and make recommendations for retention or revision. After careful analysis, the task force determined that although many elements of these standards are still applicable, several elements needed revision and updating. In addition, the task force decided to change the format to reflect current health care trends. One current trend is referring to diabetes education programs as self-management education or training programs to reflect the need for people with diabetes to manage their diabetes on a day-to-day basis. Thus, in this technical review, the terms *diabetes education* and *self-management education* will refer to the same process. The purposes of this technical review are to 1) provide rationale for revisions to these standards, 2) examine what has been learned about these standards since they were originally developed, 3) examine the impact of these components or elements on program and participant outcomes, 4) guide development of criteria to determine achievement of the revised standards, and 5) make recommendations and suggest areas for research.

The revised National Standards for Diabetes Self-Management Education

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NDAB, National Diabetes Advisory Board; ADA, American Diabetes Association; DCCT, Diabetes Control and Complications Trial; AADE, American Association of Diabetes Educators; CDE, Certified Diabetes Educator; CBGM, capillary blood glucose monitoring; DKA, diabetic ketoacidosis; HHNKC, hyperosmolar hypoglycemic nonketotic coma; IDDM, insulin-dependent diabetes mellitus; NIDDM, non-insulin-dependent diabetes mellitus; LEA, lower extremity amputation; GHb, glycosylated hemoglobin.

**Table 1—Organizations represented on the task force to review/revise the National Standards for Diabetes Patient Education Programs**

American Association of Diabetes Educators
American Diabetes Association
American Dietetic Association
Centers for Disease Control and Prevention
Department of Defense
Department of Veterans Affairs
Diabetes Research and Training Centers
Indian Health Service
Juvenile Diabetes Foundation

Programs define quality programs in terms of structure, process, and outcomes. Each of these three program components is subdivided into elements. There are standards for each of these elements. The broad outline of the revised National Standards for Diabetes Self-Management Education Programs is shown in Table 2.

**STRUCTURE**— The structure necessary to provide quality diabetes self-management education consists of the human and material resources and the management systems needed to achieve program and participant goals. Such structure includes the support and commitment of the organization sponsoring the program, the program administration and management systems, the qualifications and diversity of the personnel involved in the program, the curriculum and instructional methods and materials, and the accessibility of the program.

Structural components serve to enhance institutionalization of diabetes education programs and help ensure their long-term survival within organizations (6,7). Institutionalization implies longevity and occurs when programs are permanent and integrated into the institutions. Written policies provide concrete evidence of institutional commitment to the program (8). Strategies to increase institutionalization include planning for lead-

ership transfer and ensuring institutional financial support. In addition, determining program strengths and weaknesses and planning for the inevitable changes that occur help ensure program survival (7). Thus, these standards have a structural component that specifies the commitment of sponsoring organizations to the development and maintenance of diabetes self-management education programs.

### Organizational support

The sponsoring organization must provide the structure within which the program functions. Organizational commitment to self-management education including operational support, adequate space, personnel, budget, and materials must be clearly evident. Because multiple health care professionals from a variety of disciplines are involved in diabetes care, clear lines of authority and effective communication systems should be established.

**Standard 1.** The sponsoring organization will have a written policy that affirms education as an integral component of diabetes care.

**Standard 2.** The sponsoring organization will identify and provide the educational resources required to achieve its educational objectives in terms of its target population. These resources include adequate space, personnel, budget, and instructional materials.

**Standard 3.** The organizational relationships, lines of authority, staffing, job descriptions, and operational policies will be clearly defined and documented.

Organizational support can facilitate program development and maintenance. To identify strategies to promote program implementation, eight randomly selected, ADA-recognized programs were studied to determine how they had overcome organizational barriers (9). Data collection consisted of interviews with personnel involved in the initial implementation of the program and current personnel. Interviews with initial personnel focused on the history and current op-

**Table 2—Outline of revised national standards for diabetes self-management education programs**

I. Structure
A. Organization
B. Needs assessment
C. Program management
D. Program staff
E. Curriculum
F. Participant access
II. Process
A. Assessment
B. Plan and implementation
C. Follow up
III. Outcomes
A. Program
B. Participant

erations, while interviews with current personnel focused on current status. The most important variable identified in program initiation was dedicated individuals who spearheaded program development and implementation. Two additional critical factors, essential for program development and maintenance, were institutional commitment of resources and communication with key groups. Respondents also identified that the recognition process, in and of itself, may have helped to establish and sustain these successful programs. It appeared that completing the recognition requirements helped ensure the necessary structures, materials, and staff, enhanced local status and legitimacy of the programs, and assisted educators to collaborate with non-clinical departments such as marketing. Although not specifically studying ADA-recognized programs, the American Hospital Association's survey identified that the major barriers to effective patient education were lack of time for teaching and a lack of procedural and supervisory support (8). In addition, registered nurse and dietitian diabetes educators identified cost and lack of time as the major barriers to obtaining their own needed and desired continuing education (10,11). Thus, the standards specify that a quality diabetes self-management education pro-

gram have the educational resources necessary to function effectively.

### Community-needs assessment

A successful program is based on the needs of the population the program is intending to serve. Because diabetes populations can vary, each organization should assess its service area and match resources to the needs of the defined target population. Needs assessments should guide program planning and management. Periodic reassessment should be done to allow the program to adapt to changing needs.

**Standard 4.** The service area will be assessed to define the target population and determine appropriate allocation of personnel and resources to serve the educational needs of the target population.

Assessment of the communities' needs allows organizations to appropriately allocate resources and plan programs to match the needs of target audiences. Several methods have been used to determine the need for diabetes education programs. Institutional needs assessments ranged from formal marketing surveys, cost analyses, analyses of competitors' programs, and market share statistics, to needs identified by key health care personnel from their clinical interactions with clients (9). The use of focus groups, a method of qualitative marketing research, can be an effective approach to planning for health education programs (12–14).

### Program management

Effective management is essential to implement and maintain a successful program and to ensure that resources are adequate for the defined tasks. To ensure that management policies and program design reflect broad perspectives relevant to diabetes, the organization should designate a standing advisory committee that includes health care professionals and people with diabetes to assist staff with program planning and review. Involvement and support from the medical community are also necessary. At times,

resources outside the sponsoring institution may be required to enable individuals affected by diabetes to maximize their health outcomes.

**Standard 5.** A standing advisory committee, consisting of a physician, a nurse educator, a dietitian, an individual with behavioral science expertise, a consumer, and a community representative, at a minimum, will be established to oversee the program.

**Standard 6.** The advisory committee will participate in the annual planning process including determination of target audience, program objectives, participant access mechanisms, instructional methods, resource requirements (including space, personnel, budget, and material), participant follow-up mechanisms, and program evaluation.

**Standard 7.** Professional program staff will have sufficient time and resources for lesson planning, instruction, documentation, evaluation, and follow-up.

**Standard 8.** Community resources will be assessed periodically. Program management encompasses program planning, implementation, and evaluation. The planning process for diabetes self-management education programs should be based on the needs assessments and should include program goals and objectives, target audience, setting, referral methods, procedures, and evaluation methods (6,8,15). Selection of evaluation methods and outcome indicators at the time the program is planned provides criteria for periodic reassessment and revision by health care professionals and allows for feedback from consumers (16,17).

**Advisory committee**—As the program matures, the need for more formal communication mechanisms and greater community outreach lends support for a responsible guiding committee. Although no data exist that specifically identify the contributions of an advisory committee to a diabetes education program, a survey of Veterans Administration medical centers indicated that those with formal patient education committees were six times

more likely to have a written plan for patient education than those without such committees (8). Because educational programs often encompass diverse units within an organization (e.g., dietary, marketing, medicine, nursing), significant effort is often necessary during program initiation to involve personnel with diverse skills (9). Although informal communication among interdisciplinary team members may be adequate in the very early phases of program development, more formal relationships are required to implement and maintain an educational program. An advisory committee can provide such a format.

The study of recognized programs (9) indicated that as programs matured, procedures became more formal, and visibility, concern for contribution to organizational goals, and the need for a broader scope of communication increased. Because relevant tasks and personnel change over time, communication and resource allocations need to be formalized to sustain the program. Relationships and communication with the external community are also more important. Key maintenance activities identified by the recognized programs studied include the need to 1) demonstrate financial or other contributions; 2) retain or improve space or other resource allocations; 3) promote commitment and expertise of personnel; 4) systematize the programs; and 5) develop protocols. An advisory committee can provide the forum and mechanism essential for activities that serve to sustain programs (9).

The recommendations for health care professional membership on the advisory committee is based on representation by disciplines who participate in successful diabetes care teams (18–23). The importance of behavioral change in diabetes self-management (24–27) and the value of mental health professionals in the Diabetes Control and Complications Trial (DCCT) teams (18,20) support the inclusion of behavioral science expertise on this committee. Consumer and community involvement in educational program

planning can result in programs that are more responsive to consumer-identified needs, more culturally relevant, and of greater personal interest to consumers, thus allowing for greater participant comprehension (12,13,15,16).

**Resources**—Although no studies specifically address the amount of time needed by professional staff in quality diabetes education programs, results from the study of the eight recognized programs provide evidence that adequate staff time is necessary for a quality program (9). In addition, it was shown that by implementing system changes, such as forms and checklists, thereby increasing staff time for patient education, the number of assessments and amount of patient teaching increased (28). It has also been shown that improving the structure within which teaching occurs, such as use of teaching plans and forms, will increase the amount of teaching that occurs (29). Because people with diabetes may have multiple educational and medical care needs (30) that may not be met by a single educational program, quality diabetes self-management education programs should periodically assess the community resources that are available for program participants. For example, these resources can include sources for ophthalmologic, dental, and foot care as well as including local support groups, one-to-one counseling, or group counseling.

### Program staff

Qualified personnel are essential to the success of a diabetes self-management education program. The sponsoring organization should identify the program personnel, which should include a program coordinator who has overall responsibility for the program. Because diabetes is a chronic disorder requiring lifestyle changes, instructors need to be skilled and experienced health care professionals with recent education in diabetes, educational principles, and strategies for behavioral change.

**Standard 9.** A coordinator will be designated who is responsible for program

planning, implementation, and evaluation.

**Standard 10.** Health care professionals with recent didactic and experiential preparation in diabetes clinical and educational issues will serve as the program instructors. The staff will include a nurse educator and a dietitian, at a minimum, who collaborate routinely. Certification as a diabetes educator by the National Certification Board of Diabetes Educators is recommended.

**Standard 11.** Professional program staff will obtain education about diabetes, educational principles, and behavioral change strategies on a continuing basis.

**Coordinator**—Among the ADA-recognized programs surveyed (9), the designation of the program coordinator appeared to have represented institutional commitment to the program. Therefore, the coordinator position needs to be designated and filled. Another essential component of quality diabetes education is well-trained instructors who are knowledgeable about diabetes, educational principles, and behavioral strategies (10,21,24,31–37).

**Staff**—Nurses and dietitians provide the majority of diabetes teaching in formal programs. Studies of hospital staff nurses' diabetes knowledge demonstrated serious knowledge deficits (38–41). Therefore, training and education beyond basic educational preparation are necessary before a nurse can become an effective diabetes educator. In addition, quality diabetes care and education requires that program staff obtain continuing professional education (42). A random survey of American Association of Diabetes Educators (AADE) members, who were registered nurses and Certified Diabetes Educators (CDEs), indicated that continuing education and years of experience positively impacted exercise teaching programs and methods used (31).

A certification examination for diabetes educators was initiated in 1986, and currently, there are over 7,500 CDEs in the U.S. A CDE is defined as a health care professional who has mastered the

core of knowledge and skill in the biological and social sciences, communication, counseling, and education and who has experience in the care of people with diabetes (43). The designation CDE allows identification of trained, experienced, and knowledgeable personnel to provide diabetes education (44). Therefore, certification is recommended for key personnel.

**Continuing education**—Symposium attendance has been shown to increase the diabetes knowledge and skills of diabetes educators (33) and is the method preferred by dietitian and nurse diabetes educators for obtaining continuing education (10,11). Nurse educators identified psychosocial adjustment to diabetes and care for special populations as their greatest continuing education needs. Adherence and behavioral change skills and skills related to program implementation (e.g., marketing, meeting standards) were also high priorities (10). The dietitian educators surveyed rated weight loss, relationships between nutrition, medications, exercise, and nutrition and diabetes as their highest continuing education needs (11).

Educational principles include communication and counseling skills, as well as techniques to facilitate learning and behavioral changes. Teaching and counseling skills can impact diabetes education outcomes (32) and may be improved with specific continuing education programs (34,35,45,46). A survey of one AADE chapter found that only 50% of the respondents had received formal training in the use of behavioral strategies. However, among these diabetes educators, formal training in the use of behavioral techniques was positively associated with the reported use of behavioral change strategies (47). Health professionals' use of behavior change strategies has been shown to affect outcomes and adherence behaviors of people with diabetes (32). Communication strategies are also important, such that negative expectations by health care professionals negatively affect client behaviors (48,49).

Table 3—Fifteen content areas

1. Diabetes overview
2. Stress and psychosocial adjustment
3. Family involvement and social support
4. Nutrition
5. Exercise and activity
6. Medications
7. Monitoring and use of results
8. Relationships among nutrition, exercise, medication, and blood glucose levels
9. Prevention, detection, and treatment of acute complications
10. Prevention, detection, and treatment of chronic complications
11. Foot, skin, and dental care
12. Behavior change strategies, goal-setting, risk factor reduction, and problem solving
13. Benefits, risks, and management options for improving glucose control
14. Preconception care, pregnancy, and gestational diabetes
15. Use of health care systems and community resources

Use of more person-centered responses by nurses resulted in better glycemic control than controlling and directive communications (50); providers can be taught effective communication skills (35,51). Furthermore, it has been suggested that education of health care professionals include cultural sensitivity (15) and preparation to engage people with diabetes in a partnership (52). Because of their influence on participants' abilities to make lifestyle changes, educational principles, including behavioral change strategies, and communication skills are important areas for continuing education for professional program staff.

### Curriculum

A quality diabetes self-management education program should provide comprehensive instruction in the content areas relevant to the target population and to the participants being served. The curriculum, instructional methods, and materials should be appropriate for the specified target population, considering type and duration of diabetes, age, cultural influences, and individual learning abilities.

**Standard 12.** The program will be capable of offering, based on the needs of target population, instruction in the content areas that are detailed in Table 3.

The revised National Standards for Diabetes Self-Management Education

Programs designate 15 content areas as essential for the curriculum of a comprehensive program. (Table 3). To convey knowledge in the content areas, teaching materials and methods need to be appropriate for the target audience and based on identified needs (4,15,53–55). Thus, even though the curriculum should include all 15 content areas, not all of these areas may need to be presented to each participant.

**Diabetes overview.** Basic content areas that are important for effective self-management of diabetes have been identified (56), but the impact of these content areas on participants' outcomes has not been studied in the U.S.

**Stress and psychosocial adjustment.** Because of the impact of a chronic illness on lifestyle, the need for increased healthy functioning through stress reduction and coping skills is nearly universal among people with diabetes (57). Individuals with diabetes who suffer from psychological problems have been shown to be at risk for reduced physical and emotional well-being because of the impact of these problems on glycemia (57). Psychosocial issues, stress, and coping have received much attention in diabetes research recently, and these psychosocial factors can impact self-care behaviors and glycemic control. Although a comprehensive discussion of these topics is beyond the

scope of this review, selected findings are relevant to diabetes self-management education programs.

Stress is a major contributor to hyperglycemia and may even precipitate the onset of diabetes. However, stress may have idiosyncratic effects in people with diabetes and lead to hypoglycemia as well as hyperglycemia (58). The effects of relaxation techniques and biofeedback on glycemic control are variable, but may help some individuals improve glucose control (59). Coping skills, designed to help people with diabetes overcome barriers to successful application of new knowledge and skills, can be enhanced through diabetes education. Although diabetes education programs are not equipped to provide psychotherapy, they do appear to have a small positive effect on psychological outcomes (60). Positive effects of broadening coping skills include improved self-esteem and self-efficacy, decreased anxiety and depression, and increased knowledge-test scores (61). Therefore, psychosocial issues and skills are important in diabetes education programs (57).

**Family involvement and social support.** Because peer and family support plays an important role in self-care behaviors and impacts glycemic control (32,62,63), social support strategies that enable participants to obtain support from family members should be part of quality diabetes self-management education programs. Inclusion of spouses during education for older males (64) and peer support in group education programs for adolescents (65) and older adults (66,67) has been associated with improved metabolic control.

**Nutrition.** The goals of medical nutritional therapy in diabetes management are to maintain optimal glucose and lipid levels, attain or maintain a reasonable body weight, prevent, delay, or treat nutrition-related risk factors and complications, and improve overall health (68). Adherence to meal planning recommendations often requires people with diabetes to alter eating patterns, implement

new eating behaviors, and evaluate the impact of these behaviors on glycemic control (69). The major desired outcomes of nutrition self-management education are for participants to make appropriate nutritional changes and to improve meal planning skills, nutritional status, and self-management. Learning to adjust insulin for food intake, or to adjust food intake based on blood glucose levels, is an effective way to achieve glycemic goals (69,70). Because nutritional recommendations are one of the most problematic aspects of self-management (71), multiple teaching and behavioral strategies is an often required to assist participants to achieve desired outcomes (20,69,72).

**Exercise and activity.** People with diabetes are encouraged to participate in a variety of physical activities because of the potential to improve metabolic control, cardiovascular fitness, psychological well-being, and social interaction (69). Along with the nutritional recommendations for diabetes self-management, exercise behaviors are problematic for most people with diabetes (12,71). Nutrition and exercise recommendations may be particularly difficult because they involve behaviors deeply rooted in culture and lifestyle (73). Because of the impact of nutrition and exercise on glycemia, and therefore the prevention of chronic complications, emphasis on these content areas is of particular importance and should be included in any educational program.

**Medications.** Oral hypoglycemic agents and insulin are widely used in diabetes management and are important aspects of self-management education. As with all medications, people who take these glucose-lowering agents need to understand their use, correct administration, action, and potential side effects (74). Inaccuracies in self-administration of medications among people with diabetes are well documented (75,76) and warrant inclusion in quality diabetes education programs.

**Monitoring and use of results.** Capillary blood glucose monitoring (CBGM) is an essential tool for diabetes self-management (77), and the number of people who

use CBGM has increased dramatically in the past decade (78). Results of a diabetes questionnaire included with the National Health Interview Survey indicated that participation in a diabetes patient education class was associated with an almost threefold higher probability that respondents with diabetes tested their blood glucose levels at least once daily (79). However, adherence with recommendations for testing frequency is problematic (80,81), and the number of people who use their CBGM data to make regimen adjustments is small (78). It has been shown that people with diabetes can learn how to use CBGM data to adjust their diabetes regimens and improve metabolic control (81,82). Even though CBGM is becoming easier to use, access to training and effective education from knowledgeable health care professionals is still needed to ensure accurate and appropriate use of this self-management tool (83).

**Relationships among nutrition, exercise, medication, and blood glucose levels.** Because self-management is a goal in diabetes care (77), education about the relationships among nutrition, exercise, medications, and their impact on blood glucose results is needed by people with diabetes. Adjustment of food and insulin in response to hyperglycemia was associated with lower HbA<sub>1c</sub> levels in intensively managed DCCT subjects. CBGM techniques, and use of CBGM results to modify management plans, should be part of quality self-management education programs (84). People working toward optimal glucose control need information specific to their particular management regimens (23,85).

**Prevention, detection, and treatment of acute complications.** People with diabetes are at risk for the acute complications of hypoglycemia and hyperglycemia, diabetic ketoacidosis (DKA) and hyperosmolar hyperglycemic nonketotic coma (HHNKC). Hypoglycemia is common, and people treated with glucose-lowering agents need to learn how to diagnose, treat appropriately, and prevent this potentially life-threatening situation (86–

89). In addition, overtreatment of hypoglycemia was associated with higher HbA<sub>1c</sub> levels in intensively treated DCCT subjects (90).

Hyperglycemia also occurs, and because of its impact on quality-of-life issues, such as vision, nocturia, and energy levels, people with diabetes should be taught the causes, early recognition, treatment, and prevention of hyperglycemia. Hyperglycemia can progress to the more serious acute complications, DKA and HHNKC. These two acute complications have mortality rates of 10 and 40–70% respectively, and both are often preceded by an illness or infection (91). Even though there are no specific studies that demonstrate the value of sick-day education or other strategies to prevent or recognize symptoms of these complications, their significant costs, in terms of hospitalizations, personal suffering, and mortality, justify their inclusion in a quality diabetes self-management education program.

**Prevention, detection, and treatment of chronic complications.** The chronic complications of diabetes include neuropathy, retinopathy, nephropathy, and macrovascular disease (92). Self-management education for people with diabetes must include information about the prevention, early detection, and treatment of each of these complications. The results of the landmark DCCT showed the efficacy of blood glucose control by intensive therapy and participant self-management in preventing of the chronic complications of diabetes in insulin-dependent diabetes mellitus (IDDM) (18). Routine screening for each of these complications, as outlined in the Standards of Medical Care (93), is critical for early treatment when these complications are most amenable to interventions. For example, ophthalmologic referral impacts the early detection and treatment of retinopathy, but people with diabetes are still not receiving retinal screening and referrals at the recommended time intervals (94–96). In 1989, only 50% of people with diabetes had received dilated eye examinations in

the previous year. However, attendance at a diabetes education program increased the probability of receiving eye examinations among people with non-insulin-dependent diabetes mellitus (NIDDM) (97). Cardiovascular disease is the leading cause of mortality among people with diabetes (98,99). Thus, reduction of cardiovascular risk factors can have a major impact on morbidity and the premature mortality associated with diabetes (100,101).

**Foot, skin, and dental care.** Foot, skin, and dental care are important aspects of self-management education. At least 50% of all lower extremity amputations (LEAs) can be prevented through proper self-care and reduction of risk factors (95). A case-controlled study of diabetes-related LEAs showed that negligent self-care practices, evidenced by minor trauma leading to ulceration, were the initiating events in 72% of the LEAs. These negligent behaviors were ascribed to lack of knowledge, noncompliance with medical recommendations, and inadequate social support (102). A foot care program that included professional education, systems changes such as chart reminders, and foot care education and behavioral contracts with people with NIDDM positively impacted foot care practices and reduced the incidence of lower extremity morbidity (103). To reduce LEAs by 40%, at least 80% of all people with diabetes at high risk for LEAs must receive effective foot care, including self-care instruction (95).

Although no studies specifically address skin care, preliminary results from a prospective study of foot ulceration show that the use of lotion on dry, neuropathic feet reduced the risk of ulceration by 50% (104). The supporting tissues of the teeth are prone to the systemic effects of diabetes, and severe periodontal disease or infections can negatively impact glycemic control (105). Thus, the value of skin care and routine dental care should be stressed to people with diabetes.

**Behavior change strategies, goal setting, risk factor reduction, and prob-**

**lem solving.** Adherence problems in diabetes are well documented (24,26). Inclusion of behavioral strategies has been shown to be superior to didactic instruction in improving adherence and therapeutic outcomes (25). Contingency contracting, goal setting, behavior modification, and relapse prevention have all been shown to be effective behavior change strategies when used by health care professionals (24,26,54,103,106). Although the effect of teaching these techniques as content has not specifically been studied, it is recommended that participants in diabetes self-management education programs be taught these strategies, including the setting of measurable and realistic long- and short-term behavior change goals. Goal attainment can then be used as part of the program evaluation process.

Risk factor reduction strategies include general health promotion strategies, such as smoking cessation, moderate alcohol intake, healthy meal planning, and exercise. Education targeted at increasing knowledge, identifying personal risk factors, and making lifestyle changes to reduce these risk factors was shown to be effective in a community sample of middle-aged adults (107). In addition, management of the cardiovascular risk factors of dyslipidemia and hypertension (which is also associated with nephropathy progression) is indicated (69,93,108). Often management of these risk factors involves nutrition and exercise behaviors. Intensive medical nutrition therapy directed toward dietary changes has been shown to lower cholesterol levels in people with NIDDM (109). The value of quitting smoking and illicit drug use should be stressed. While cigarette smoking by some people with diabetes may be decreasing, it appears that the prevalence of smoking in young people and African-American males with diabetes is still unacceptably high (110). Smoking behavior needs to be addressed from three perspectives: prevention information, cessation strategies, and maintenance or relapse prevention (111).

Empowerment, defined as a process whereby participants gain the knowledge, skills, attitudes, and self-awareness necessary to influence their behavior and that of others to manage their diabetes, has been suggested as an alternative to the expert-driven adherence and compliance models of care and education (27). One study showed that participants who attended an empowerment-based series of support sessions demonstrated improved self-efficacy and glycemic control (112). Provider/patient interactions that promote assertive communication and partnership have been shown to result in better physiological control and functional status, more positive self-evaluation of health, and greater patient satisfaction (50,113,114).

Among IDDM individuals, those who identified more barriers to self-management were found to have poorer adherence to their diabetes regimens (115). Problem-based diabetes education can be effective in the application of daily problem-solving skills for older adults (12), African-American females (54), and adolescents (116). Use of problem-solving strategies to overcome regimen barriers is a significant predictor of dietary and exercise behavior (117). Therefore, problem solving is an important content area for diabetes education programs.

**Benefits, risks, and management options for improving glucose control.** The DCCT results have impacted the ADA's Standards of Medical Care for Patients with Diabetes Mellitus (93) and the diabetes self-management education provided to them (118). Information about the costs, risks, and benefits of implementation of intensive therapies should be provided to all people with diabetes as part of self-management education.

**Preconception care, pregnancy, and gestational diabetes.** The impact of glycemic control on pregnancy outcomes is well documented (119). Thus, preconception care and counseling and education about appropriate self-management techniques during pregnancy should be provided to all women of childbearing



age with diabetes (95). A statewide program for preconception counseling, contraception knowledge, and prenatal care demonstrated improved pregnancy outcomes in women with established diabetes (120). In addition, preconception care has been shown to be cost-effective (121). Women with gestational diabetes should receive education regarding the importance of optimal glucose control in preventing fetal morbidity and mortality. This education should include medical nutrition therapy, exercise, monitoring, and insulin use, if indicated (122,123).

**Use of health care systems and community resources.** People with diabetes are frequent recipients of many costly health care services (30). The costs and complexity of diabetes care provide support for the inclusion of content about appropriate use of health care systems. Information about community and self-help resources is also recommended (95,124). In addition, obtaining third party reimbursement in the current climate of dwindling resources will require advocacy skills for negotiation with health and political systems (52).

**Standard 13.** The program will use instructional methods and materials that are appropriate for the target population and the participants being served.

A review of 20 studies published before 1988 found that patient education is generally effective in influencing knowledge, regardless of teaching methods (125). However, a meta-analysis of the overall efficacy of educational and psychosocial interventions found that, while all types of educational interventions led to improvements, diet instruction, social learning, and behavior modification interventions had the strongest effects on physical outcome measures and knowledge gain (126).

Both individual and group instruction can be appropriate and effective for diabetes self-management education. The number of instructors should be appropriate for the caseload and content. One-to-one counseling or small groups are recommended for higher order activ-

ities, such as learning to analyze, evaluate, and synthesize information, problem solving, and applying abstract principles to concrete situations (127). Small groups increase the time available for every member to participate and increase involvement in learning. Opportunities for individualized educational experiences and for interpersonal relationships to develop may also occur. In addition, small groups enhance group cohesiveness and help decrease inhibitions to participation (128). On the other hand, larger groups are more efficient and can be effective for teaching factual content (127). A random survey of the opinions of 325 nurse and dietitian AADE members identified one-to-one teaching and counseling sessions as the most educationally effective, and group sessions as the most cost-effective, educational methods they used (129). Meta-analyses (60,126,130) support the efficacy of group diabetes education.

Diabetes educators identified booklets and videotapes as the most cost-effective forms of educational media and expressed need for more materials with psychosocial content and materials targeted for special populations (129). However, educational materials that match participants ethnicity, preferred language, reading levels, and preferred learning styles need to be selected and used (53,131–138). A review of the efficacy of videos in health education found these to be at least as effective as the more traditional methods for increasing short-term knowledge (139). Role models depicting people in similar situations on videotape can be effective for decreasing anxiety. Indeed, videotapes were identified by diabetes educators in the previously cited survey as the most effective form of educational media and one that is widely used by them as an adjunct to their teaching (129). Skills training, using modular computer programs based on competency criteria, has also been shown to be an effective strategy (25), and a computer-assisted nutritional educational program was shown to improve knowledge, dietary habits, and metabolic con-

trol among people with diabetes in France (140).

Most diabetes education programs serve members of culturally diverse groups. A potential barrier to self-management education may be the lack of educational materials and programs that are linguistically appropriate and culturally sensitive to these groups (15,37,53). A weight-loss program developed specifically for urban African-American females (54), a culturally specific nutrition intervention program (141), and educational media developed specifically for Mexican-Americans (142) and Native Americans (131) were found to be effective in the provision of diabetes care information to these populations.

### Participant access

Quality programs must be readily accessible to those in need of education. The sponsoring organization should facilitate access to self-management education for the target population identified in the needs assessment. Access is promoted by a commitment to routinely inform referral sources and the target population of the availability and benefits of the program.

**Standard 14.** A system will be in place to inform the target population and potential referral sources of the availability and benefits of the program.

**Standard 15.** The program will be conveniently and regularly available.

**Standard 16.** The program will be responsive to requests for information and referrals from consumer, health care professionals, and health care agencies.

A diabetes-related goal of *Healthy People 2000* is for 75% of Americans with diabetes to receive formal diabetes education (95). However, among the 2,405 adults with diabetes surveyed in the 1989 National Health Information Survey (143), only 35% had ever attended a diabetes class or education program. Of respondents with IDDM, 59% attended classes, whereas only 49% of insulin treated NIDDM people attended classes. Of particular concern is that only 24% of



respondents not on insulin had attended classes. A survey of people with diabetes in Washington state found that only 38% had attended local diabetes education programs (144). A 1991 study of randomly selected Michigan communities (145) indicated that only 58% of respondents with diabetes reported ever receiving diabetes education, which was a significant decline from the 70% who had received diabetes education in a 1981 survey.

Several barriers to diabetes education program attendance have been identified. The Washington state survey identified that the major reasons for non-attendance were that subjects thought they had enough knowledge and the cost and scheduling of the programs (144). These respondents identified physicians as their most frequent sources of information about diabetes education programs. However, even though 91% of physicians surveyed knew about programs in their communities, over half of them had never referred patients, or only referred occasionally. Many only referred under special circumstances, such as new diagnoses or insulin initiation. Two major strategies to increase referrals suggested by these physicians were to offer the programs at more frequent and convenient times and increase individualization of the program by needs assessments and one-to-one teaching (144).

External marketing of ADA-recognized programs has included newspaper and other media announcements, presentations to community groups, and diabetes screening programs. Some program medical directors established diabetes education as standard practice for all people with diabetes (9). A study of participation in an educational program designed for adults over 60 years of age found that attendees were more likely to be self-referred after reading advertisements in local media, flyers, or brochures. Nonattendees were more likely to have received a letter from their physicians or program staff, followed by a telephone call from program staff (146).

Diabetes education program attrition rates of 40% and more are common (147). A study that examined program dropouts showed that less formal education and income, younger age, longer duration of diabetes, more self-care barriers, and poorer health correlated with higher attrition rates. Special assistance to overcome barriers to program completion and more culturally sensitive and relevant programs may be needed to decrease attrition (148).

Open communication among consumers, referring clinicians, and program educators is an important element in an effective educational program. Among ADA-recognized programs surveyed, a critical area identified in the establishment and maintenance of programs was communication with potential referral sources. Most programs reported taking special care to communicate with medical staff. These programs also reported communication with other departments, such as admitting and information, and other health professionals through internal newsletter announcements and memos (9).

**PROCESS** — Process refers to the methods or means by which resources are used to attain stated goals. The process of providing diabetes self-management education involves the integration of an individual assessment, goal setting, educational plan development, implementation, evaluation, and follow-up. Each component requires documentation that can be evaluated.

#### Assessment

Because individuals are unique, their educational needs will vary with age, disease processes, culture, and lifestyles. Effective instruction can only be accomplished by a corroborative effort between educators and participants to identify individualized educational needs.

**Standard 17.** An individualized assessment will be developed and updated in

collaboration with each participant. The assessment will include relevant medical history, present health status, health services or resource utilization, risk factors, diabetes knowledge and skills, cultural influences, health beliefs and attitudes, health behaviors and goals, support systems, barriers to learning, and socioeconomic factors.

The need to design interventions to meet individual needs has long been recognized in diabetes education (149). To develop individualized interventions, deficits in knowledge and skills must be identified, as well as current attitudes, beliefs, and behaviors (150). The effectiveness of the information provided increases when it evolves from, and is related to, participants' experiences. Individual assessment promotes consideration of each participant's educational concerns and priorities and recognizes the person with diabetes as an equal partner in the educational process (4). Knowledge and skills assessments help to identify deficits and can ensure individualization of the educational plan and efficient teaching (149). Knowledge tests can be used in addition to asking patients to rate their current level of understanding (149–151). Reliable and valid measures of diabetes knowledge and self-care behaviors need to be developed and used (60).

Attitudes toward diabetes are important to assess to individualize educational programs. Attitudes and beliefs about diabetes appear to be particularly important for guiding knowledge and skills acquisition in the aspects of the management regimen that require more complicated behavior changes, such as nutrition and exercise (152). Because the acquisition of health-enhancing behaviors and cessation of high-risk behaviors is believed to involve progression through five stages of change, assessment of readiness to make behavioral changes can also serve as a useful guide for the educational and goal-setting process (153,154). In addition, assessment of common barriers, such as obstacles to behavior changes

(155), competing demands, and emotional states, provides useful information that can assist in planning the educational process (115). Factors such as ethnic and sociocultural beliefs about diabetes (155), economic factors, and social relationships that impact self-care behaviors should also be assessed (15,156).

### Plan and implementation

For the educational experience to meet the participant's needs, an individual assessment should be used to develop and implement the education plan. All information about the educational experience should be documented in the participant's permanent medical or education record. Because different health care professionals may be involved in the provision of the educational experience, effective communication and coordination are essential.

**Standard 18.** An individualized education plan, based on the assessment, will be developed in collaboration with each participant.

**Standard 19.** The participant's educational experience including assessment, intervention, evaluation, and follow-up will be documented in a permanent medical or education record. There will be documentation of collaboration and coordination among program staff and other providers.

In collaboration with participants, assessment data can be used to select the most appropriate content areas to be taught (16). Staff responsibilities and activities must be coordinated and communicated to ensure that individual participant's needs are met (4). Diabetes self-management education is an integral component of diabetes care and should not occur in isolation. Strategies to integrate education and treatment and to establish linkages with other care providers are essential in quality diabetes self-management education programs. For these programs to operate effectively, communication must occur on several levels. At the organizational level, members of the education program profes-

sional staff need to communicate with other professionals about the program. In addition, program staff members need to communicate with each other about participants' progress toward goals and fulfillment of educational needs. Standardization of practices and forms appears to occur in successful diabetes education programs (6,9). Linkages between different care settings, different providers, and the consumer must be coordinated and documented. Communication also needs to occur with outside agencies from whom consumers were referred, or to whom they will be referred, for follow-up.

### Follow-up

Because diabetes is a chronic disorder requiring a lifetime of self-management, follow-up services will be needed. Participants' lifestyles, knowledge, skills, attitudes, and disease characteristics change over time, so that ongoing education is necessary and appropriate. Programs should be able to offer periodic reassessment and education as part of comprehensive services.

**Standard 20.** The program will offer appropriate and timely educational intervention based on periodic reassessments of health status, knowledge, skills, attitudes, goals, and self-care behaviors.

Because diabetes is a lifelong condition, it is unlikely that a single education program experience will be adequate to effectively implement, and maintain, the complicated skills and behavior changes that diabetes regimens require (4,17). In the complex chronic illness model, illness extends over a considerable time. Therefore, measures of how well interventions are applied must include multiple assessments at different time periods (157). The need for continuing diabetes education was illustrated in a study where diabetes knowledge was negatively correlated with duration of diabetes (158).

Important areas for follow-up are the prevention, early detection, and treatment of diabetes complications and risk

factor reduction (4). The studies cited earlier point out the value of screening for complications, but the number of people who receive these preventive services is not optimal (96). Greater follow-up is needed to ensure that consumers receive and follow through with referrals for essential services if the *Healthy People 2000* targets for the reduction of complications are to be reached (95).

**OUTCOMES** — Outcomes are the desired results for the program and participants. For programs, the desired results include achievement of stated objectives, reaching the defined target population, and helping participants to improve their health outcomes. For participants, outcomes include the knowledge and skills necessary for self-management, desired self-management behaviors, and improved health outcomes. Assessing outcomes, and using the assessments, in regular program evaluation and subsequent planning is essential to maintain quality programs.

### Program outcomes

The advisory committee should periodically review the program to ascertain that the program continues to meet the National Standards for Diabetes Self-Management Education Programs. The results of this review should be documented and used in subsequent program planning and modification.

**Standard 21.** The advisory committee will review program performance annually, including all components of the annual program plan and curriculum, and use the information in subsequent planning and program modification.

Program evaluation and planning is a circular process. Periodic review of outcomes enables advisory committees to determine if programs are continuing to meet the standards and institutional goals and to identify strengths as well as problem areas. Program evaluation can include a measurement of outcomes and

process evaluation. Systematic, quantitative observation of predefined outcomes provides data that can be used to improve diabetes self-management programs. Programs should be evaluated on their progress toward meeting program objectives and other outcome indicators that were established during the planning process. In addition, it has been recommended that outcomes such as personal satisfaction with care and perceived quality of life be included in the periodic review (159,160).

The advisory committee is expected to conduct an annual program review that includes process evaluation. The purpose of process evaluation is to describe the quality of the program elements as they are being implemented and what occurs in these elements as the program matures (161). Process evaluation can include program policies, procedures, goals and objectives, resources, program implementation, including staff performance, methods of data collection, and communication. Process evaluation may be accomplished by surveys, audits, participant evaluations, or peer review (6,8,161).

### Participant outcomes

Participants' outcomes, such as success in incorporating self-management into their lifestyles, should be periodically reviewed. The specific outcomes evaluated will vary with the program, but the programs effectiveness in helping participants improve their health outcomes should be documented and used for future program planning and modification. **Standard 22.** The advisory committee will annually review and evaluate predetermined outcomes for program participants.

Outcome evaluation should also focus on the effects of the program on participants' outcomes, such as changes in quality of life, glycemic control, weight control, risk factors, morbidity, and mortality (161). Outcome measurement enables programs to look at participants' progress in terms of increased knowl-

edge, satisfaction with care, attitudes, health care behaviors, and physiological outcomes, such as glycemic control and weight. Evaluation of diabetes education programs generally shows knowledge score increases (60,130,150). However, given the complexity and intensity of the diabetes self-management regimen, it is critical that evaluations not focus solely on increased knowledge. Although knowledge is indispensable to self-care, regimen efficacy, self-management behaviors, and attitudinal and environmental factors also influence metabolic control (162,163). Therefore, glycemic indicators, such as glycosylated hemoglobin (GHb) have limitations in assessing any one of these factors individually (163). For example, level of diabetes knowledge alone has not always been shown to correlate with glycemia (150,164). People with diabetes may become more knowledgeable as they gain experience with the day-to-day management of their disease, but may have declining metabolic control due to disease progression.

Outcome measurements can vary, depending on the objectives of a particular program. For example, lower extremity ulceration and amputation rates have decreased and self-care behaviors increased in experimental versus control groups after simple (165) and intensive (166,167) lower extremity-focused education programs. The meta-analyses of diabetes education studies previously cited found that diabetes education was generally effective in increasing knowledge, self-care behaviors, and metabolic control (60,130). Because multifaceted interventions are aimed at enhancing self-efficacy, self-management behaviors, and quality of life, these attitudes and behaviors need to be evaluated as outcomes (159,160, 168). A framework and examples of feasible collection measures for evaluating diabetes education programs have been offered (168).

A capitated health care system with an ADA-recognized, 3-day diabetes education program evaluated client satis-

faction, cost-effectiveness of diabetes education, cost reduction in health care, and costs of attending program versus inpatient stays (169). A 36% decline in GHb in education program participants occurred, which was maintained up to 2 years. Participant satisfaction increased and the average number of hospitalizations for diabetes-related problems decreased post-program as did the use of diabetes and hypertension medications, representing significant cost savings. Several other studies, although not of recognized programs, have shown decreased hospital admission rates and lengths of stay after diabetes education (151,162, 170).

A pre- versus postintervention survey of participants in an education program with cognitive based diabetes-specific skills showed increased diabetes knowledge, self-esteem, and self-efficacy and decreased anxiety (61). A cross-sectional study in the Netherlands (36) showed a positive correlation between positive attitudes toward self-care and appropriate diabetes regimen self-adjustments. Health information-seeking behaviors may also be an effective way to evaluate diabetes education programs. Greenfield et al. (158) showed, in a randomized controlled trial to improve information-seeking skills, that in the experimental group, health rating improved and days lost from work decreased as did GHb.

The complexity of the evaluation process and difficulty in relying only on physiological measures was demonstrated in a correlational study that showed that adherence to one aspect of the diabetes regimen was independent of adherence to other aspects of the regimen (171). Another correlational study showed that regimen adherence was higher for medication-taking and glucose-testing, task-related behaviors, than for meal planning and exercise behaviors, which require more complex lifestyle changes. In addition, there was no relationship between glycemic control and adherence behaviors, indicating that other factors,

such as appropriateness of the management prescription, may have more of an impact on glycemic control than adherence behaviors (172). A correlational study of self-efficacy as predictor of dietary self-care found no significant correlations between these variables. However, there was a significant predictive value of self-efficacy and exercise in females and outcome expectations in males (173), indicating that each behavioral outcome may need to be evaluated separately. In addition, teaching the use of behavioral change strategies in diabetes self-management education programs may result in management prescriptions that are more appropriate for a particular individual.

Coping strategies, attitudes, and self-care beliefs may be appropriate outcomes to evaluate (174). Coping strategies can be taught (130) and incorporated in diabetes education programs. A survey of pre- versus post-diabetes education program participants showed increased perception of diabetes severity and the benefits of therapy and an increased ability to carry out recommended self-care behaviors post-program, indicating that diabetes education can modify some health beliefs (175). This study also showed the difficulty of separating the effects of diabetes education on glycemic control from the effects of management changes.

### Recommendations

Although diabetes education has been shown to be effective (60,130), self-management education programs still need to be accountable to administrators, advisory committees, payers, and participants. In assessing the credibility of health education programs, studies have demonstrated that the following attributes are critical success factors: multi-component menus of learner options, knowledgeable and properly trained instructors, assessment of learner readiness and knowledge, integration with clinical services, behaviorally oriented and interactive, culturally relevant and linguistically appropriate, provision of ongoing

support, and evaluation, using continuous quality improvement (176).

Knowledge about diabetes care and education has grown considerably since the National Standards for Diabetes Patient Education Programs were first developed and implemented. The standards were revised considering these new directions and findings. However, each standard needs to be critically evaluated separately and for its contribution to the whole program. In addition, a controlled, well-designed study of the impact of these standards needs to be undertaken.

Specific recommendations and suggestions for research include

1. Increase access to self-management education for all people with diabetes and their support systems. Measures to accomplish this include increasing the numbers of quality diabetes self-management education programs, marketing diabetes self-management education programs to people with diabetes, health care professionals, and the public, and continuing efforts by diabetes advocacy organizations, people with diabetes, and health care professionals, to ensure access to, and reimbursement for, diabetes self-management education programs. An important message for marketing diabetes self-management education programs is that self-management education is important for people with NIDDM who are not taking medications when interventions such as meal planning changes and exercise may be most efficacious.
2. Develop valid and reliable measures of diabetes attitudes, knowledge, skills, and behaviors that are easy to administer and interpret.
3. Increase the availability and use of standardized and reliable measures of diabetes knowledge, skills, and behaviors.
4. Determine the impact of diabetes advisory committees on maintenance and success of diabetes self-management programs.
5. Determine the optimal amount of

time required for staff to adequately teach self-management to particular target populations.

6. Develop reliable and valid measures of self-care behaviors.
7. Identify appropriate and cost-effective strategies to improve access to diabetes self-management education programs.
8. Continue studying and emphasizing psychosocial issues, stress, behavior change, cultural relevance, empowerment, and promotion of active involvement of people with diabetes and their support systems in self-care.
9. Conduct research to determine the most effective strategies to reach populations with a high prevalence of diabetes.
10. Conduct research to validate the inclusion of the identified 15 content areas in diabetes self-management education programs.
11. Conduct further research to identify the most effective methods to deliver the 15 content areas to various populations. This research is particularly needed among ethnic groups with a high prevalence of diabetes.
12. Determine educational methods most likely to influence health beliefs and attitudes. These methods should allow educators and clinicians to assist people with diabetes to incorporate the principles of diabetes self-management into their lifestyles more effectively.
13. Conduct further research to determine the most appropriate outcomes to measure the efficacy of diabetes self-management education programs.
14. Determine the cost-to-benefit ratio and cost-effectiveness of diabetes self-management education programs.

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# References

1. Bartlett EE: Historical glimpses of patient education in the U.S. *Patient Educ Counseling* 8:135-149, 1986
2. National Diabetes Advisory Board: National standards for diabetes patient education programs. *Diabetes Educ* 9:11-14, 1984
3. National Diabetes Advisory Board: National standards and review criteria for diabetes patient education programs. *Diabetes Educ* 12:286-291, 1987
4. American Diabetes Association: Standards and review criteria: national standards for diabetes patient education and American Diabetes Association review criteria. *Diabetes Care* 13 (Suppl. 1):60-65, 1990; 16 (Suppl. 2):113-118, 1993
5. Berlin N, Sims D, Belloni J, Brimberry J, Etzweiler D, Hiss R, Kramer N, Krueger K, Leichter S, Lipsett L, Paduano D: National standards for diabetes patient education programs: pilot study results and implementation plan. *Diabetes Educ* 12:292-296, 1987
6. Degeling D, Salkeld G, Dowse J, Fahey P: Patient education policy and practice in Australian hospitals. *Patient Educ Counseling* 15:127-138, 1990
7. Pichert JW, Penha MLI: Institutionalization of diabetes care and education programs: a tale of two cities. *Diabetes Educ* 19:273,276-277, 1993
8. Giloth BE: Management of patient education in U.S. hospitals: evolution of a concept. *Patient Educ Counseling* 15:101-111, 1990
9. Heins JM, Nord WR, Cameron M: Establishing and sustaining state-of-the-art diabetes education programs: research and recommendations. *Diabetes Educ* 18:501-508, 1992
10. Anderson RM, Donnelly MB, Funnell MM, Johnson PD: The continuing education needs of diabetes nurse educators. *J Continuing Educ Nurs* 22:163-166, 1991
11. Anderson RM, Arnold MS, Donnelly MB, Funnell MM, Johnson PD, Oh MS: Continuing education needs of dietitians who are diabetes educators. *J Am Diet Assoc* 92:607-609, 1992
12. Glasgow RE, Toobert DJ, Hampson SE, Brown JE, Lewinson PM, Donnelly J: Improving self-care among older patients with type II diabetes: the sixty something study. *Patient Educ Counseling* 19:61-74, 1992
13. Basch CE: Focus group interview: an underutilized research technique for improving theory and practice in health education. *Health Educ Q* 14:411-448, 1987
14. Quatromoni PA, Milbauer M, Posner BM, Carballeira NP, Brunt M, Chipkin SR: Use of focus groups to explore nutrition practices and health beliefs of urban Caribbean Latinos with diabetes. *Diabetes Care* 17:869-873, 1994
15. Anderson RM, Herman WH, Davis JM, Freedman RP, Funnell MM, Neighbors HW: Barriers to improving diabetes care for blacks. *Diabetes Care* 14:605-609, 1991
16. Duchin SP, Brown SA: Patients should participate in designing diabetes educational content. *Patient Educ Counseling* 16:255-267, 1990
17. The North Tyneside Diabetes Team: The diabetes annual review as an educational tool: assessment and learning integrated with care, screening, and audit. *Diabetic Med* 9:389-394, 1992
18. The Diabetes Control and Complications Trial 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* 14:977-986, 1993
19. Delehanty LM, Halford BN: The role of diet behaviors in improved glycemic control in intensively treated patients in the Diabetes Control and Complications Trial. *Diabetes Care* 16:1453-1458, 1993
20. Dawson L: DCCT: team approach takes center stage. *Diabetes Spectrum* 6:222-224, 1993
21. Gruesser M, Bott U, Ellerman P, Kronsbein P, Jorgens V: Evaluation of a structured treatment and teaching program for non-insulin-treated type II diabetic outpatients in Germany after the nationwide introduction of reimbursement policy for physicians. *Diabetes Care* 16:1268-1275, 1993
22. Halter J, Anderson L, Herman W, Fogler J, Merritt J, Funnell M, Arnold M, Brown M, Davis W: Intensive treatment safely improves glycemic control of elderly patients with diabetes mellitus (Abstract). *Diabetes* 42 (Suppl. 1):146A, 1993
23. Hollander P, Castle G, Callahan P, Olson B, Nelson J, Joynes J: Teaching patients self-management skills for intensified insulin therapy (Abstract). *Diabetes* 42 (Suppl. 1):152A, 1993
24. Kurtz SMS: Adherence to diabetes regimens: empirical status and clinical applications. *Diabetes Educ* 16:50-56, 1990
25. Mazza SA, Moorman NH, Wheeler ML, Norton JA, Fineberg NS, Vinicor F, Cohen SJ, Clark CM: The diabetes education study: a controlled trial of the effects of diabetes patient education. *Diabetes Care* 9:1-10, 1986
26. D'Eramo-Melkus GA, Wylie-Rosett J, Hagan JA: Metabolic impact of education in NIDDM. *Diabetes Care* 15:864-869, 1992
27. Funnell MM, Anderson RM, Arnold MS, Barr PA, Donnelly MB, Johnson PD, Taylor-Moon D, White NH: Empowerment: an idea whose time has come in diabetes education. *Diabetes Educ* 17:37-41, 1991
28. Lorenz RA, Pichert JW, Enns SJ, Hanson SL: Impact of organizational interventions on the delivery of patient education in a diabetes clinic. *Patient Educ Counseling* 8:115-123, 1986
29. Redman BK, Levine D, Howard D: Organizational resources in support of patient education programs: relationship to reported delivery of instruction. *Patient Educ Counseling* 9:177-197, 1987
30. Rubin RJ, Altman WM, Mendelson DN: Health care expenditures for people with diabetes, 1992. *J Clin Endocrinol Metab* 78:809A-809F, 1994
31. Ruby KL, Blainey CA, Haas LB, Patrick M: The knowledge and practices of registered nurse, certified diabetes educators: teaching elderly clients about exercise. *Diabetes Educ* 19:299-306, 1993

32. Anderson LA: Health-care communication and selected psychosocial correlates of adherence in diabetes management. *Diabetes Care* 13 (Suppl. 2):66-77, 1990
33. Knopf RF, Kittel PRE, Funnell MM, Wolf FM: Development and evaluation of diabetes continuing education courses for health professionals: a synthesis of eight years of experience. *Diabetes Educ* 14: 136-141, 1988
34. Roach RR, Pichert JW, Stetson BA, Lorenz RA, Boswell EJ, Schlundt DG: Improving dietitians' teaching skills. *J Am Diet Assoc* 92:1466-1473, 1992
35. Lorenz RA: Training health professionals to improve the effectiveness of patient education programs. *Diabetes Educ* 12: 204-209, 1986
36. de Weerd I, Visser AP, Kok G, Van der Veen EA: Determinants of active self-care behavior of insulin treated patients with diabetes: implications for diabetes education. *Soc Sci & Med* 30:605-615, 1990
37. Murphy FG, Satterfield DW, Anderson RM, Lyons AE: Diabetes educators as cultural translators. *Diabetes Educ* 19: 113-118, 1993
38. Drass JA, Muir-Nash J, Boykin PC, Turek JM, Baker RN: Perceived and actual level of knowledge of diabetes mellitus among nurses. *Diabetes Care* 12: 351-356, 1989
39. Gossain VV, Bowman KA, Rovner DR: The actual and self-perceived knowledge of diabetes among staff nurses. *Diabetes Educ* 19:215-219, 1993
40. Jayne RI, Rankin SH: Revisiting nurse knowledge about diabetes: an update and implications for practice. *Diabetes Educ* 19:497-502, 1993
41. Moriarity DR, Stephens LC: Factors that influence diabetes patient teaching performed by hospital staff nurses. *Diabetes Educ* 16:31-35, 1990
42. Dunn SM: Rethinking the models and modes of diabetes education. *Patient Educ Counseling* 16:281-288, 1990
43. American Association of Diabetes Educators: The scope of practice for diabetes educators and the standards of practice for diabetes educators. *Diabetes Educ* 19: 233-236, 1993
44. Ratner RE, El-Gamassay ER: Legal aspects of the team approach to diabetes treatment. *Diabetes Educ* 16:113-116, 1990
45. Anderson RM, Funnell MM, Barr PA, Dedrick RF, Davis WK: Learning to empower patients: results of professional education program for diabetes education. *Diabetes Care* 14:584-590, 1991
46. Lorenz RA, Pichert JW: Evaluation of education program developments: illustration of a research and development cycle. *Diabetes Educ* 15:253-256, 1989
47. Cypress M, Wylie-Rosett J, Engel SS, Stager TB: The scope of practice of diabetes educators in a metropolitan area. *Diabetes Educ* 18:111-114, 1992
48. Laux L, Valbona C, Merrill J, Baker S, Pavlik V: Physician affect and patient beliefs related to expected failure in the management of diabetes (Abstract). *Diabetes* 37:55A, 1988
49. St. James PJ, Younger MD, Hamilton BD, Waisbren SE: Unplanned pregnancies in young women with diabetes. *Diabetes Care* 16:1572-1577, 1993
50. Street RL Jr, Piziak VK, Varpentier WS, Herzog J, Hejl J, Skinner G, McClellan L: Provider-patient communication and metabolic control. *Diabetes Care* 16: 714-721, 1993
51. Sanson-Fisher RW, Campbell EM, Redman S, Hennrikus DJ: Patient-provider interactions and patient outcomes. *Diabetes Educ* 15:134-138, 1989
52. Wallerstein NB: Learning to empower patients: results of a professional education program for diabetes education (by RM Anderson, MM Funnell, PA Barr, RF Dedrick, WK Davis) (Summary and Commentary). *Diabetes Spectrum* 7:101-102, 1994
53. Westberg J: Patient education for Hispanic Americans. *Patient Educ Counseling* 13:143-160, 1989
54. McNabb WL, Quinn MT, Rosing L: Weight loss program for inner-city black women with non-insulin-dependent diabetes mellitus: PATHWAYS. *J Am Diet Assoc* 93:75-77, 1993
55. Schwab T, Meyer J, Merrell R: Measuring attitudes and health beliefs among Mexican Americans with diabetes. *Diabetes Educ* 20:221-227, 1994
56. American Diabetes Association: *Goals for Diabetes Education*. Alexandria, VA, American Diabetes Association, 1986
57. Rubin RR, Peyrot MP: Psychosocial problems and interventions in diabetes: a review of the literature. *Diabetes Care* 15:1640-1657, 1992
58. Surwit RS, Schneider MS, Feinglos MN: Stress and diabetes mellitus. *Diabetes Care* 15:1413-1422, 1992
59. Lane JD, McCaskill CC, Ross SL, Feinglos MN, Surwit RS: Relaxation training for NIDDM. *Diabetes Care* 16:1087-1094, 1993
60. Brown SA: Effects of educational interventions and outcomes in diabetic adults: a meta-analysis revisited. *Patient Educ Counseling* 16:189-215, 1990
61. Rubin RR, Peyrot M, Saudek DC: The effect of a diabetes education program incorporating coping skills training on emotional well-being and diabetes self-efficacy. *Diabetes Educ* 19:210-214, 1993
62. Connell CM: Psychosocial contexts of diabetes and older adulthood: reciprocal effects. *Diabetes Educ* 17:364-371, 1991
63. Kvam SH, Lyons JS: Assessment of coping strategies, social support, and general health status in individuals with diabetes mellitus. *Psychol Rep* 68:623-632, 1991
64. Gilden JL, Hendryx S, Casia C, Singh SP: The effectiveness of diabetes education programs for older patients and their spouses. *J Am Geriatr Soc* 37:1023-1030, 1989
65. Anderson BJ, Wolf FM, Burkhart MT, Cornell RG, Bacon GE: Effects of peer-group intervention on metabolic control of adolescents with IDDM. *Diabetes Care* 12:179-183, 1989
66. Gilden JL, Hendryx MS, Clar S, Casia C, Singh SP: Diabetes support groups improve health care of older diabetic patients. *Diabetes Care* 15:864-869, 1992
67. Wilson W, Pratt C: The impact of diabetes education and peer support upon weight and glycemic control of elderly persons with noninsulin dependent diabetes mellitus (NIDDM). *Am J Public Health* 77:634-635, 1987
68. American Diabetes Association: *Nutrition recommendations and principles for people with diabetes mellitus* (Posi-

- tion Statement). *Diabetes Care* 17:519–522, 1994
69. Franz MJ, Horton ES Sr, Bantle JP, Beebe CA, Brunzell JD, Coulston AM, Henry RR, Hoogwerf BJ, Stacpoole PW: Nutrition principles for the management of diabetes and related complications (Technical Review). *Diabetes Care* 17: 490–518, 1994
70. Malik RW, Horwitz DL, McNabb WL, Tokaki ET, Hawkins HA, Keys AG, Unterman TG: Adjustment of caloric intake based on self-monitoring in non-insulin-dependent diabetes mellitus: development and feasibility. *J Am Diet Assoc* 89:960–961, 1989
71. Lockwood D, Frey ML, Gladish NA, Hiss RG: The biggest problem in diabetes. *Diabetes Educ* 12:30–33, 1986
72. Anderson EJ, Richardson M, Cashe G, Cercone S, Delahanty L, Lyon R, Mueller D, Snetelaar L: DCCT Research Group: nutrition interventions for intensive therapy in the diabetes control and complications trial. *J Am Diet Assoc* 93:768–772, 1993
73. Rubin RR, Peyrot M, Saudek DC: Differential effects of diabetes education on self-regulation and life-style behaviors. *Diabetes Care* 14:335–338, 1991
74. Kitching JB: Patient information leaflets: the state of the art. *J R Soc Med* 83:298–300, 1990
75. Watkins JD, Roberts DE, Williams TF, Martin DA, Coyle V: Observation of medication errors made by diabetic patients in the home. *Diabetes* 16:882–885, 1967
76. Coscelli C, Calbrese G, Fedele D, Pisu E, Calderini C, Bistone S, Lapolla A, Mauri MG, Rossi A, Zappella A: Use of premixed insulin among the elderly. *Diabetes Care* 15:1628–1630, 1992
77. American Diabetes Association: Self-monitoring of blood glucose (Consensus Statement). *Diabetes Care* 17:81–86, 1994
78. Hiss RG (Ed.): *Diabetes in Communities II*. Ann Arbor, The University of Michigan Press, 1993
79. Harris MI, Cowie CC, Howie CJ: Self-monitoring of blood glucose by adults with diabetes in the U.S. population. *Diabetes Care* 16:1116–1123, 1993
80. Mazze RS, Shamoon H, Pasmantler R, Lucido D, Murphy J, Hartmann K, Kuykendall V, Loatin W: Reliability of blood glucose monitoring by patients with diabetes mellitus. *Am J Med* 77: 211–217, 1984
81. Floyd JC Jr, Funnell MM, Kazi IU: Feasibility of adjustment of insulin dosage by patients with insulin-requiring type II diabetes. *Diabetes Care* 13:386–392, 1990
82. Peyrot M, Rubin RR: Modeling the effect of diabetes education on glycemic control. *Diabetes Educ* 20:143–148, 1994
83. The National Steering Committee for Quality Assurance in Capillary Blood Glucose Monitoring: Proposed strategies for reducing user error in capillary blood glucose monitoring. *Diabetes Care* 16: 493–498, 1993
84. Reichard P, Nilsson B-Y, Rosenqvist U: The effect of long-term intensified insulin treatment on the development of microvascular complications of diabetes mellitus. *N Engl J Med* 329:304–309, 1993
85. Funnell M, Anderson L, Arnold M, Fogler J, Merritt J: Participation in a diabetes education and care program: Experience from the diabetes care for older adults project (DCOAP) (Abstract). *Diabetes* 43 (Suppl. 1):20A, 1994
86. Cryer PE, Fisher JN, Shamoon H: Hypoglycemia (Technical Review). *Diabetes Care* 17:734–755, 1994
87. The DCCT Research Group: Epidemiology of severe hypoglycemia in the diabetes control and complications trial. *Am J Med* 90:450–451, 1991
88. Frier BM: Hypoglycemia and diabetes. *Diabetic Med* 3:513–525, 1986
89. White NH: The risk of hypoglycemia during intensive therapy of IDDM (Conclusions). *Diabetes Spectrum* 7:263–265, 1994
90. Delehan LM, Halford BN: The role of diet behaviors in improved glycemic control in intensively treated patients in the diabetes control and complications trial. *Diabetes Care* 16:1453–1458, 1993
91. Kitabachi AE, Fisher JN, Murphy MB, Bumbak MJ: Diabetic ketoacidosis and hyperglycemic, hyperosmolar, nonketotic state. In *Joslin's Diabetes Mellitus*, 13th ed. Kahn CR, Weir GS, Eds. Philadelphia, PA, Lea & Febiger, 1994, p. 738–770
92. Nathan DM: Long-term complications of diabetes mellitus. *N Engl J Med* 328: 1676–1684, 1993
93. American Diabetes Association: Standards of medical care for patients with diabetes mellitus (Position Statement). *Diabetes Care* 17:616–623, 1994
94. Klein R, Moss SE, Klein BEK, Davis MD, DeMets DL: Wisconsin epidemiologic study of diabetic retinopathy. *Diabetes* 39:1445–1450, 1990.
95. Department of Health and Human Services: *Healthy People 2000: National Health Promotion and Disease Prevention Objectives*. (DHHS publication no. (PHS) 91–50212) Washington, DC, U.S. Govt. Printing Office, 1991
96. Eastman RC, Silverman R, Harris M, Javitt JCV, Chiang YP, Gordon P: Lessening the burden of diabetes: intervention strategies. *Diabetes Care* 16:1095–1102, 1993
97. Brechner RJ, Cowie CC, Howie J, Herman WH, Will JC, Harris MI: Ophthalmic examination among adults with diagnosed diabetes mellitus. *JAMA* 270: 1714–1718, 1993
98. Kleinman JC, Donahue RP, Harris MI, Finucane FF, Madans JH, Brock DB: Mortality among diabetics in a national sample. *Am J Epidemiol* 128:389–401, 1988
99. Donahue RP, Orchard TJ: Diabetes mellitus and macrovascular complications: an epidemiological perspective. *Diabetes Care* 15:1141–1155, 1992
100. Burchfiel CM, Hamman RF, Marwill JA, Baxter J, Kahn LB, Amirani JJ: Cardiovascular risk factors and impaired glucose tolerance: the San Luis Valley Diabetes Study. *Am J Epidemiol* 131:57–70, 1990
101. Stamler J, Vaccaro O, Neaton JD, Wentworth D, Multiple Risk Factor Intervention Trial Research Group: Diabetes, other risk factors, and 12-yr cardiovascular mortality for men screened in the Multiple Risk Factor Intervention Trial. *Diabetes Care* 16:434–444, 1993
102. Pecoraro RE, Reiber GE, Burgess EM:



- Pathways to diabetic limb amputation: basis for prevention. *Diabetes Care* 13: 513-521, 1990
103. Litzelman DK, Slemenda CW, Langefeld CD, Hays LM, Welch MA, Bild DE, Ford ES, Vinicor F: Reduction of lower extremity clinical abnormalities in patients with NIDDM: a randomized controlled trial. *Ann Intern Med* 119:36-40, 1993
  104. Clinical News: Study reveals surprise in major causes of diabetic foot ulcers. *Mod Med* 62:26, 1994
  105. Hallmon WW, Mealey BL: Implications of diabetes mellitus and periodontal disease. *Diabetes Educ* 18:310-315, 1992
  106. Krug LM, Haire-Joshu D, Hady SA: Exercise habits and exercise relapse in persons with noninsulin-dependent diabetes mellitus. *Diabetes Educ* 17:185-188, 1991
  107. Smith MF, Bobroff LB: Study of the effectiveness of a health-risk reduction program. *Eval & Health Prof* 14:88-89, 1991
  108. Baynes C, Feher MD, Elkeles RS: The effect of treatment of non-insulin-dependent diabetes mellitus (NIDDM) on serum lipids and lipoproteins. *Q J Med* 72:579-587, 1989
  109. Campbell, LV, Barth, R, Gosper, JK, Jupp, JJ, Simons, LA, Chisholm DJ: Impact of intensive education approach to dietary change in NIDDM. *Diabetes Care* 13:841-847, 1990
  110. Ford ES, Malarcher AM, Herman WH, Aubert RE: Diabetes mellitus and cigarette smoking. *Diabetes Care* 17:688-692, 1994
  111. Haire-Joshu D: Smoking, cessation and the diabetes health care team. *Diabetes Educ* 17:54-64, 1991
  112. Anderson R, Funnell M, Arnold M, Butler P, Feste C: Evaluation of a patient empowerment program (Abstract). *Diabetes* 43 (Suppl. 1):146A, 1994
  113. Anderson LA, Zimmerman MA: Patient and physician perceptions of their relationship and patient satisfaction: a study of chronic disease management. *Patient Educ Counseling* 20:27-36, 1993
  114. Kaplan SH, Greenfield S, Ware JE Jr: Assessing the effects of physician-patient interactions on the outcomes of chronic disease. *Med Care* 27 (Suppl.):110-127, 1989
  115. Glasgow RE, McCaul KD, Schafer LD: Barriers to regimen adherence among persons with insulin-dependent diabetes. *J Behav Med* 9:65-77, 1986
  116. Pichert JW, Murkin SC, Snyder GM, Boswell EJ, Kinzer CK: Problem-based diabetes education using a video anchor. *Diabetes Spectrum* 6:160-164, 1993
  117. Toobert DJ, Glasgow RE: Problem solving and diabetes self-care. *J Behav Med* 14:71-86, 1991
  118. American Diabetes Association: Implications of the Diabetes Control and Complications Trial (Position Statement). *Diabetes Care* 16:1517-1520, 1993
  119. Jovanovic L, Druzin M, Peterson CM: Effect of euglycemia on the outcome of pregnancy in insulin-dependent diabetic women as compared with normal control subjects. *Am J Med* 71:921-927, 1981
  120. Willhoite MB, Pennert HW, Palomaki GE, Zaremba MM, Herman WH, Williams JR, Spear NH: The impact of preconception counseling on pregnancy outcomes. *Diabetes Care* 16:450-455, 1993
  121. Elixhauser A, Weschler JM, Kitzmiller JL, Marks JS, Bennert HW Jr, Coustan DR, Gabbe SG, Herman WH, Kaufmann RC, Ogata ES, Sepe SJ: Cost-benefit analysis of preconception care for women with established diabetes mellitus. *Diabetes Care* 16:1146-1157, 1993
  122. American Diabetes Association: Gestational diabetes (Position statement). *Diabetes Care* 16 (Suppl. 2):5-6, 1993
  123. Coustan DR: Gestational diabetes: state of the union (Commentary). *Diabetes Care* 15:716-718, 1992
  124. Betschart JE, German, RR, Satterfield, DW, Klein, RJ: Progress toward achieving healthy people 2000 objectives for diabetes patient education. *Diabetes Educ* 20:391-92, 94, 96, 1994
  125. Lindeman CA: Patient education. *Annu Rev Nurs Res* 6:29-60, 1988
  126. Padgett D, Mumford E, Hynes M, Carter R: Meta-analysis of the effects of educational and psychosocial interventions on management of diabetes mellitus. *J Clin Epidemiol* 41:1007-1030, 1988
  127. Tiberius RG: *Small Group Teaching: A Trouble-Shooting Guide*. Toronto, The Ontario Institute for Studies in Education Press, 1989, p. 2-3
  128. Shaw ME: *Group Dynamics: The Psychology of Small Group Behavior*. 3rd ed. New York, McGraw-Hill, 1981, p. 169-174
  129. Funnell MM, Donnelly MB, Anderson RM, Johnson PD, Oh MS: Perceived effectiveness, cost and availability of patient education methods and materials. *Diabetes Educ* 18:139-145, 1992
  130. Brown SA: Studies of educational interventions in diabetes care: a meta-analysis of findings. *Nurs Res* 37:223-230, 1988
  131. Hosey GM, Freeman WL, Stracqualursi F, Gohdes D: Designing and evaluating diabetes education material for American Indians. *Diabetes Educ* 16:407-414, 1990
  132. Doak CC, Doak LG, Root JH: *Teaching Patients with Low Literacy Skills*. Philadelphia, PA, Lippincott, 1985
  133. Estey A, Musseau A, Keehn L: Comprehension levels of patients reading health information. *Patient Educ Counseling* 18: 165-169, 1991
  134. Glanz K, Rudd K: Readability and content analysis of print cholesterol education materials. *Patient Educ Counseling* 16:109-118, 1990
  135. Kicklighter JR, Stein MA: Factors influencing diabetic clients' ability to read and comprehend printed diabetic diet materials. *Diabetes Educ* 19:40-46, 1993
  136. Meade CD, Smith CF: Readability formulas: cautions and criteria. *Patient Educ Counseling* 17:153-158, 1991
  137. Streif LD: Can clients understand our instructions? *Image: J Nurs Scholarship* 18: 48-52, 1986
  138. Weinrich SP, Boyd M: Education in the elderly: adapting and evaluating teaching tools. *J Gerontol Nurs* 18:15-20, 1992
  139. Gagliano ME: A literature review on the efficacy of video in patient education. *J Med Educ* 63:785-792, 1988
  140. Turnin MCG, Beddock RH, Clottes JP, Martini PF, Abadie RG, Butsson JC, Duput CS, Conneu M, Camare R, Anton JP, Chrisment CY, Farreny H, Bayard F,

- Tauber JP: Telematic expert system diabetes. *Diabetes Care* 15:204-212, 1992
141. Elshaw EB, Young EA, Saunders MJ, McGarn WC, Lopez LC: Utilizing a 24 hour dietary recall in culturally specific diabetes education in Mexican-Americans with diabetes. *Diabetes Educ* 20:228-235, 1994
142. Brown SA, Duchin SP, Villagomez ET: Diabetes education in a Mexican-American population: pilot testing of a research based video-tape. *Diabetes Educ* 18:47-51, 1992
143. Coonrod BA, Betschart J, Harris MI: Frequency and determinants of diabetes patient education among adults in the U.S. population. *Diabetes Care* 17:852-858, 1994
144. Chapko MK, Norman J, Bell-Hart M, Nagusky D, Connell FA: Increasing the utilization of outpatient diabetes education programs. *Diabetes Educ* 13:116-119, 1987
145. Anderson RM, Hiss RG, Stepien CJ, Fitzgerald JT, Funnell MM: The diabetes education experience of randomly selected patients under the care of community physicians. *Diabetes Educ* 20:399-405, 1994
146. Glasgow RE, Toobert DJ, Hampson SE: Participation in outpatient diabetes education program: how many patients take part and how representative are they? *Diabetes Educ* 17:376-380, 1991
147. Kaplan R, Davis W: Evaluating the costs and benefits of outpatient diabetes education and nutrition counseling. *Diabetes Care* 9:81-86, 1986
148. Irvine AA, Mitchell CM: Impact of community-based diabetes education on program attenders and nonattenders. *Diabetes Educ* 18:29-33, 1992
149. Davis WK, Hull AL, Boutaugh ML: Factors affecting the educational diagnosis of diabetic patients. *Diabetes Educ* 4:275-278, 1981
150. Beeney LJ, Dunn SM: Knowledge improvement and metabolic control in diabetes education: approaching the limits? *Patient Educ Counseling* 16:217-229, 1990
151. Watson JF, DuFord S: Perceived and actual knowledge of diet by individuals with noninsulin-dependent diabetes. *Diabetes Educ* 18:401-406, 1992
152. Anderson RM, Fitzgerald JT, Oh MS: The relationship between diabetes-related attitudes and patients' self-reported adherence. *Diabetes Educ* 19:287-292, 1993
153. Prochaska JO, DiClemente CC, Norcross JC: In search of how people change: applications to addictive behaviors. *Am Psychol* 47:1102-1114, 1992
154. Ruggiero L, Prochaska JO: Readiness for change: application of the transtheoretical model to diabetes (Introduction). *Diabetes Spectrum* 6:22-24, 1993
155. Schlundt DG, Rea MR, Kline SS, Pichert JW: Situational obstacles to dietary adherence. *J Am Diet Assoc* 94:874-879, 1994
156. Anderson JM, Blue C, Lau A: Women's perspectives on chronic illness: ethnicity, ideology and restructuring of life. *Soc Sci & Med* 33:101-113, 1991
157. Pawlson LG: Chronic illness: implication of a new paradigm for health care. *J Qual Improv* 20:83-89, 1994
158. Greenfield S, Kaplan SH, Ware JE, Yano EM, Frank H: Patients' participation in medical care: effects on blood sugar control and quality of life in diabetes. *J Gen Intern Med* 3:448-457, 1988
159. Anderson LA, Jenkins C: Educational interventions in diabetes: where are we now? (Conclusions). *Diabetes Spectrum* 7:121-123, 1994
160. Kaplan RM: Behavior as the central outcome in health care. *Am Psychol* 45:1211-1220, 1990
161. Green LW, Kreuter MW: *Health Promotion and Planning: An Educational and Environmental Approach*. 2nd ed. Mountain View, CA, Mayfield Publishing, 1991
162. Muhlhauser I, Berger M: Diabetes and insulin therapy: when will they ever learn? *J Intern Med* 233:321-326, 1993
163. Goodall TA, Halford WK: Self-management of diabetes mellitus: a critical review. *Health Psychol* 10:1-8, 1991
164. Jacobson AM, Adler AG, Wolfsdorf JL, Anderson B, Derby L: Psychological characteristics of adults with IDDM: comparison of patients in poor and good control. *Diabetes Care* 13:375-381, 1990
165. Malone JM, Snyder M, Anderson G, Bernhard VM, Holloway GA, Bunt TJ: Prevention of amputation by diabetic education. *Am J Surg* 158:520-524, 1989
166. Barth R, Campbell LV, Allen S, Jupp JJ, Chisholm DJ: Intensive education improves knowledge, compliance, and foot problems in type 2 diabetes. *Diabetic Med* 8:111-117, 1991
167. Kruger S, Guthrie D: Foot care: knowledge retention and self-care practices. *Diabetes Educ* 18:487-490, 1992
168. Glasgow RE, Olsten VC: Evaluating diabetes education: are we measuring the most important outcomes? *Diabetes Care* 15:1423-1432, 1992
169. Anders CL: Evaluating the effectiveness of a diabetes education program. *Diabetes Spectrum* 6:314-319, 1993
170. Drozda DK, Dawson VA, Long DJ, Fresson LS, Sperling MA: Assessment of the effects of a comprehensive diabetes management program on hospital admission rates of children with diabetes mellitus. *Diabetes Educ* 16:389-393, 1990
171. Orme CM, Binik YM: Consistency of adherence across regimen demands. *Health Psychol* 8:27-43, 1989
172. Glasgow RE, McCaul KD, Schafer LC: Self-care behaviors and glycemic control in type I diabetes. *J Chronic Dis* 40:399-412, 1987
173. Kingery PM, Glasgow RE: Self-efficacy and outcome expectations in the self-regulation of non-insulin-dependent diabetes mellitus. *Health Educ* 20:13-19, 1989
174. Lundman B, Norberg A: Coping strategies in people with insulin-dependent diabetes mellitus. *Diabetes Educ* 19:198-204, 1993
175. Wooldridge KL, Wallston KA, Graber AL, Brown AW, Davidson P: The relationship between health beliefs, adherence, and metabolic control of diabetes. *Diabetes Educ* 19:495-500, 1992
176. Terry P, Wogleitner T, Bikowski D, McCoy C: Does health education work? *Park Nicollet Med Foundation Health Educ Cent Bull* 37:95-109, 1993