

Meeting Quality Standards for Self-Management Education in Pediatric Type 2 Diabetes

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Abstract

Educational interventions in pediatric practices have typically focused on individuals with type 1 diabetes. Because the prevalence of type 2 diabetes is increasing in pediatric patients, the process of diabetes self-management education (DSME) must be expanded to incorporate appropriate materials and methods for youth with type 2 diabetes. To meet quality education

standards in a pediatric program, DSME should be individualized, be provided by a multidisciplinary team, involve family members, and strategize behavior change with opportunities for periodic reinforcement. Content areas for a comprehensive DSME program for youth with type 2 diabetes are outlined, and an annotated bibliography of available materials is provided.

In the past, type 1 and type 2 diabetes were primarily distinguished by the age of onset or insulin dependency. For many years, type 1 diabetes was known as juvenile or insulin-dependent diabetes, and type 2 diabetes was labeled adult-onset or non-insulin-dependent diabetes. In recent decades, practitioners have noticed an increasing trend of type 2 diabetes in the pediatric population^{1,2} as a consequence of obesity believed to be from poor nutrition habits and less physical activity.^{3,4} No accurate estimate is available for the incidence of type 2 diabetes in the North American pediatric population.⁵ It is now projected that one in every three Americans born in 2000 will develop diabetes.⁶

Diabetes self-management education (DSME) is a crucial component of treatment for all individuals with a diagnosis of diabetes. Educational interventions in pediatric practices have typically focused on individuals with type 1 diabetes. Because the prevalence of type 2 diabetes is increasing in pediatric patients, the process of DSME must be expanded to incorporate materials and methods relevant to this population. This article describes how DSME 1) can be tailored to youth with type 2 diabetes and 2) can meet education

standards in a pediatric program.

Structure of DSME

Curriculums should be developmentally focused to meet the educational needs of pediatric patients with type 2 diabetes.⁷ Because these youngsters are adolescents or sometimes school-age children, a two-pronged approach to curriculum formation is suggested, in contrast to curriculums for type 1 diabetes, which have traditionally included five levels of development based on cognitive developmental theory. Self-management teaching for adolescents should be child-focused, in contrast to self-management teaching for school-aged children, which involves a balance between the family and child.⁸

According to the national standards for DSME,⁹ a multidisciplinary instructional team is recommended for optimal educational intervention. Minimally, this team must consist of a registered nurse and a registered dietitian. Because weight reduction is a treatment focus in type 2 diabetes, the registered dietitian is an especially vital member of the instructional team. Other members of the multidisciplinary team may include family members, medical practitioners, certified diabetes educators, social workers, psychologists, exercise physiologists, and pharmacists.³

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Evidence-Based Pediatric Diabetes Education

Scientific literature has been summarized in six quantitative reviews¹⁰⁻¹⁵ and two integrative reviews^{16,17} consistently suggesting that DSME has a moderate positive effect on various biological and psychosocial outcomes for individuals with type 2 diabetes. Only one review¹⁵ included studies with pediatric subjects. One integrative review of the literature addressed education in pediatric type 1 diabetes only.¹⁸

Diet instruction had large effects on psychological, knowledge, and compliance outcomes and a moderate effect on physical outcomes when pediatric and adult samples were combined in a meta-analysis of 93 published and unpublished studies from 1976 to 1986.¹⁵ Number of hours with an educator was associated with a significant decrease in hemoglobin A_{1c} (A1C), and DSME improved control in adults with type 2 diabetes when 31 published studies were combined in a more recent meta-analysis.¹⁴ Several reviews have suggested that DSME must be combined with behavioral strategies¹⁵⁻¹⁷ and include follow-up with reinforcement^{14,16,17} to achieve optimal outcomes.

Randomized controlled trials of individual or group approaches to DSME are needed in the pediatric population with type 2 diabetes.

Process of DSME

Before the education intervention, an individualized initial assessment of the child or adolescent with type 2 diabetes and his or her family should be completed.^{3,4} The assessment includes questions pertaining to medical history, social history, diabetes knowledge, and readiness to learn (Table 1). Because minority youth are disproportionately affected,⁵ special attention to cultural background is important to obtain information about dietary influences and health beliefs or attitudes that will help to individualize the teaching plan. Although families may have family experience with the disease, they may have limited economic and social resources. Based on this specific information, suitable educational materials and interventions can be selected. Reassessment is important before each continuing education session.

Table 1. Individualized Assessment for Pediatric Type 2 Diabetes Patients

Medical History

Personal Medical History

- Prenatal: mother with gestational diabetes
- Birth weight
- Serial plot of BMI
- Past illnesses: recurrent or chronic conditions, physical limitations
- Developmental history: major milestones met, cognitive ability, academic achievement
- Pertinent laboratory results: fasting or random blood glucose, oral glucose tolerance test, past A1C, antibodies
- Diabetes onset: age at diagnosis, associated type/duration of symptoms, laboratory results, complications

Family History

- Type 1 or type 2 diabetes
- Obesity
- Hypertension
- Heart disease

Present Illness

- Current medications
- Current associated signs and symptoms of hyper- and hypoglycemia
- Physical findings: blood pressure, BMI, weight loss or gain, acanthosis nigricans, lipohypertrophy, necrobiosis diabetorum
- Current blood glucose monitoring regimen: how often, timing with medication
- Current nutrition plan: eating habits, overeating or undereating, daily food consumption using 24-hour recall or food frequency, food preparation responsibilities, food preferences
- Current exercise plan: favorite activities, number of minutes per week, participation in organized sports, amount of TV and other sedentary activities
- Current A1C and lipid profile

Social History

Family Demographics

- Number of family members
- Other caregivers

Parent/Guardian's Socioeconomic Status

- Income
- Education level
- Insurance status

Support Systems

- Family
- Friends
- School personnel

High-Risk Behaviors

- Drug use
- Smoking
- Alcohol consumption
- Sexual activity

Cultural Background

- Language
- Dietary influences
- Health beliefs/attitudes

School

- Current grade
- Type: public, private, home
- Attendance
- Performance
- Peer groups
- Physical education
- Nurse availability
- Support for self-monitoring, medication administration (if required), assistance with hypoglycemia (if applicable)

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Table 1. Individualized Assessment for Pediatric Type 2 Diabetes Patients, *cont'd from p. 41***Diabetes Knowledge***Previous Diabetes Education*

- Total contact hours: primary care provider, nurse, dietitian, or diabetes educator
- Content areas addressed
- Success with prior behavioral contracts

Skill Performance

- SMBG
- Insulin preparation and administration (if required)

Readiness to Learn*Child/adolescent*

- Appointment attendance
- Attention to presentation
- Questions
- Requests for assistance
- Willingness to lose/maintain weight or exercise
- Willingness to change eating behavior (decrease portion sizes, give up sugared drinks, not skip meals)

Parent/caregiver

- Attention to presentation
- Questions
- Requests for assistance
- Willingness to participate in weight management or exercise (if applicable) or to encourage patient

Effective education plans are based on comprehensive assessment data. Once an assessment is completed, goals and content areas for teaching are identified. Published resources such as Diabetes Education Goals¹⁹ can be used. Age-appropriate goals for type 2 diabetes teaching sessions may be selected from this reference for either initial or continuing education with many goals applicable for youth as well as adults.

Based on reviews of the scientific literature, education interventions are most effective when they are combined with behavioral change strategies^{16,17} and occur with an educator over an extended period of time.¹⁴ One approach would be for both the youth with diabetes and parent(s) or caregiver(s) to attend focused single-topic education sessions scheduled for no longer than 30-minute intervals. Opportunity for reinforcement of previous education is important to build into an education plan. Successful attainment of mutually defined self-management goals requires an ongoing effort for individuals with diabetes with support from their family and educator.

All 10 content areas identified in the national standards for DSME⁹ are

applicable to pediatric patients with type 2 diabetes.³ However, not all 10 content areas must be addressed with every patient; teaching topics should be based on individual patient education needs. A DSME curriculum for children or adolescents with type 2 diabetes should be developmentally based and individualized based on the assessment. Content areas and specific topics applicable to pediatric patients with type 2 diabetes are shown in Table 2, although, practically, only a single content area might be addressed with the individual patient in an education session.

Disease process of type 2 diabetes

Youngsters and their parents need to have a fundamental understanding of the disease process for type 2 diabetes to have successful outcomes.⁸ Verbal explanation of the disease process is especially inadequate for teaching school-aged children or adolescents with type 2 diabetes. Concrete images, such as models of the human body or drawings of pathophysiology, are useful when describing the disease. Video recordings and workbooks need to be developed that depict images of youth with type 2 diabetes.

Nutritional management

Medical nutrition therapy is one of the most important areas of diabetes education for all patients with type 2 diabetes.^{4,7} Working with children and adolescents raises great difficulty when designing and implementing a nutrition program if the whole family does not participate. Youngsters have to eat what is available to them. When fast food, pizza, or junk food make up a family's main form of nutrition, it is extremely difficult for a child to make dietary changes. Consequently, it is important to involve the entire family in planning behavioral and lifestyle changes. Achieving nutritional goals begins with bringing home healthy foods for meals and snacks.⁴

Dietary changes should be focused on decreasing high-calorie, high-fat foods and increasing fruits, vegetables, and whole grains.²⁰ Fluid intake should be limited to water and beverages containing artificial sweeteners. Skipping meals and eating unhealthy between-meal snacks should be discouraged.²¹ Visual tools, such as food models and the new food pyramid, aid in the educational process. Many existing nutrition materials designed for use with adults with type 2 diabetes are suitable for use with pediatric patients.

Referral should be made to a dietitian who is knowledgeable about the nutritional needs of children and adolescents with diabetes.³ Children need adequate caloric intake for normal linear development. Therefore, promotion of weight maintenance for younger children is a primary goal to allow time for children to grow into their present weight. Dieting for pediatric type 2 diabetes patients is not generally recommended unless supervised by a pediatric dietitian.⁴ As with school-aged children, adolescents need ample caloric intake for pubertal growth spurts. However, if the growth spurt has already occurred, a recommended decrease of 250–500 calories daily is sufficient,⁹ and careful monitoring of growth is necessary. Dietary interventions for severely obese older adolescents with comorbid conditions should be individualized.²²

Physical activity

Regular physical activity is another important content area for type 2 diabetes education.^{3,7} Exercise helps to

Table 2. Content Areas and Topics for Diabetes Education

Content Area	Topics for Initial or Continuing Education
Diabetes disease process	<ul style="list-style-type: none"> • Overview of the disease process, including difference between type 1 and type 2 diabetes and metabolic impact of type 2 diabetes • Treatment options
Nutritional management	<ul style="list-style-type: none"> • How to read nutrition labels • How to make appropriate food choices, including fast food and fluids • Family participation in food purchases and preparation • Guidelines for meal and snack planning, including reduction of total daily caloric and fat intake and limitations on portion sizes • How to change food behavior habits
Physical activity	<ul style="list-style-type: none"> • Increase amount, type, and frequency of daily activity • Limit sedentary activity • Effect of exercise on blood glucose level; preventing hypoglycemia (if applicable)
Medications	<ul style="list-style-type: none"> • Insulin storage, preparation, and administration (if required) • Oral medication(s): action, dose, frequency, adverse reactions
Monitoring	<ul style="list-style-type: none"> • SMBG: frequency, technique, recording results • How to interpret blood glucose and A1C results
Acute complications	<ul style="list-style-type: none"> • Hypoglycemia recognition, treatment, prevention (especially if taking insulin or insulin secretagogue)
Chronic complications	<ul style="list-style-type: none"> • Age-appropriate explanation of relationship of existing complications to diabetes diagnosis • Age-appropriate explanation of risk for microvascular and macrovascular changes associated with poor diabetes control or hyperlipidemia
Goal setting	<ul style="list-style-type: none"> • Assistance in setting realistic achievable behavior change goals (especially for exercise and weight management) • Day-to-day problem solving
Psychosocial adjustment	<ul style="list-style-type: none"> • School support for diabetes self-management: age-appropriate supervision of meals/snacks, SMBG, medication administration (if required), medication side effects (diarrhea, gastric upset if taking metformin), hypoglycemia, hyperglycemia; supplies; communication with parent/guardian about school issues; privacy; participation • Management of overnight stays away from home (especially if taking insulin) • School-age issues: appropriate parental supervision • Adolescent issues: adherence to treatment plan, independence from parents, peer pressure, use of tobacco, alcohol, and drugs
Preconception care	<ul style="list-style-type: none"> • Adolescent issues: relationship between diabetes control and pregnancy outcomes, pregnancy avoidance, safe sex

burn fat, increase energy expenditure, decrease comorbidities such as hypertension and dyslipidemia, and maintain weight loss. It not only has favorable effects on cardiovascular health and lipid status, but it also decreases insulin resistance, therefore helping to normalize blood glucose levels.⁷

Exercise programs should also involve the whole family and be enjoyable.⁴ Physical activities should start slowly and gradually increase in intensity as tolerance builds. For sedentary individuals, Beck et al.²³ suggest starting with a short walk of 15–20 minutes in duration a few times a week. These walks should progressively build up to 30-minute

workouts 5–7 times a week while alternating to either increase duration or intensity. Parents can help children incorporate activity into their day by going on family walks or bike rides or playing ball in the yard. Individual activity should be encouraged instead of group sports because of decreased physical ability. Prolonged daily TV viewing and computer and electronic game playing should be limited.²¹

Medication use

Only two pharmacological agents—insulin and metformin—are approved for use in pediatric type 2 diabetes. Insulin is approved for use

with all pediatric patients, whereas metformin is only approved for children ≥ 10 years of age.⁵ Other oral medications available for adults with type 2 diabetes, such as sulfonylureas, meglitinides, or thiazolidinediones, may be used in pediatric patients, although the U.S. Food and Drug Administration has not approved these medications for use in children and adolescents.

Educational materials about insulin preparation and administration for pediatric patients with type 1 diabetes can also be used for teaching patients with type 2 diabetes. Written medication information about oral diabetes medications is useful for explaining

the medication action, appropriate dosing, and side effects.

Pharmacological treatment for hypertension or hyperlipidemia may be prescribed. Written medication information should also be provided to explain the medication action, appropriate dosing, and side effects.

Blood glucose monitoring

Self-monitoring of blood glucose (SMBG) is indicated for children and adolescents with type 2 diabetes to prevent and detect hypoglycemia, avoid severe hyperglycemia, adjust medications, and determine exercise and meal plan effects on blood glucose levels.⁷ Rationale; techniques of SMBG, including meter quality control; and use of results must be clearly taught. Based on the youngster's individual needs and goals, the timing and frequency of blood glucose testing is recommended by the practitioner.⁷ SMBG skills should be demonstrated, and return demonstrations should be observed when a new meter is prescribed.

A daily written glucose log is a good reference for assessing blood glucose goals and adjusting the medication regimen. Individuals can be taught to interpret data and respond to blood glucose patterns by adjusting food intake, exercise activity, and possibly pharmacological therapy to achieve optimal glucose control.⁷ It is also very important to educate individuals and families about how to deal with blood glucose fluctuations on sick days, especially for individuals who are taking insulin.

Routine follow-up care every 3–4 months is needed for youngsters being treated for type 2 diabetes to assess diabetes control and screen for any possible comorbid conditions and complications.²⁴ Youth with diabetes are able to understand a simple explanation of the meaning of A1C results and treatment goals for optimal diabetes control.

Complications information

Acute complications. Recognition and treatment of hypoglycemia is important with insulin therapy or oral medications that stimulate insulin production, although youth with type 2 diabetes may not experience symptomatic low blood glucose because of insulin resistance.⁵ School-aged children and adolescents with type 2 dia-

betes who are at risk for developing hypoglycemia must be equipped with rapid-acting carbohydrate-containing foods or fluids for treatment of hypoglycemia. Personalized strategies for safely dealing with hypoglycemia can be developed during the education session.

Chronic complications. All practitioners should educate individuals with diabetes about the seriousness of chronic hyperglycemia.² Youngsters are at greater risk for developing complications because of the early age of disease onset. Complications may even be present at the time of diagnosis.⁵ With the increasing numbers of youth developing the disease, the consequences for patients, health care professionals, and economic resources will be catastrophic if proper interventions are not implemented in a timely manner. Young people have the advantage of being able to adopt optimal lifestyle behaviors early in life to prevent heart, dental, and eye disease; skin disorders; and foot complications. The significance of foot examinations among school-aged children and adolescents is unclear, but these examinations are inexpensive, fast, and can be a good time for education of proper foot care; therefore, they should not be excluded.³

Goal setting. Lifestyle modification is needed to meet therapeutic goals successfully. Contracting is useful for setting mutually defined goals related to daily activities, such as SMBG, healthy eating, regular physical exercise, and accurate, safe medication use. Goal statements are written in measurable and attainable terms within a realistic time frame and evaluated at follow-up appointments.³

Effective problem-solving of day-to-day issues in the self-management of diabetes is important for youth with type 1 or type 2 diabetes. Emotional support for children and families is integral to lifestyle change.²¹ Evaluation of the teaching process should incorporate assessment of ability to safely apply information from DSME to everyday living.

Psychosocial adjustment. Transition to independent self-care is a goal in late adolescence. The peak age of onset for pediatric type 2 diabetes is adolescence.⁴ Adolescence is a difficult time and is complicated by demands of chronic illness. Youth

diagnosed with diabetes face many psychosocial issues that are compounded by a regimen with complex care requirements, which renders success at optimal self-care a daily challenge.

Many youngsters with type 2 diabetes follow their treatment regimen strictly at diagnosis, but later rebel and refuse to comply.⁴ During this time in life, blood glucose becomes increasingly harder to control, perhaps because of the negative effects of growth hormone on insulin usage.³ Feelings of frustration may precipitate a desire to refuse to adhere to the treatment plan. Adolescents with diabetes may also struggle with fitting in with their peers, and when diabetes is associated with obesity, additional issues of negative self-image and self-esteem make coping more difficult. All teenagers need to be educated about the dangers of smoking and alcohol use. Teenagers with diabetes can learn how smoking and alcohol use are especially problematic for someone with diabetes.

Practitioners are in a position to help teenagers develop the skills they need to overcome the frustrations of life during this time. The multidisciplinary team needs to support individuals and their family members in exploring potential barriers to self-care and strategies to overcome them. Frequent contact with educators or referral to a psychologist or mental health professional may be helpful.

Preconception care. Education about pregnancy prevention and safe sex is the same for teens with type 2 diabetes as it is for teens with type 1 diabetes.²⁴ Excellent diabetes control is a prerequisite for healthy pregnancy outcomes. For young women taking oral diabetes medications, pregnancy must be avoided because of risk from teratogenic drug effects. Education about preconception care involves discussion about specific measures to either abstain from sex or use contraception.

Available Materials for Pediatric Type 2 Diabetes Education

Few curriculums and educational materials have been published that are specifically targeted to youngsters with type 2 diabetes. Children are not simply small adults, so pediatric materials and methods must be

developed and tested with this population. An annotated bibliography of selected available written and web-based educational material is presented in Table 3. Currently, there is not a single reference that completely addresses every topic area. Consequently, additional material would be useful to meet the needs of this population.

Outcomes of DSME

Type 2 diabetes among youth is a significant clinical problem for practitioners treating pediatric patients. This relatively new phenomenon, especially in school-aged children, remains poorly investigated, especially in terms of the effectiveness of interventions for DSME in this population. Until data from pediatric type 2 dia-

betes education studies are available, approaches to lifestyle change that are known to be effective with obese children without diabetes may be useful. During the past decade, treatment regimens have been designed to mimic that of adult patients with the same disease. The goal of therapy is to normalize blood glucose and A1C levels, promote weight control, and control

Table 3. Annotated Bibliography of Available Educational Materials

Printed Material

- Betschart-Roemer J: *Secrets for Success: Type 2 Diabetes in Teens*. New York, Wiley & Sons, 2002

This is an excellent book for any teen diagnosed with type 2 diabetes. It gives in-depth information on diabetes, how to control blood glucose, balancing exercise and insulin injections, healthy eating, and managing cravings and gives tips on dealing with the stresses of growing up with this chronic disease. A unique aspect of the book is the different personal stories of teenagers living with diabetes. These stories may help kids identify with others facing a variety of struggles. The book also gives parents suggestions to help their teen successfully manage the disease. It addresses 7 of the 10 content areas for DSME: disease process, nutritional management, physical exercise, SMBG, medications, acute complications, and psychosocial adjustment.

- Chase P: Type 2 Diabetes. In *Understanding Diabetes*. 10th ed. Denver, Colo., Barbara Davis Center for Childhood Diabetes, 2002, p. 18–25

In this book, the main discussion focuses on type 1 diabetes; however, this chapter discusses type 2 diabetes. It is presented at an 8th grade reading level with wonderful cartoon illustrations of the Pink Panther that help to engage readers. The chapter contains teaching and learning objectives that address 7 of the 10 content areas for DSME: disease process, medications, nutritional management, physical activity, SMBG, detecting and treating acute complications, and preventing chronic complications.

- Wysocki T: *The Ten Keys to Helping Your Child Grow Up With Diabetes*. 2nd ed. Alexandria, Va., American Diabetes Association, 2004

This book was originally written 7 years ago with diabetes type 1 as its focus. The second edition has been revised to include type 2 diabetes. It is a great resource for parents and caregivers in need of information about day-to-day emotions kids and teens face when living with diabetes. The author includes ways to effectively communicate with youngsters, skills and steps for transferring diabetes management to adolescents, and information related to school education. One unique aspect of this book is the “for fathers only” sections in several chapters, which is important because often mothers assume the majority of diabetes management responsibility.

Electronic Material

- The National Diabetes Education Program located online at www.ndep.nih.gov

This website has four free quick reference sheets for children and their families to access for diabetes education. These tip sheets are easy to read and understand and provide excellent information on what diabetes is, being active, eating healthy foods, and staying at a healthy weight. They provide great ideas to help take charge and successfully manage the disease.

This website also includes *Helping the Student With Diabetes Succeed: A Guide for School Personnel*, which was developed by the National Diabetes Education Program. It provides comprehensive information on diabetes, management tips, and different ways each staff member can help meet the needs of students with diabetes. It also offers suggestions for managing special events, such as field trips and extracurricular activities. Most importantly, it provides a quick reference guide to emergency situations for school personnel to follow.

- American Diabetes Association located at www.diabetes.org

The American Diabetes Association (ADA) has a website for everyone with diabetes; however, the site has a special link for parents and kids with diabetes. Here, they can learn about the disease process, healthy eating, how to start an exercise program, hypo- and hyperglycemia, insulin (if applicable), and ways to relate to diabetes team members. There are also fun sites for children and teens that are presented at their education level. One unique aspect of the website is its interactive games, which reinforce learning.

any comorbidities that may develop. Successful treatment plans for pediatric patients with type 2 diabetes include multiple lifestyle changes, increased physical activity, and diet modification, as well as improvement in quality of life and maintenance of normal growth and development. Primary prevention, rather than management, of obesity and type 2 diabetes in youth is the ultimate goal in our society.

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