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Diabetes preparedness in schools: what do foodservice personnel need to know to respond?

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Please note that this study was published before the implementation of Healthy, Hunger-Free Kids Act of 2010, which went into effect during the 2012-13 school year, and its provision for Smart Snacks Nutrition Standards for Competitive Food in Schools, implemented during the 2014-15 school year. As such, certain research may not be relevant today.

ABSTRACT

Diabetes is increasing in youth, presenting a serious public health threat. Although type 1 diabetes has historically been more common in children, type 2 diabetes is on the rise, linked to increases in overweight and obesity among American youth, particularly those of high risk racial and ethnic groups. Foodservice personnel, along with other members of the school community, will require knowledge, skills, and preparation to respond to the daily management needs of children with diabetes, in order to support optimal health and learning. Diabetes awareness training is necessary to understand overall treatment strategies, factors affecting blood glucose levels, warning signs and treatment of hypoglycemia, and basic dietary strategies for diabetes meal planning. Providing healthy school meals which meet the Dietary Guidelines for Americans will further support diabetes management as well as help prevent type 2 diabetes in children.

Diabetes Prevalence and Risk is Increasing in Youth

Diabetes mellitus (diabetes) is increasing in prevalence in the United States (U.S.) and worldwide. The latest government estimates indicate that 23.6 million Americans have diabetes, and another 57 million have pre-diabetes, a condition in which blood glucose levels are elevated, but not high enough to be classified as diabetes (Centers for Disease Control and Prevention [CDC], 2008). Pre-diabetes is a risk factor for future development of diabetes and other chronic health conditions. Uncontrolled diabetes may lead to serious health complications, including heart disease, stroke, lower limb amputation, kidney disease, and blindness.

Diabetes prevalence is increasing in children as well as adults, presenting a serious global health threat to youth (Pinhas-Hamiel & Zeitler, 2005). About 186,300 or 0.2% of all young people under the age of 20 in the U.S. are diagnosed with type 1 or type 2 diabetes (CDC, 2008). Until recently, the majority of cases of childhood diabetes represented type 1, an autoimmune disorder in which insulin-producing cells of the pancreas are destroyed in response to incompletely understood genetic and environmental factors. Type 1 diabetes requires insulin replacement through daily injections or insulin pump therapy (American Diabetes Association [ADA], 2005). Type 1 diabetes affects about 1 in 523 youth, and is increasing in prevalence worldwide, particularly in non-Hispanic white youth (Devendra, Liu, & Eisenbarth, 2004).

Historically a disease of older adults, type 2 diabetes is becoming more common in youth, paralleling recent increases in rates of childhood obesity. Features of type 2 diabetes include the inability to utilize insulin effectively (insulin resistance) with progressive insulin deficiency. Type 2 diabetes has a strong familial link, and is more prevalent in people of minority race/ethnic groups (ADA, 2000). The SEARCH for Diabetes in Youth Study Group (2006) showed that type 2 diabetes

accounted for 3,700 diagnosed new cases of diabetes in 2001, with rates dependent on age, gender, and race/ethnicity. While these cases of type 2 diabetes are still relatively infrequent in the overall population, early warning signs of pre-diabetes (impaired fasting glucose or impaired glucose tolerance) are emerging. Between 1999 and 2000, 7.0% of all American adolescents aged 12-19 exhibited impaired fasting glucose (CDC, 2008), with overweight and minority youth showing greater susceptibility (Sinha et al, 2002; STOPP-T2D Prevention Study Group, 2006).

The onset of diabetes in childhood or adolescence can present chronic health implications, similar to those seen in adults diagnosed with the disease. Risk factors for cardiovascular disease, such as hypertension or abnormal blood lipids, are present at diagnosis for many children with both type 1 and type 2 diabetes (Rodriquez et al., 2006). Maintaining near-normal blood glucose levels has been shown to slow the onset and progression of many of the complications of diabetes (Diabetes Control and Complications Trial Research Group, 1994). Treatment goals include achieving individualized blood glucose levels and other metabolic outcomes through a balance of diet, physical activity, and medication, if necessary.

Currently there is no known means of preventing type 1 diabetes, but research has shown that implementing healthy lifestyle behaviors in diet and physical activity can reduce the rate of progression of pre-diabetes to type 2 diabetes (Knowler et al., 2002). It is critical to identify children who are at risk of developing type 2 diabetes for early intervention. Recommendations have been developed for screening youth for type 2 diabetes (ADA, 2008b).

Management of Diabetes in the School Setting

Federal laws protect the rights and confidentiality of children with defined disabilities, including diabetes (Americans with Disabilities Act of 1990; Individuals with Disabilities Education Act; Rehabilitation Act of 1973; & U.S. Department of Agriculture [USDA] non-discrimination regulations, 7 CFR 15b), and require provision of necessary medical and educational accommodations, and related aides and services for applicable children in the school setting. Additionally, the national school meals programs (USDA, 7 CFR 210-299) require dietary substitutions for medically certified children whose disabilities impact their diets and feeding.

As the number of children with diabetes increases in the general population, school personnel will increasingly be called upon to implement provisions of diabetes-related medical and educational management plans. Successful diabetes management is important for optimal academic performance (McCarthy, Lindgren, Mengeling, Tsalikian, & Engvall, 2003), and requires knowledge and self-care skills pertaining to medications, meal planning, exercise, stress, sick-days and other issues which may impact blood glucose levels. Planning and communication is essential between the student, parents/guardian, the healthcare team, and members of the school community to ensure student safety in school, and otherwise assist with the many daily tasks of diabetes self-care.

School foodservice staff play key roles in supporting children with diabetes. They may be asked to provide meal substitutions or nutrition information pertaining to school meals to students and their families for meal planning (e.g., portion size of menu items, grams of carbohydrates, total fat, or calories per serving). Cafeteria staff may assist young children with portion selection, observe their food intake, and respond to signs and symptoms of hypoglycemia around meal times. Foodservice personnel will benefit from diabetes awareness training, including a review of diabetes meal planning, to better provide a supportive school meal environment.

Fundamentals of Diabetes Meal-Planning

Nutrition-related goals for youth with diabetes include provision of adequate calories and nutrients for normal growth and development, and achievement of near-normal blood glucose levels to prevent or reduce the risk of diabetes-related complications (Franz et al., 2002). In type 1 diabetes, insulin regimens are usually integrated into the child's usual eating and physical activity habits. For youth with type 2 diabetes, positive behavior changes in eating and physical activity are encouraged. Wherever possible, nutrition goals should reflect children's individual needs, and personal and cultural preferences (ADA, 2000).

Role of Macronutrients in Achieving Metabolic Goals in Diabetes

The basic nutritional requirements for children with diabetes are the same as for all children. Recommendations for a healthy diet for children ages 2 and older are embodied in the 2005 Dietary Guidelines for Americans (U.S. Department of Health and Human Services [USDHHS] & USDA, 2005). A nutrient dense eating pattern which is rich in fruits, vegetables, whole grains, and low fat dairy, and low in saturated fat, trans fat, and cholesterol is recommended for optimal health and to prevent chronic disease, including type 2 diabetes. Supporting the nutrition-related goals of diabetes meal planning requires an understanding of the function of macronutrients such as carbohydrates, proteins, and fats, and their effect on blood glucose response and overall health. Carbohydrates from foods such as fruits, vegetables, grains, legumes, dairy, and sweets, are primary dietary sources of readily available energy in the body. After digestion, carbohydrates are completely absorbed into the bloodstream in the form of glucose, or blood sugar. Compared to the action of other macronutrients, carbohydrates are largely responsible for raising post-meal blood glucose levels (Franz et al., 2002). Carbohydrate foods also supply many important vitamins, minerals, fiber, and other substances needed for good health. In order to balance the need for healthy carbohydrate foods with blood glucose goals, monitoring and moderating the total amount of carbohydrate consumed at meals and snacks remains a key strategy in diabetes meal planning (ADA, 2008a).

While protein and fat have less of a direct effect on blood glucose levels after meals compared to carbohydrates, these macronutrients play important roles in diabetes meal planning. Adequate protein intake is important in all children for proper growth and development. Protein needs for children with diabetes with normal renal function are similar to those without diabetes, and can be met through typical U.S. intake patterns (Franz et al., 2002). The Dietary Guidelines for Americans may be used as a meal planning guide for selection of appropriate portions of healthy protein choices, including lean meats, poultry, fish, seafood, and vegetable sources such as legumes and soy products

In order to reduce the significant risk for cardiovascular disease in individuals with diabetes, particularly type 2 diabetes, nutrition recommendations include a dietary pattern that is low in total, saturated, and trans fats, as well as low in cholesterol and sodium (ADA, 2008a). The American Heart Association dietary guidelines (Lichtenstein et al., 2006), the Dietary Approaches to Stop Hypertension (USDHHS, National Institutes of Health, & National Heart, Lung, and Blood Institute, 2006) and the Dietary Guidelines for Americans (USDHHS & USDA, 2005) are examples of dietary patterns which incorporate these recommendations.

Integrating Food, Physical Activity, and Medications

Diabetes self-management education typically includes training on meal planning conducted by Registered Dietitians and Certified Diabetes Educators, in conjunction with other members of the child's healthcare team. A diabetes meal plan includes recommendations for the total amount of carbohydrate and other foods at meals and snacks; guidelines for mealtime doses of insulin based on amount of carbohydrate consumed (insulin to carbohydrate ratios); optimal timing of meals and snacks in relation to the medication regimen and daily schedule; target blood glucose goals before and after meals; and adjustments to medication or food intake for physical activity, illness, and other special circumstances. For children using meal-time insulin, pre-meal (bolus) doses are coordinated with the amount of carbohydrate consumed, in order to achieve post-meal blood glucose goals. For fixed insulin doses, consistency with timing and carbohydrate content of meals and snacks is important. Adjusting bolus insulin doses based on projected or actual carbohydrate intake at meals allows greater flexibility with meal timing and content. For children with type 2 diabetes, incorporating healthier food choices, along with increased physical activity, represent primary strategies to improve weight and decrease insulin resistance and co-morbidities of diabetes. Meal plans may include suggested portion sizes of foods, and targets for total carbohydrates, total fat, saturated fat, and calories.

Avoiding hypoglycemia, or abnormally low blood glucose, is a key management goal for children with diabetes. Potential causes of hypoglycemia include an imbalance of medication and food, delayed or skipped meals and snacks, and increased or vigorous physical activity. Symptoms of mild to moderate hypoglycemia can be varied in children, and may include shakiness, dizziness,

sweatiness, hunger, irritability, confusion, and mood changes. Treatment includes administration of a fast-acting source of carbohydrate, such as 3-4 glucose tablets, 4 ounces of juice, or 8 ounces of low fat or non-fat milk (Steil, 2006). Severe hypoglycemia may result in loss of consciousness or coma, and is a medical emergency. Emergency response procedures should be clearly outlined in the student's emergency medical plan, and reviewed in advance with all appropriate school personnel. School foodservice staff must be aware of the risk of hypoglycemia prior to lunch period, and after gym or recess periods. Prompt service of meals and adequate time for meal consumption can also help to prevent hypoglycemia in the cafeteria setting.

Tools and Strategies for Diabetes Meal Planning

In order to assist the student with diabetes at meal times, school personnel, including the school nurse and foodservice staff, will require information on the type of meal plan used by a student. Several tools and strategies are used by consumers and nutrition professionals for diabetes meal planning. Exchange lists (ADA & American Dietetic Association, 2003) categorize foods into three main groups (i.e., carbohydrates, meat/meat substitutes and fats) and show "exchanges", or portions of different foods having the same nutritional content. One exchange of a food item is approximately equal to another on the same list, and therefore can substitute within a list to meet meal plan goals. Carbohydrate counting is a flexible meal planning approach, based on the principle that the total amount of carbohydrate consumed has a greater affect on blood glucose than the specific type (Gillespie, Kulkarni, & Daly, 1998). Nutrition professionals calculate carbohydrate goals for meals and snacks. One carbohydrate serving of a carbohydrate-containing food provides about 15 grams of carbohydrate, but typical meal-time portions for children may reflect multiple servings and are based upon individual needs. Information needed for accurate carbohydrate counting may be obtained from recipes, reference lists such as Exchange Lists, and the Nutrition Facts label on packaged and prepared foods. Necessary information includes the serving size, and grams of total carbohydrate per serving. The total amount of carbohydrate consumed is then calculated based on the actual portion consumed. Other methods of diabetes meal planning include plate methods, in which a divided dinner plate serves as a visual tool for identifying suggested portion sizes of various foods in the meal plan (Camelon et al., 1998).

Recommendations for Providing a Diabetes-Supportive School Meal Environment

For children living with chronic diseases such as diabetes, daily food choices play an integral role in overall disease management. It is critical that the school environment be supportive of children's needs for healthy eating. While this article primarily addresses children diagnosed with diabetes, healthy eating, along with adequate physical activity will help to prevent type 2 diabetes, and other chronic diseases in children. School foodservice personnel can work towards providing a diabetes-supportive meal environment by taking the following actions:

Ensure that school meals and snacks meet USDA requirements and the Dietary Guidelines for Americans.

- The basis for a healthy school meal environment which supports diabetes prevention and management begins with meeting the recommendations of the 2005 Dietary Guidelines for Americans. Strive to provide school meals and snacks that are low in saturated and trans fats, rich in fruits, vegetables, whole grains, and low fat dairy products, and low in added sugars.
- Utilize available resources to incorporate healthy eating guidelines into school meals programs, such as USDA's Team Nutrition (http://teamnutrition.usda.gov/Default.htm) and MyPyramid (http://www.mypyramid.gov/index.html) websites.

Support and implement provisions of local school wellness policies to improve nutrition education, food choices, and physical activity in schools.

- Understand applicable nutrition standards for snacks and beverages offered at school. Use information on food labels to identify and remove food items that do not meet nutrition standards or local wellness policies. Work with food vendors to find suitable alternatives.
- Provide a pleasant dining environment and adequate time for children to consume school meals. Integrate nutrition education into the cafeteria environment with educational information, contests, posters, and other initiatives. Serve as positive role models for children by modeling healthy lifestyle behaviors.

Understand basic meal planning and other concepts of effective diabetes management in children.

- Obtain a copy of the student's meal plan guidelines whenever possible. Be prepared to provide accurate information on nutrient breakdown, portion size, and ingredients of foods served or sold at school to the student, parents, and authorized school personnel.
- Provide meal menus and other nutrition information in advance to the student and parents for meal planning. Assure that meals are served at the specified time to children with diabetes, with sufficient time for consumption.
- Recognize high risk times and warning signs/symptoms of hypoglycemia in children. Plan an emergency response procedure for the school cafeteria setting by working with the school health team.
- Support positive psychosocial development for children with diabetes. Respect confidentiality in the cafeteria, and treat the student with diabetes the same as everyone else.

Additional resources are available regarding the care of children with diabetes in schools (ADA, 2007; National Diabetes Education Program, 2003; & USDA, 2001).

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