



Section 5: Type 2 Diabetes

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SECTION OVERVIEW

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Definition and Symptoms

Type 2 diabetes is occurring more frequently in children and adolescents. Type 2 diabetes develops when the pancreas does not produce enough insulin or when the body does not properly use insulin. Insulin is a hormone made by the pancreas that helps turn sugar (glucose) in the food we eat into energy. Type 2 diabetes usually develops slowly. Symptoms may or may not be present. Common symptoms of high blood glucose (hyperglycemia) and type 2 diabetes include:

- Frequent urination/bedwetting in children
- Extreme thirst/dry mouth
- Sweet, fruity breath
- Tiredness/fatigue
- Increased hunger
- Blurred vision
- Flushed skin
- Lack of concentration
- Nausea/vomiting
- Stomach pain/cramps
- Dry, itchy skin
- Unusual weight loss
- Labored breathing
- Weakness
- Confusion
- Unconsciousness
- Acanthosis nigricans (specific to type 2 diabetes)
- Yeast infections or other infection

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A common symptom seen with type 2 diabetes is acanthosis nigricans, a dark, thick, velvety appearance to the skin in the major skin folds, such as around the neck and armpits. Many times these dark, thick areas are mistaken for dirty skin and at times hidden or covered with clothing. This type of skin change is often a sign of insulin resistance. A picture of a student with acanthosis nigricans is provided in Figure 5.

The cornerstone of treatment for students with type 2 diabetes is adopting a lifestyle that promotes healthy food choices and physical activity as the primary ways to control blood glucose levels. Use of oral medication and/or insulin is sometimes necessary to optimize diabetes control.

Figure 5: Acanthosis nigricans.



Photo printed with permission from Irwin Braverman, MD, Department of Dermatology, Yale Medical School.

Blood Glucose Monitoring

Self-monitoring of blood glucose is a useful tool to assist with managing diabetes. Blood glucose monitoring can help determine patterns of high and/or low blood glucose and circumstances that might influence blood glucose levels at school and related activities. Monitoring also assists in detecting urgent problems requiring immediate attention from school personnel. Sometimes students with type 2 diabetes must take a blood glucose reading after a meal (postprandial) to determine the effectiveness of their oral medication. Students with type 2 diabetes who use an intensive insulin regimen will commonly monitor blood glucose levels before each meal. Additional information on blood glucose monitoring, blood glucose testing times, and self-monitoring blood glucose is included in *Section 4: Type 1 Diabetes*.

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Healthy Eating

Healthy eating is encouraged for all students, including those with type 2 diabetes. **There are no forbidden foods.** One key to good blood glucose control is regular intake of food (particularly carbohydrate foods) spread evenly throughout the day (e.g., three meals a day and snacks). Skipping meals promotes a sluggish metabolism, fluctuating blood glucose levels, and the tendency to overeat later. Healthy eating guidelines and physical activity habits should focus on reducing insulin resistance, improving metabolic status, and promoting a healthy weight.

Students with type 2 diabetes who are overweight or obese will benefit from interventions that promote weight loss, weight management, and blood glucose control. Healthy eating guidelines must be individualized and can depend on a student's:

- Current oral medication and/or insulin regimen
- Current blood glucose and A1C levels
- Weight management goals

Each student should have an established meal plan developed by the health care team and family. A meal plan ensures adequate energy for growth and development. This meal plan may include times of meals and snacks, type, and amount of food to balance a student's nutritional needs. A meal plan is determined by considering a student's current activity level, medication/insulin regimen, and weight goals. For more information on nutrition, refer to *Section 7: Nutrition for Students with Diabetes*.

Physical Activity

Physical activity is a fundamental part of a healthy lifestyle for all students, including those with type 2 diabetes. Having type 2 diabetes should not limit a student from participating in physical activity. Physical activity can reduce the amount of oral medication and/or insulin needed to control blood glucose levels.

For additional information on physical activity, refer to *Section 8: Physical Activity for Students with Diabetes*.

A low blood glucose level (< 70 mg/dL) can occur during or after a period of increased or unexpected physical activity because of decreased insulin resistance and increased use of glucose by the body in a student with type 2 diabetes if using oral medication and/or insulin. Self-monitoring of blood glucose before starting an activity can assist in determining if additional carbohydrates are needed to assist in preventing a low blood glucose reaction, as recommended by a health care provider.

Coaches and school personnel must be aware of a student's diabetes and make sure a trained person is present to provide necessary help if the student needs to eat additional carbohydrates to treat or prevent a low blood glucose (including administration of Glucagon if the student is on insulin). Examples of quick-acting carbohydrate options include: milk, fruit juice, glucose gel, or glucose tablets.

High blood glucose is not as likely to result in problems for students with type 2 diabetes who engage in physical activity. However, if blood glucose levels are ≥ 250 mg/dL, checking urine ketones prior to physical activity may be recommended for some students. Participating in physical activity with urine ketones present (although rare in students with type 2 diabetes) and high blood glucose levels may increase risk of diabetic ketoacidosis and dehydration. For more information on low blood glucose, high blood glucose, and ketones, refer to *Section 6: Diabetes Emergencies*.

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Oral Medication

A student with type 2 diabetes may need to take oral medication if improved lifestyle changes (e.g., healthy food choices and increased physical activity) do not lower blood glucose levels. Metformin is an oral medication used in students with type 2 diabetes. Metformin helps the body use insulin and reduces the release of glucose stored in the liver. Students taking oral medication may need medication dose adjustments to optimize blood glucose control. Students on oral medication for diabetes should consult with their health care provider if using any other over-the-counter and/or prescription drug. This includes birth control, alcohol, or other illicit drugs. Table 10 provides information on common oral medications used to treat type 2 diabetes.

Table 10: Common Oral Blood Glucose Lowering Agents for Type 2 Diabetes

Drug Class	Blood Glucose Most Affected	SMBG* Testing to Recommend	Greatest Risk for Hypoglycemia	Examples
Sulfonylureas	Fasting and postprandial	2-3 times per day, especially fasting	4-6 hr after meal and fasting	For common generic and brand names for each class, see the Wisconsin Diabetes Mellitus Essential Care Guidelines 2008
Meglitinide	Postprandial	2 hr after meal	2-3 hr after meal	
Biguanide▲	Fasting	Fasting	Unlikely if used as single agent	
Alpha-glucosidase inhibitor	Postprandial	2 hr after meal	None if used as single agent	
Thiazolidinedione	Fasting and postprandial	2-3 times per day, especially fasting	After exercise when used with sulfonylureas or insulin	

Combination products also exist; see the Wisconsin Diabetes Mellitus Essential Care Guidelines 2008

Adapted from: Wisconsin Diabetes Prevention and Control Program, Department of Health Services (2008). Wisconsin Diabetes Mellitus Essential Care Guidelines, 4:18-19.

*Self-monitoring of blood glucose

▲ Metformin is currently the only oral glucose lowering agent approved for use in students <18 years old.

Insulin

When diet changes, increased physical activity, and the use of oral medication do not lower blood glucose levels into the optimal range, a treatment plan for students with type 2 diabetes may include insulin. Special circumstances may exist where insulin is required (e.g., illness, pregnancy) or temporarily needed to reduce blood glucose levels quickly. However, once blood glucose is under control, insulin may be stopped and oral medication started or resumed. For more information on insulin, refer to the insulin content in *Section 4: Type 1 Diabetes*.

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Sharps Disposal

State law requires the disposal of all sharps generated from insulin syringes, pen needles, infusion sets, and lancets in an approved sharps container – not in the regular trash. Schools will likely have varying policies and procedures for disposing of sharps; therefore, it is important for school personnel to be aware of their own school district’s specific policies and procedures.

Wisconsin has an active sharps collection program. This program is based on a state law that requires everyone to separate sharps from other waste. Free information and resources on sharps disposal resources and publications are available through the Wisconsin Department of Natural Resources (DNR). For additional information about sharps disposal in Wisconsin, go to the Wisconsin DNR web site: <http://dnr.wi.gov/org/aw/wm/medinf/>.

