

Diabetes Overview

What Is Diabetes?

Diabetes is a chronic disease in which blood glucose (sugar) levels are above normal. People with diabetes have problems converting food to energy. After a meal, food is broken down into a sugar called blood glucose, which is carried by the blood to cells throughout the body. Insulin, a hormone made in the pancreas, allows blood glucose to enter the cells of the body where it is used for energy.

People develop diabetes because the pancreas produces little or no insulin or because the cells in the muscles, liver, and fat do not use insulin properly. As a result, the blood glucose builds up in the blood and is transported to the kidney, where it is eliminated from the body in the urine. Thus, the body loses its main source of fuel even though the blood contains large amounts of blood glucose.

When insulin is no longer made, it must be obtained from another source—**insulin injections** or an **insulin pump**. When the body does not use insulin properly, people with diabetes may take insulin or other blood glucose-lowering medications. **Neither insulin nor other medications, however, are cures for diabetes; they only help to manage the disease.**

Taking care of diabetes is important. Over the years, ongoing high blood glucose, also called hyperglycemia, can lead to serious health problems. If not managed effectively, diabetes can affect the blood vessels, eyes, kidneys, nerves, gums, and teeth, making it the leading cause of adult blindness, kidney failure, and non-traumatic lower-limb amputations. Poorly controlled diabetes also increases a person's risk for heart disease and stroke.

Some of these problems can occur in teens and young adults who develop diabetes during childhood. The good news is that research shows these problems can be greatly reduced, delayed, or possibly prevented through intensive treatment that keeps blood glucose levels near normal.

The three main types of diabetes are type 1, type 2, and gestational diabetes.

Type 1 Diabetes

Type 1 diabetes, formerly called juvenile diabetes, is a disease of the immune system, the body's system for fighting infection. In people with type 1 diabetes, the immune system attacks the beta cells (the insulin-producing cells of the pancreas) and destroys them. Because the pancreas can no longer produce insulin, people with type 1 diabetes must take insulin daily to live.

Type 1 diabetes can occur at any age, but onset of the disease occurs most often in children and young adults. Most cases of diabetes in children under age 10 are type 1 diabetes. In adults, type 1 diabetes accounts for 5 to 10 percent of all cases of diagnosed diabetes.

Symptoms. The symptoms of type 1 diabetes are due to an increase in the level of glucose in the blood and include increased thirst and urination, unexplained weight loss, blurred vision, and feeling tired all the time. These symptoms may be mistaken for severe flu or another rapid-onset illness. If not diagnosed and treated with insulin, the student with type 1 diabetes can lapse into a life-threatening condition known as **diabetic ketoacidosis** or DKA. Signs of DKA include vomiting; sleepiness; fruity breath; difficulty breathing; and, if untreated, coma and death.

Risk factors. Although scientists have made much progress in predicting who is at risk for type 1 diabetes, they do not yet know what triggers the immune system's attack on the pancreas' beta cells. They believe that type 1 diabetes is due to a combination of genetic and environmental factors that are beyond the individual's control. Researchers are working to identify these factors and to stop the autoimmune process that leads to type 1 diabetes.

Type 1 Diabetes TrialNet is an international network of researchers who are exploring ways to prevent, delay, and reverse the progression of type 1 diabetes.

Type 2 Diabetes

Type 2 diabetes, formerly called adult-onset diabetes, is the most common form of the disease in adults. People can develop it at any age, even during childhood. A progressive disease, type 2 diabetes usually begins with insulin resistance, a condition in which cells do not use insulin properly. At first, the pancreas keeps up with the added demand by producing more insulin. Over time, however, the pancreas loses its ability to secrete enough insulin in response to meals or to control blood glucose levels overnight or during periods of fasting.

Managing type 2 diabetes requires maintaining a healthy weight and weight loss, if overweight. Lifestyle changes such as making healthy food choices and getting regular physical activity are essential. In addition, people with type 2 diabetes may take insulin and/or other blood glucose-lowering medications to manage their diabetes.

Type 2 diabetes used to be found mainly in overweight or obese adults age 40 or older. Now, as more children and adolescents in the United States have become overweight and inactive, type 2 diabetes is occurring in young people.

Symptoms. Symptoms of type 2 diabetes may be similar to those of type 1 diabetes. A person may feel very tired or thirsty and have to urinate often due to high blood glucose levels. Other symptoms include unexplained weight loss and blurred vision. High blood pressure and elevated blood lipids (cholesterol) are associated with insulin resistance. In addition, physical signs of insulin resistance may appear, such as acanthosis nigricans, a condition in which the skin around the neck, armpits, or groin looks dark, thick, and feels velvety. Often, this condition is mistaken for poor hygiene.

Some children or adolescents (and adults) with type 2 diabetes may have no recognized symptoms when they are diagnosed. For that reason, it is important for the parents/guardians to know the risk factors of type 2 diabetes and to talk to their health care professionals about screening children or teens who are at high risk for type 2 diabetes.

Risk factors. The key risk factors for type 2 diabetes in youth include being overweight or obese and having a family member who has type 2 diabetes. In addition, type 2 diabetes is more common in certain racial and ethnic groups such as African Americans, Hispanics/Latinos, American Indians, Alaska Natives, Asian Americans, and Pacific Islanders, including Native Hawaiians. Other risk factors include having a mother who had diabetes during her pregnancy; having high blood pressure, high cholesterol, abnormal lipid levels, polycystic ovary syndrome; and being inactive.

For children and teens at risk, health care professionals can encourage, support, and educate the entire family to make lifestyle changes that may delay—or prevent—the onset of type 2 diabetes. Changes include reaching and maintaining a healthy weight by making healthy food choices and engaging in regular physical activity.

Gestational Diabetes

Diabetes can develop during pregnancy, which is called gestational diabetes, and is caused by the hormones of pregnancy. These hormones can cause insulin resistance or a shortage of insulin. Although gestational diabetes usually goes away after the baby is born, a woman who has had it is at increased risk for developing diabetes later in life. In addition, the offspring of a pregnancy affected by gestational diabetes is at increased risk for obesity and developing type 2 diabetes.

What Is Effective Diabetes Management at School?

- Maintaining Optimal Blood Glucose Control
- Assisting the Student with Performing Diabetes Care Tasks
- Designating Trained Diabetes Personnel

Maintaining Optimal Blood Glucose Control

The goal of effective diabetes management is to keep **blood glucose levels within a target range determined by the student's personal diabetes health care team**. Optimal blood glucose control helps to promote normal growth and development and to prevent the immediate dangers of blood glucose levels that are too high or too low. Maintaining blood glucose levels within the target range also can help to optimize the student's ability to learn by avoiding the effects of **hypoglycemia** and **hyperglycemia** on cognition, attention, and behavior. In the long term, effective diabetes management helps to prevent or delay the serious complications of diabetes such as heart disease, stroke, blindness, kidney failure, gum disease, nerve disease, and amputations of the foot or leg.

The key to maintaining optimal blood glucose control is to carefully balance food intake, physical activity, **insulin**, and/or other medication. **As a general rule, food makes blood glucose levels go up. Physical activity, insulin, and diabetes medications make blood glucose levels go down.** Several other factors, such as growth and puberty, physical and emotional stress, illness, or injury, also can affect blood glucose levels.

Managing blood glucose is a constant juggling act—24 hours a day, 7 days a week.

Many students with diabetes check their blood glucose levels throughout the day using a **blood glucose meter**. Some students also wear a **continuous glucose monitor (CGM)**. When blood glucose levels are too low (hypoglycemia) or too high (hyperglycemia), corrective actions need to be taken.

Low blood glucose levels, which can be life-threatening, present the greatest immediate danger to students with diabetes.

Assisting the Student with Performing Diabetes Care Tasks

Diabetes management is needed 24 hours a day, 7 days a week. Many students will be able to handle all or almost all of their nonemergency diabetes care tasks by themselves. Others, because of age, developmental level, inexperience, or issues with adherence to their diabetes tasks, will need help from school personnel. (See **Understand Why Diabetes Self-Management Is Important**).

All students with diabetes will need help during an emergency, which may happen at any time. School personnel need to be prepared to provide diabetes care at school and at all school-sponsored activities in which a student with diabetes participates.

The school nurse is the most appropriate person in the school setting to provide care for a student with diabetes.

Many schools, however, do not have a full-time nurse, and sometimes a single nurse must cover more than one school. Moreover, even when a nurse is assigned to a school full time, she or he may not always be available during the school day, during extracurricular activities, or on field trips.

In circumstances where a nurse is absent or unavailable, the school remains responsible for arranging and implementing the agreed upon diabetes care that is necessary to enable the child to participate in school and school-related activities. The school nurse or another qualified health care professional plays a major role in selecting and training appropriate staff and providing professional supervision and consultation regarding routine and emergency care of the student with diabetes.

Designating Trained Diabetes Personnel

Nonmedical school personnel—called “trained diabetes personnel” in this guide—can be trained and supervised to perform diabetes care tasks safely in the school setting. School staff who may be trained to provide diabetes care include: health aides, teachers, physical education personnel, school principals, school secretaries, school psychologists or guidance counselors, food service personnel, and other appropriate personnel. Some schools may call these individuals unlicensed assistive personnel, assistive personnel, paraprofessionals, or trained nonmedical personnel. Trained diabetes personnel may be identified from existing school staff who are willing to serve in this role.

Care tasks performed by trained diabetes personnel may include **blood glucose monitoring**, insulin administration (by **syringe, pen**, or assistance with a **pump**), **glucagon** administration, **ketone testing**, and basic **carbohydrate counting**. In addition to learning how to perform general diabetes care tasks, trained diabetes personnel should receive student-specific training and be supervised by the school nurse or another qualified health care professional. (See **Train School Personnel**.)

The school nurse has a critical role in training and supervising trained diabetes personnel to ensure the health and safety of students with diabetes. In addition, a student’s health care provider or a diabetes educator may assist in training nonmedical personnel in diabetes care. Given the rapid changes in diabetes technology, therapies, and evidence-based practice, the school nurse who provides care to students with diabetes and facilitates diabetes management training for school personnel has the professional responsibility to acquire and maintain knowledge and competency related to diabetes management. (See **Train School Personnel**.)

Once it has been determined that a student-specific diabetes care task may be delegated, the school nurse should be involved in the decision-making process to identify which school personnel are most appropriate to be trained. A diabetes-trained health care professional, such as a school nurse or a certified **diabetes educator**, develops and implements the training program, evaluates the ability of the trained diabetes personnel to perform the task, and establishes a plan for ongoing supervision throughout the school year. Diabetes care must be carried out as specified in the student’s **health care plans**.

How Do You Plan Effective Diabetes Management in the School Setting?

- Assemble a School Health Team
- Review the Federal Laws
- Assemble the Student’s Health Care Plans
 - Diabetes Medical Management Plan (Prepared by the Student’s Personal Diabetes Health Care Team)
 - Individualized Health Care Plan (Prepared by the School Nurse)
 - Emergency Care Plans for Hypoglycemia and Hyperglycemia (Prepared by the School Nurse)
- Prepare the Student’s Education Plan (As Needed)
- Train School Personnel
- Diabetes Management Training Resources

Assemble a School Health Team

Collaboration and cooperation are key elements in planning and implementing successful diabetes management at school. As is true for students with other chronic diseases, students with diabetes are more likely to succeed in school when the student’s school health team and the student’s **personal diabetes health care team** work together.

To work collaboratively, a **school health team should be assembled** that includes people who are knowledgeable about diabetes, the school environment, and Federal and State education and nursing laws. **School health team members should include:** the student with diabetes, the parents/guardians, the school nurse and other health care personnel, the staff members designated as **trained diabetes personnel**, administrators, the principal, the 504/IEP coordinator, office staff, the student’s teacher(s), the school psychologist or guidance counselor, the coach, and lunchroom and other school staff members.

The school health team is distinct from the **student’s personal diabetes health care team**. Members of this team include: the student with diabetes, the parents/guardians, and the student’s doctor, nurse, **registered dietitian nutritionist, diabetes educator**, and other health care providers involved in the student’s care.

The school health team members work together to implement the medical orders in the **Diabetes Medical Management Plan (DMMP)** developed by the student’s personal diabetes health care team, using the strategies outlined by the school nurse in the **Individualized Health Care Plan (IHP)**. In addition, the school health team should be part of the group that develops and implements the student’s Section 504 Plan, other **education plan**, or **individualized education program (IEP)**. These plans are developed to address students’ needs for services to manage diabetes safely and effectively in school, as required under **Section 504 of the Rehabilitation Act of 1973** or the **Individuals with Disabilities Education Act (IDEA)**.

Members of the School Health Team
Student with diabetes
Parents/guardians
School nurse
Other school health care personnel
Trained diabetes personnel
Administrators
Principal
504/IEP coordinator
Office staff
Student’s teacher(s)
School psychologist or guidance counselor
Coach, lunchroom, and other school staff members

Members of the Student’s Personal Diabetes Health Care Team
Student with diabetes
Parents/guardians
Doctor
Nurse
Registered dietitian nutritionist
Diabetes educator
Other health care providers involved with the student’s care

Review the Federal Laws

Three Federal laws address the school's responsibilities to help students with diabetes:

- Section 504 of the Rehabilitation Act of 1973 (Section 504)
- **The Americans with Disabilities Act of 1990 (ADA)**
- The Individuals with Disabilities Education Act (IDEA)

In addition, the **Family Educational Rights and Privacy Act (FERPA)** and IDEA protect the student's privacy. FERPA and IDEA prohibit schools, with certain exceptions, from disclosing personally identifiable information in a student's education record, unless the school obtains the prior written consent of the student's parents/guardians or the eligible student (i.e., a student who is 18 years old or older or who attends an institution of post-secondary education). FERPA does not specifically afford unaccompanied minor students who are under 18 years of age and separated from a responsible adult the rights that are afforded to parents/guardians and eligible students under the law. However, schools may use their judgment in determining whether an unaccompanied minor student who is under 18 years of age is responsible enough to exercise certain FERPA rights, such as inspecting and reviewing education records and providing written consent for the disclosure of education records, in addition to those given to his or her parents/guardians. See **34 CFR § 99.5(b)**.

These Federal laws provide a framework for planning and implementing effective diabetes management in the school setting, for preparing the student's education plan, and for protecting the student's privacy and access to appropriate care. The requirements of Federal laws must always be met. (See **School Responsibilities Under Federal Laws.**) School administrators and nursing personnel also should determine whether there are applicable State and local laws and factor them into helping the student with diabetes at school.¹

Assemble the Student's Health Care Plans

Health care plans outline how each student's diabetes will be managed. These plans help students, their families, school personnel, and the student's personal diabetes health care team to know what is expected of each of them. These expectations should be laid out in writing in the following health care plans:

- A Diabetes Medical Management Plan (prepared by the student's personal diabetes health care team)
- An Individualized Health Care Plan (prepared by the school nurse)
- Emergency Care Plans for Hypoglycemia and Hyperglycemia (prepared by the school nurse)

Diabetes Medical Management Plan

The Diabetes Medical Management Plan (DMMP), prepared by the student's personal diabetes health care team, contains the medical orders tailored for each student. The student's health care provider should sign this plan. The DMMP is the basis for all of the health care and education plans designed to help the student manage diabetes effectively at school. Although the DMMP is not required by Section 504, ADA, or IDEA, the information it contains can be useful in addressing the requirements of these Federal laws for the student with diabetes.

The school nurse uses the information in the DMMP to develop the student's Individualized Health Care Plan and the Emergency Care Plans for Hypoglycemia and Hyperglycemia. This information also should be incorporated into any Section 504 Plan, other education plan, or IEP.

¹ State and local laws, including those concerning who can administer medications, cannot interfere with the rights of students with disabilities guaranteed by Section 504 and the ADA.

Information in the DMMP may include:

- Date of diagnosis
- Contact information (parents/guardians and student's physician/health care provider)
- Specific medical orders for checking blood glucose, administering **insulin** and other medications, and **carbohydrate (carb) counting**
- Assessment of student's self-care skills for performing diabetes care tasks
- Typical signs, symptoms, and prescribed treatment for **hypoglycemia** and **hyperglycemia**
- Student's diabetes equipment and supplies, including **blood glucose meter**, insulin delivery devices, **glucagon**, and **continuous glucose monitoring systems (CGM)**
- Use of smartphone and/or other monitoring technology
- Additional monitoring and treatment for **ketones**
- Meal and snack plan
- Physical activity
- 72-hour disaster, lockdown, or emergency plan

The student's personal diabetes health care team should complete and approve the DMMP before the student returns to school, immediately after diagnosis, or when a student transfers to a new school. The DMMP should be reviewed and updated each school year or upon a change in the student's prescribed care plan, level of self-management, or school circumstances (e.g., a change in schedule) or at the request of the student or his or her parents/guardians.

Individualized Health Care Plan

The Individualized Health Care Plan (IHP) is developed by the school nurse in collaboration with the student's personal diabetes health care team to implement the student's DMMP. The IHP, sometimes called the nursing care plan, is based on the medical orders in the student's DMMP and incorporates an assessment of the school environment as well as student-specific information (e.g., familial, psychosocial, and developmental information).

Although the IHP is not required by Section 504, ADA, or IDEA, the information it contains can be useful in addressing the requirements of these Federal laws for the student with diabetes.

The school nurse uses the information in the DMMP and the nurse's additional assessment findings to outline the diabetes management strategies and personnel needed to meet the student's health goals. The school nurse reviews the IHP with the student and the parents/guardians before it is implemented and establishes a timeline to revisit the plan periodically to evaluate progress toward desired health goals throughout the school year.

Information in the IHP may include:

- Plan for maintaining the student's blood glucose within the target range specified in the DMMP (including strategies for blood glucose monitoring, administering insulin, treating hypoglycemia and hyperglycemia, adhering to the student's meal plan, and participating in physical activity)
- Supplies needed and where they will be kept
- Use of smartphone, school phone, CGM, or computer to log data and/or to notify the school nurse or parents/guardians of blood glucose levels
- Need for free access to the restroom and water
- Nutritional needs, including provisions for meals and snacks
- Participation in all school-sponsored activities and field trips, with coverage provided by the school nurse or trained diabetes personnel
- Guidelines for communicating with the family and the student's personal diabetes health care team

- List of trained diabetes personnel and the diabetes care tasks they will perform
- Plan and timeline for training and supervising trained diabetes personnel (see **Train School Personnel**)
- Plan and timeline to train other school personnel (e.g., teachers, physical education instructors, food service, and transportation personnel – see **Train School Personnel**)
- Timeframe for ongoing review of student outcomes
- Strategies to ensure the student is not subject to inappropriate penalties for health care appointments and to provide accommodations during the school day
- Plan for the student who independently manages diabetes at school
- Maintenance of confidentiality and the student’s right to privacy

Emergency Care Plans for Hypoglycemia and Hyperglycemia

The Emergency Care Plans for **Hypoglycemia** and **Hyperglycemia** are based on the medical orders in the student’s DMMP. The school nurse usually will coordinate developing these emergency plans. The plans for individual students summarize how to recognize and treat hypoglycemia and hyperglycemia and what to do in an emergency.

These plans should be distributed to all school personnel who have responsibility for students with diabetes throughout the school day and during school-sponsored activities.

Prepare the Student’s Education Plan (As Needed)

School health team members should be part of the group that plans how the DMMP will be implemented and be part of the group that determines the student’s eligibility under Section 504, the Americans with Disabilities Act, and/or IDEA. The school health team members should also be part of the group that determines the student’s needs for services to manage diabetes safely and effectively in school.

The information collected about needed services should be included in any Section 504 Plan, other education plan, or IEP developed for the student and should be distributed to all school personnel who will be involved with implementing these plans.

- Section 504 Plan is the commonly used term for a plan of services developed under Section 504 of the Rehabilitation Act. For a student with diabetes, the plan would be developed and reviewed by a team that usually includes: the school nurse, parents/guardians, 504 coordinator, school administrator, school psychologist or guidance counselor, and teacher.
- An IEP is required for students with disabilities who receive special education and related services under the IDEA. For a student with diabetes, the IEP would be developed and reviewed by the IEP team, including: the parents/guardians; at least one regular education teacher and one special education teacher of the student; a qualified school district representative such as the IEP coordinator or school administrator; an individual who can interpret the instructional implications of the student’s needs; and, at the discretion of the parents/guardians or school district, other personnel with knowledge or special expertise regarding the student—usually the school nurse, school psychologist or guidance counselor, and/or trained diabetes personnel.

The information in the DMMP and IHP should be used in developing either a Section 504 Plan or an IEP, but it is not a substitute for these plans.

Individual students with diabetes have different needs, but their education plans are likely to address the following common elements:

- Where and when blood glucose monitoring and treatment will take place
- Identity of trained diabetes personnel—the staff members who are trained to perform or assist with diabetes care tasks such as monitoring blood glucose, administering insulin and glucagon, and treating hypoglycemia and hyperglycemia
- Location of the student’s diabetes management supplies
- Use of smartphone, school phone, insulin pump, CGM, or computer to log data and/or to notify the school nurse or parents/guardians of blood glucose levels
- Need for easy access to the restroom and water
- Nutritional needs, including provisions for meals and snacks
- Full participation in all school-sponsored activities and field trips, with coverage provided by trained diabetes personnel
- Alternative times and arrangements for academic exams if the student is experiencing hypoglycemia or hyperglycemia
- Permission for absences without penalty for health care appointments or illness
- The opportunity to make up school work missed due to health care appointments or prolonged illness, including appropriate arrangements for meeting educational needs during or following an illness
- Maintenance of confidentiality and the student’s right to privacy

It is strongly recommended that the information in the education plan be agreed upon before each school year begins (or upon diagnosis of diabetes) and be documented and signed by a representative of the school and the parents/guardians.

The student’s education plans help ensure that school personnel, the parents/guardians, and students know their responsibilities. The parents/guardians must be notified in a timely manner of any proposed changes in the provision of services and must be included in related discussions. (See **School Responsibilities Under Federal Laws.**)

Plans for Diabetes Management

Plan	Contents	Who Prepares It
Diabetes Medical Management Plan (DMMP)	Medical orders: all aspects of routine and emergency diabetes care	Student’s personal diabetes health care team
Individualized Health Care Plan (IHP)	School nursing care plan: how diabetes care, as prescribed in the Diabetes Medical Management Plan, will be delivered in the school	School nurse
Emergency Care Plans for Hypoglycemia and Hyperglycemia	Tool for school staff: how to recognize and treat hypoglycemia or hyperglycemia and what to do in an emergency	School nurse
Section 504 Plan, other education plan, or individualized education program (IEP)	Education plans: address each student’s needs for services to manage their diabetes safely and effectively in school, where required under Section 504, the Americans with Disabilities Act, or the Individuals with Disabilities Education Act	504 team IEP team

Train School Personnel

Diabetes management training for school personnel is essential to facilitate appropriate care for students with diabetes.

Trained school personnel can help to ensure that students with diabetes are safe, ready to learn, and able to participate in all school-sponsored events.

All school personnel should receive the appropriate level of diabetes care training suited to their responsibilities for students with diabetes. When a school nurse is assigned to the school (or school district), he or she is the key school staff member who leads and coordinates the provision of health care services for a student with diabetes at school and at school-related activities. The school nurse, in collaboration with the principal, also takes the lead in identifying, training, and providing ongoing supervision of trained diabetes personnel. This will ensure that at least one trained diabetes personnel is available to provide care when a school nurse is not available.

Diabetes technology, therapies, and evidence-based practices are changing rapidly. **The school nurse, who provides care to students with diabetes and facilitates diabetes management training for school personnel, has the professional responsibility to acquire and maintain current knowledge and competency related to diabetes management on a regular and ongoing basis.**

Diabetes management training should be facilitated by a diabetes-trained health care professional such as the school nurse or a certified diabetes educator. Training should occur at the beginning of each school year and should be repeated when an enrolled student is first diagnosed with diabetes or when a student with diabetes enrolls in the school. Periodic refresher training is recommended.

Three levels of training are needed to keep students with diabetes safe at school. Training should be designed to include the elements outlined below using standardized training materials.

Level 1. Diabetes Overview and How to Recognize and Respond to an Emergency Situation

Level 1 training is for all school personnel and should cover:

- An overview of diabetes
- How to recognize and respond to hypoglycemia and hyperglycemia
- Whom to contact for help in an emergency

Level 2. Diabetes Basics and What to Do in an Emergency Situation

Level 2 training builds on Level 1 and is designed for school personnel who have responsibility for the student with diabetes throughout the school day (e.g., classroom, physical education, music, and art teachers and other personnel such as lunchroom staff, coaches, and bus drivers).

Level 2 training should cover:

- Content from Level 1 with specific instructions for what to do in case of an emergency
- Roles and responsibilities of individual staff members (see **Actions for School Personnel, Parents/Guardians, and Students**)
- Expanded overview of diabetes (types of diabetes, the role of blood glucose monitoring, and the importance of balancing insulin/medication with physical activity and nutrition and how it is done)

- Procedures and brief overview of the operation of devices (or equipment) commonly used by students with diabetes
- Impact of hypoglycemia or hyperglycemia on behavior, learning, and other activities
- The student’s Individualized Health Care Plan, Section 504 Plan, other education plan, or IEP
- The student’s Emergency Care Plans for Hypoglycemia and Hyperglycemia
- How to activate Emergency Medical Services in case of a diabetes emergency
- What to do during a schoolwide emergency (e.g., lockdown or evacuation)
- Tips and planning needed for the classroom and for special events
- Overview of the legal rights of students with diabetes in the school setting

Level 3. General and Student-Specific Diabetes Care Tasks

Level 3 training is for one or more school staff members designated as trained diabetes personnel who will perform or assist the student with diabetes care tasks as allowed by law. Level 3 training should be provided by a diabetes-trained health care professional such as the school nurse or a certified diabetes educator.

Level 3 training should cover:

- All information from Level 1 and Level 2 training
- General training on diabetes care tasks specified in the student’s DMMP:
 - Blood glucose monitoring
 - Insulin administration
 - Glucagon administration
 - Ketone testing (urine and blood)
 - Basic carbohydrate counting
- Student-specific training, when addressing each diabetes care task, includes:
 - Clear identification and understanding of the task as outlined in the student’s DMMP
 - Each student’s symptoms and treatment for hypoglycemia and hyperglycemia
 - Step-by-step instructions on how to perform the task using the student’s equipment and supplies
 - Clear parameters on when to perform the task, when not to do so, and when to ask for help from a health care professional
- How to document that all care tasks are performed
- Plan for ongoing evaluation of trained diabetes personnel’s performance

A school nurse, a certified diabetes educator, or another qualified health care professional with expertise in diabetes develops the instruction on performing the care tasks, provides for demonstration and return demonstration of the tasks, and evaluates the trained diabetes personnel’s competency. The school nurse establishes a plan for ongoing supervision to occur throughout the school year. The school nurse or other qualified health care professional also documents the instruction, competency evaluation, and ongoing supervision that are provided.

Diabetes Management Training Resources

- There are many resources available for training school nurses and staff about diabetes management.
- The National Association of School Nurses offers a live and online continuing education program for school nurses. This program, called **Helping Administer to the Needs of the Student with Diabetes in School** (H.A.N.D.S.SM), equips the school nurse with current diabetes knowledge and provides tools and resources to facilitate effective diabetes management for students at school. It is presented by a school nurse with a specific interest in diabetes and a certified diabetes educator.

- The American Diabetes Association offers **Diabetes Care Tasks at School: What Key Personnel Need to Know**, a curriculum containing a set of training modules and corresponding DVD video segments. These materials are designed for use by the school nurse or other diabetes-trained health care professionals when training a school’s trained diabetes personnel. **Training resources** are also available.
- **The Joslin Diabetes Center’s Diabetes Education Program for School Nurses** offers a one-day program, designed by the American Diabetes Association and the Joslin Diabetes Center, to provide school nurses with up-to-date diabetes information to create a safe learning environment for students with diabetes.
- JDRF offers the **School Advisory Toolkit for Families**, a guide which includes collaborative methods for educators and parents of children with type 1 diabetes to ensure that every child enjoys the best possible school experience.
- A number of State programs have developed training curricula based on the American Diabetes Association’s curriculum, including **California, New York, Texas, and Virginia**.
- Some manufacturers of blood glucose meters, CGMs, insulin pens, and insulin pumps provide training materials, including apps specific to their products. Visit manufacturers’ websites for more information.

Diabetes Management Training for School Personnel

Level 1. Diabetes Overview and How to Recognize and Respond to an Emergency Situation	
Who	All school personnel
What	<ul style="list-style-type: none"> • General overview of diabetes • How to recognize and respond to signs and symptoms of hypoglycemia and hyperglycemia • Whom to contact for help in an emergency
Level 2. Diabetes Basics and What to Do in an Emergency Situation	
Who	Classroom teachers and all school personnel who have responsibility for the student with diabetes during the school day
What	<ul style="list-style-type: none"> • Content from Level 1 • Specific instruction on the Emergency Care Plans for Hypoglycemia and Hyperglycemia • How to activate Emergency Medical Services in case of a diabetes emergency • Roles and responsibilities of individual staff members • Expanded overview of diabetes • Impact of hypoglycemia or hyperglycemia on behavior and learning • Tips and planning needed for the classroom and for special events • The student’s health care and education plans • Legal rights of students with diabetes
Level 3. General and Student-Specific Diabetes Care Tasks	
Who	Trained diabetes personnel
What	<ul style="list-style-type: none"> • Content from Level 1 and Level 2 training • General training on diabetes care tasks specified in the student’s Diabetes Medical Management Plan • Student-specific training, using the student’s equipment and supplies for each diabetes care task

How to Help Students Implement Effective Diabetes Management

- Check Blood Glucose Levels
- Plan for Disposal of Sharp Objects and Materials That Come in Contact with Blood
- Recognize and Treat Hypoglycemia (Low Blood Glucose)
- Recognize and Treat Hyperglycemia (High Blood Glucose)
- Administer Insulin and/or Other Diabetes Medication
- Plan for Disasters and Emergencies
- Follow an Individualized Meal Plan
- Promote Regular Physical Activity
- Maintain a Healthy Weight
- Help to Plan for Special Events, Field Trips, and Extracurricular Activities
- Deal with Emotional and Social Issues
- Understand Why Diabetes Self-Management Is Important

Diabetes management involves checking blood glucose levels throughout the day, following an individualized meal plan, getting regular physical activity, and administering insulin and/or blood glucose-lowering medications. These actions are taken to help maintain blood glucose levels in the target range and to prevent hypoglycemia or hyperglycemia. **Students with diabetes must have access to supplies and equipment for immediate treatment of high and low blood glucose levels at all times.**

Additional elements of effective diabetes management in school include: planning for appropriate disposal of sharp objects and materials that come in contact with blood; planning for disasters, emergencies, and lockdowns; planning for school-sponsored events outside the usual school day; and dealing with the emotional and social aspects of living with diabetes.

Check Blood Glucose Levels

One of the most important diabetes management tasks is to check (or monitor) blood glucose levels throughout the day using a blood glucose meter or a continuous glucose monitor (CGM). Students who use a CGM also use a blood glucose meter to verify CGM readings.

Blood Glucose Meter

A blood glucose meter is a small portable machine used to check blood glucose levels. Before using the blood glucose meter, wash and dry hands and the test site. Insert the **test strip** into the meter. Using a lancet (a small needle inserted in a spring-loaded device), perform a finger stick by pricking the side of the fingertip. Apply a drop of blood to the test strip. The meter then gives the blood glucose level as a number on its digital display.

Heat and humidity may affect blood glucose meters and test strips and may reduce the accuracy of blood glucose readings. This is especially important when blood glucose is checked outside (e.g., on the practice field). Consult the manufacturer's instructions regarding the operation and storage environment for the student's blood glucose meter.

Continuous Glucose Monitor

Some students use a continuous glucose monitor (CGM), a device that measures blood glucose levels and trends throughout the day. The CGM works through a sensor inserted under the skin that measures interstitial glucose levels (the glucose found in the fluid between cells) at regular intervals and sends the current equivalent glucose level wirelessly to a monitor. The monitor may be part of the **insulin pump** or a separate device, which may include a smartphone that is carried or worn by the student in a pocket, a backpack, or a purse.

The CGM sets off an alarm when blood glucose levels are too high or too low, or when they are increasing or decreasing at a rapid rate. Never ignore a CGM alarm. Appropriate action should be taken in accordance with the student's **Diabetes Medical Management Plan (DMMP)**.

Some CGMs can transmit data remotely to multiple devices at the same time via smartphone technology. The school nurse, trained diabetes personnel, the student's health care providers as well as the parents/guardians can have access to the CGM data and alarms in real time at locations remote from the student.

At this time, treatment decisions and diabetes care plan adjustments should not be based solely on CGM results.

The sensor's glucose levels should be confirmed with a blood glucose meter whenever the reading suggests insulin needs to be given or hypoglycemia needs to be treated. The CGM is a useful tool for identifying trends and can enhance the ability of the student's **personal diabetes health care team** to make needed adjustments to the student's diabetes care plan. Refer to the manufacturer's instructions on how to use the student's device.

Checking Blood Glucose During the School Day

The student's personal diabetes health care team may order blood glucose checks with a meter several times during the school day. Some students may maintain a record of blood glucose results in their blood glucose meter or through other monitoring technology such as a smartphone or a logbook.

Blood glucose levels may need to be checked before and after eating snacks and meals, before and after physical activity, or when there are symptoms of hypoglycemia or hyperglycemia. In some students, symptoms may be subtle; blood glucose levels should be checked whenever symptoms are suspected. Some students can check their own blood glucose levels. Other students need supervision. Still others need to have this task performed by a school nurse or trained diabetes personnel.

All students, even those who can independently check their blood glucose, may need assistance when experiencing low blood glucose levels.

Students must be able to check their blood glucose levels and respond to levels that are too high or too low as quickly as possible. If recommended by the student's personal diabetes health care team, it is medically preferable to permit students to check blood glucose levels and respond to the results in the classroom or wherever they happen to be. When in doubt, taking immediate action is important to prevent hypoglycemia and to prevent the student from missing class time.

Advantages of Checking Blood Glucose Levels Any Time and Any Place

- The student can confirm a low blood glucose level immediately. As a result, the student is less likely to experience a seizure or a coma.
- The student is safer when he or she does not have to go to a designated place and does not have to delay treatment for low or high blood glucose levels.
- The student spends less time out of class.
- The student gains independence in diabetes management when the blood glucose meter is easily accessible and monitoring can be conducted as needed.
- The student can achieve better blood glucose control to prevent onset of severe symptoms of high and low blood glucose levels and decrease the risk of long-term **complications of diabetes**.
- When the student can check at any time and in any place, blood glucose monitoring is handled as a normal part of the school day.

Plan for Disposal of Sharp Objects and Materials That Come into Contact with Blood

Checking blood glucose does not present a danger to other students or staff members when there is a plan for proper disposal of lancets and other materials that come into contact with blood. The **school health team** should agree on the plan, which should be consistent with standard precautions and local waste disposal laws.

Sharp objects (sharps) such as lancets and needles may be disposed of in a heavy-duty plastic or metal container with a tight-fitting lid that may be kept at school or in the student's personal container. Some students may leave the lancet in their lancet device and bring it home for disposal. These arrangements should be agreed upon in advance by the school health team. Used blood glucose test strips and other materials may be discarded in the regular trash. Check with the local health department about health and safety requirements in your area.

Recognize and Treat Hypoglycemia (Low Blood Glucose)

Hypoglycemia, also called "low blood glucose" or "low blood sugar," is a serious condition associated with diabetes that can happen very suddenly and requires immediate treatment. Hypoglycemia can impair a student's cognitive abilities and adversely affect academic performance. Hypoglycemia can affect attention, mood, and ability to follow directions and therefore can be mistaken for misbehavior.

Hypoglycemia occurs when a student's blood glucose level falls too low, usually as a result of too much insulin, missing or delaying meals or snacks, not eating enough food (**carbohydrates**), or participating in extra, intense, or unplanned physical activity. For most students, a blood glucose level of **70 mg/dL** or less is considered hypoglycemia. Low blood glucose levels are more likely to occur before lunch, at the end of the school day, during or after physical education classes, or in the event of unanticipated physical activities. Hypoglycemia may occur due to illness, particularly gastrointestinal illness, or it may occur for no obvious reason.

Hypoglycemia occurs when a student's blood glucose level falls too low, usually as a result of:

- Too much insulin
- Missing or delaying meals or snacks
- Not eating enough food (carbohydrates)
- Getting extra, intense, or unplanned physical activity
- Being ill, particularly with gastrointestinal illness

Hypoglycemia usually can be treated easily and effectively. If it is not treated promptly, however, hypoglycemia can lead to loss of consciousness and seizures and can be life threatening.

Hypoglycemia, which is not always preventable, is the greatest immediate danger to students with diabetes.

Early recognition of hypoglycemia symptoms and prompt treatment in accordance with the student's DMMP are necessary to prevent the onset of severe symptoms that may place the student in danger. **This information, contained in the student's Emergency Care Plans for Hypoglycemia and Hyperglycemia, should be provided to all school personnel who have responsibility for the student with diabetes during the school day.**

(See **Tools for Effective Diabetes Management**.)

Not all students, especially young students, will recognize hypoglycemia symptoms with every episode.

Usually, the first signs of hypoglycemia are due to the body releasing adrenaline and other **hormones**/compounds that cause sweating, shakiness, hunger, **pallor**, light-headedness, weakness, and headache. As hypoglycemia progresses and there is insufficient blood glucose for the brain to function normally, it can lead to changes in behavior, lethargy, progressive weakness, confusion, unconsciousness, seizures, and, if prolonged, even death.

Hypoglycemia Symptoms		
Mild to Moderate		Severe
<ul style="list-style-type: none"> • Shakiness/jitteriness • Sweating • Hunger • Pallor • Headache • Blurry vision • Sleepiness • Dizziness • Lightheadedness • Confusion • Disorientation 	<ul style="list-style-type: none"> • Loss of coordination • Irritability or nervousness • Argumentativeness • Combativeness • Changed personality • Changed behavior • Inability to concentrate • Weakness • Lethargy 	<ul style="list-style-type: none"> • Inability to eat or drink • Loss of consciousness • Unresponsiveness • Seizure activity or convulsions (jerking movements)

Some children and adolescents may have **hypoglycemia unawareness**. In other words, they do not experience early physical warning signs such as shaking, jitteriness, or sweating, and the only clue that their blood glucose levels are low is sudden behavior change. Even students who usually recognize when their blood glucose is low may sometimes have a sudden “low” without the initial symptoms. Although symptoms of hypoglycemia may vary from student to student, each student will tend to have the same symptoms each time hypoglycemia occurs. **Therefore, all school personnel should know how to recognize hypoglycemia and know what to do if they observe its onset.**

The student should never be left alone or sent anywhere alone or with another student when experiencing hypoglycemia.

As soon as the student exhibits symptoms of low blood glucose, treat the situation as a hypoglycemic emergency as outlined in the student’s Emergency Care Plan for Hypoglycemia. Immediately contact the school nurse or trained diabetes personnel who will check the student’s blood glucose level and treat the student for hypoglycemia. If the school nurse or trained diabetes personnel are not available, or if the blood glucose level cannot be checked, school personnel should treat the student for hypoglycemia as outlined in the Emergency Care Plan for Hypoglycemia. Symptoms will progress if not treated immediately. When in doubt, always treat for hypoglycemia.

Treatment for Mild to Moderate Hypoglycemia

The following checklist provides a generally accepted approach for the treatment of mild to moderate hypoglycemia. Each student’s specific hypoglycemia treatment plan is provided in the student’s DMMP.

Checklist for Treatment of Mild to Moderate Hypoglycemia Symptoms

- As soon as symptoms are observed, notify the school nurse or trained diabetes personnel. Check the student's blood glucose level to determine if it is low.
- If the blood glucose level is below the level in the Emergency Care Plan for Hypoglycemia (usually 70–80 mg/dL), or if the student has symptoms, give the student a **quick-acting glucose** product equal to 15 grams of carbohydrate (or the amount specified in the emergency care plan) such as:
 - 4 **glucose tablets** or 1 tube of glucose gel or
 - 4 ounces of fruit juice (not low-calorie or reduced-sugar) or
 - 4–6 ounces (half a can) of soda (not low-calorie or reduced-sugar)
- Wait 15 minutes, then recheck the blood glucose level.
- Repeat the steps above if the blood glucose level is below the level indicated in the Emergency Care Plan for Hypoglycemia.
- Contact the student's parents/guardians if indicated in the Emergency Care Plan for Hypoglycemia.
- Once blood glucose returns to normal, as designated in the student's Emergency Care Plan for Hypoglycemia, check the blood glucose level 1 hour later. If needed, provide an additional source of carbohydrate (e.g., whole grain crackers, graham crackers, granola bar, yogurt, fruit) if a meal or snack is not planned.

Treatment for Severe Hypoglycemia

Severe hypoglycemia is rare at school and generally can be prevented with prompt treatment of mild to moderate symptoms of low blood glucose. When hypoglycemia symptoms are severe, the school nurse or trained diabetes personnel must be notified and must respond immediately. Symptoms of severe hypoglycemia may include: inability to eat food or drink fluids, unconsciousness, unresponsiveness, and seizure activity or convulsions (jerking movements). At this point, school personnel should never attempt to give the student food or a drink or to put anything in the mouth, because it could cause choking.

Severe hypoglycemia is treated by administering glucagon by injection. Glucagon is a hormone that raises blood glucose levels by causing the release of glycogen (a form of stored carbohydrate) from the liver. Glucagon is given by the school nurse or trained diabetes personnel. Although it may cause nausea and vomiting when the student regains consciousness, **glucagon is a potentially life-saving treatment that cannot harm a student.** The school nurse and/or trained diabetes personnel must know where the student's glucagon emergency kit is stored, have access to it at all times, and be familiar with the glucagon instructions before an emergency arises.

Checklist for Treatment of Severe Hypoglycemia

- Position the student on his or her side to prevent choking.
- Contact the school nurse or trained diabetes personnel immediately.
- Do not attempt to give anything by mouth.
- The school nurse or trained diabetes personnel should administer glucagon, as indicated in the student's Emergency Care Plan for Hypoglycemia.*
- Call 911 (Emergency Medical Services).
- Call the student's parents/guardians.
- Stay with the student until Emergency Medical Services arrive.
- Notify the student's personal diabetes health care team.

*If administration of glucagon is not authorized by the student's Diabetes Medical Management Plan or Emergency Care Plan for Hypoglycemia, or if it is not available, staff should call 911 immediately.

Glucagon Emergency Kit

The parents/guardians should supply the school with a glucagon emergency kit if prescribed. The kit usually contains a bottle (vial) of glucagon in powder form and a prefilled syringe with special liquid; the two ingredients should only be mixed just before a glucagon injection is given. The glucagon emergency kit may be stored at room temperature. The school nurse and/or trained diabetes personnel should also be aware of the expiration date on the kit and notify the student's parents/guardians when a new kit is needed.

Recognize and Treat Hyperglycemia (High Blood Glucose)

Hyperglycemia means blood glucose levels are above the target range, as specified in the student's DMMP. Almost all students with diabetes will experience blood glucose levels above their target range at times throughout the day. For many students, these elevations in blood glucose will be only minimally above the target range (less than 250 mg/dL) and are short in duration. Other students may experience daily spikes of blood glucose levels that are high (in excess of 250 mg/dL) and of longer duration.

Hyperglycemia does not usually result in a medical emergency. Hyperglycemia may be caused by too little insulin or other blood glucose-lowering medications, a malfunction in the **insulin pump** or infusion set, food intake that has not been covered adequately by insulin or other blood glucose-lowering medications, or decreased physical activity. Other causes include: illness, infection, injury, or severe physical or emotional stress. Onset of hyperglycemia may occur over several hours or days.

Symptoms of hyperglycemia include: increased thirst, dry mouth, frequent or increased urination, change in appetite, blurry vision, and fatigue. In the short term, hyperglycemia can impair cognitive abilities and adversely affect academic performance. **In the long term, moderately high blood glucose levels can increase risk for serious complications such as heart disease, stroke, blindness, kidney failure, nerve disease, gum disease, and amputations.**

Hyperglycemia Symptoms	
<ul style="list-style-type: none">• Thirst• Dry mouth• Frequent or increased urination	<ul style="list-style-type: none">• Change in appetite• Blurry vision• Fatigue

Hyperglycemia needs to be recognized and treated in accordance with the student's DMMP. Information in the DMMP should be used to develop the student's Emergency Care Plan for Hyperglycemia. All school personnel who have responsibility for the student with diabetes should receive a copy of the Emergency Care Plan for Hyperglycemia and be prepared to recognize and respond to the signs and symptoms of hyperglycemia. (See Tools for Effective Diabetes Management.)

Hyperglycemia Treatment

As soon as symptoms of hyperglycemia are suspected, notify the school nurse or trained diabetes personnel. Treatment of hyperglycemia begins with checking the student's blood glucose level to determine if it is above the target range. When checking blood glucose at a time not specified in the DMMP, treatment decisions should take into account the time and amount of the student's last carbohydrate intake or insulin dose.

In accordance with the Emergency Care Plan for Hyperglycemia, the student's urine or blood should be checked for **ketones**, the chemicals the body makes when there is not enough insulin in the blood and the body must break down fat for energy. The **urine ketone test** involves dipping a special strip into the urine, waiting a specified amount of time, and then comparing the resulting color to a color chart. The **blood ketone test** is done with a finger stick using a special meter and a test strip, similar to checking blood glucose. If the test indicates ketones are present, notify the parents/guardians.

Students with type 2 diabetes usually still make a reasonable amount of insulin, and therefore, ketone checks may not be prescribed.

Ketones and Diabetic Ketoacidosis

While hyperglycemia does not usually result in a medical emergency, the following situations may lead to a breakdown of fat, causing ketones to form along with the hyperglycemia:

- Significant or prolonged insulin deficiency from failure to take any insulin or the correct amount of insulin
- An insulin pump or infusion set malfunction causing an interruption in insulin delivery
- Physical or emotional stress that increases the release of hormones that work against the action of insulin
- Infection or illness, particularly with diarrhea and/or vomiting

Ketones are usually associated with high blood glucose levels but also may occur when a student is ill and blood glucose levels fall below the student's target range. At first, ketones will be cleared by the kidneys into the urine, but as their production increases, they build up in the bloodstream causing **diabetic ketoacidosis (DKA)**, a medical emergency.

Diabetic ketoacidosis develops over hours to days and is associated with hyperglycemia, a buildup of ketones (ketosis) in the blood, and dehydration. As a result of these conditions, the classic signs of diabetic ketoacidosis include: severe abdominal pain; nausea and vomiting; fruity breath, heavy breathing, or shortness of breath; chest pain; increasing sleepiness or lethargy; and depressed level of consciousness. As soon as these symptoms are observed, the school nurse or trained diabetes personnel should call 911, the parents/guardians, and the student's health care provider. Stay with the student until Emergency Medical Services arrive.

Checklist for Treatment of Hyperglycemia

Refer to the student's DMMP for specific instructions.

- Check the blood glucose level to determine if it is high.
- Check urine or blood for ketones.
- Calculate the **Insulin Correction Dose** needed.
- Administer supplemental insulin dose in accordance with the student's Emergency Care Plan for Hyperglycemia. (If student uses an insulin pump, see instructions below.)
- Give extra water or non-sugar-containing drinks (as needed).
- Allow free and unrestricted access to the restroom and to liquids, as high blood glucose levels can cause increased urination and may lead to dehydration if the student cannot replace the fluids.
- Recheck blood glucose every 2 hours to determine if it is decreasing to target range.
- Restrict participation in physical activity as specified in the DMMP. However, if the student is not nauseous or vomiting and moderate to large ketones are not present, light physical activity might help to lower the blood glucose level.
- Notify parents/guardians as specified in the DMMP.

For Students Using an Insulin Pump:

- If student uses a pump, check to see if pump is connected properly and functioning by giving a **correction bolus** through the pump and checking blood glucose level 1 hour later.
- If moderate or large ketones are present, change pump site and treat ketones with an injection of insulin by syringe or insulin pen.
- For infusion site failure: Insert new infusion set and/or replace reservoir, or give insulin by syringe or insulin pen.
- For suspected pump failure: Suspend or remove pump and give insulin by syringe or insulin pen.

Administer Insulin

Students with type 1 diabetes—and many students with type 2 diabetes—need to administer or be given insulin at regular times during the school day. Students may need to take insulin to cover meals and/or snacks and may need additional or corrective dosages of insulin to treat hyperglycemia as specified in the DMMP. It is medically preferable that the student be allowed to self-administer insulin in the classroom or wherever they happen to be.

The DMMP, which will be different for each student, specifies the dosage, delivery system, and schedule for insulin administration. The **Individualized Health Care Plan (IHP)** and the student's **education plan**, based on the DMMP, should specify who will administer prescribed insulin and under what circumstances.

Some students who need insulin during the school day are able to administer it on their own; others will need supervision; and yet others will need someone to administer the insulin for them. The school nurse and/or trained diabetes personnel should assist with insulin administration in accordance with the student's health care plans and education plans.

A diabetes-trained health care professional such as the school nurse or a certified diabetes educator should teach, monitor, and supervise trained diabetes personnel to administer insulin.

Types of Insulin

Today, new types of insulin and new delivery systems help keep blood glucose levels within the target range. These options, however, require more frequent blood glucose monitoring and more assistance for the student with diabetes.

Insulin has three characteristics:

- **Onset** is the length of time before insulin reaches the bloodstream and begins lowering blood glucose levels.
- **Peak** is the time at which insulin is at its maximum strength in terms of lowering blood glucose levels.
- **Duration** is the number of hours during which insulin continues to lower blood glucose levels.

Insulin is classified in four types by how it works:

- **Rapid-acting** begins to work about 15 minutes after injection, peaks in about 1 hour, and continues to work for 2 to 4 hours.
- **Short-acting** usually reaches the bloodstream within 30 minutes after injection, peaks anywhere from 2 to 3 hours after injection, and is effective for approximately 3 to 6 hours.
- **Intermediate-acting** generally reaches the bloodstream about 2 to 4 hours after injection, peaks 4 to 12 hours later, and is effective for about 12 to 18 hours.
- **Long-acting** reaches the bloodstream several hours after injection and tends to lower glucose levels fairly evenly over a 24-hour period.

Types of Insulin Plans

Insulin therapy plans are tailored to the individual student's insulin needs as well as the student's health literacy and numeracy (i.e., ability to understand the prescribed plan). Two common plans are the basal/bolus insulin plan and the fixed dose insulin therapy plan.

Basal/Bolus Insulin Plan (Adjustable Insulin Therapy)

Most students with type 1 diabetes use a basal/bolus insulin plan. This type of insulin plan, sometimes referred to as adjustable insulin therapy, reproduces or mimics the way a normally functioning **pancreas** produces insulin.

A coordinated combination of different types of insulin is used to achieve target blood glucose levels at meals and snacks, during periods of physical activity, and through the night.

- **Basal insulin is long-acting or intermediate-acting insulin** delivered once or twice a day. This type of insulin is used to control blood glucose levels overnight and between meals.
- **Bolus insulin refers to a dose of rapid-acting or short-acting insulin** that is given to cover the carbohydrate in a meal or snack and to lower blood glucose levels that are above target.

Students using a basal/bolus insulin plan require multiple injections during the school day, or they receive their insulin through a programmable insulin pump.

Fixed Dose Insulin Therapy

Other students may take the same doses of insulin each day with rapid-acting, short-acting, intermediate-acting, or long-acting insulin. This type of plan is sometimes referred to as fixed dose insulin therapy.

Insulin Storage

The shelf life of insulin after opening varies according to the type of insulin, the type of container (vial or pen cartridge), and how insulin is administered (through a syringe, a pen, or a pump). Review the product storage instructions on the manufacturer's package insert and check the expiration date.

In general, most opened vials of insulin may be left at room temperature (below 86 degrees Fahrenheit) for 30 days and then discarded. Most opened disposable pens or pen cartridges may be left at room temperature for less than 30 days, depending on the type of insulin and the type of pen or cartridge. Unopened vials or pen cartridges should be stored in a refrigerator. They may be used until their expiration date and then must be discarded.

Insulin Delivery

The three most common ways to administer insulin are with a syringe, an insulin pen, or an insulin pump. The manufacturers of insulin, insulin syringes, insulin pens, and insulin pumps have websites where school personnel can learn more about these products.

1. **Insulin syringes**, available in several sizes, make it easy to draw up the proper dosage. Shorter, smaller needles make injections easy and relatively painless.
2. An **insulin pen** holds a cartridge of insulin. Insulin pens are convenient and appropriate when students need a single type of insulin. During the school day, pens are used most often with rapid-acting insulin to cover a meal or to treat a high blood glucose level. Generally, a user will follow these steps:
 - Screw the needle onto the tip of the pen just before use.
 - Dial the pen to 2 units.
 - Hold the pen upright and press the button on the pen to discard the air and fill the needle with insulin. Repeat if needed until a drop of insulin appears.
 - Dial the pen to the prescribed dose and inject the insulin.
 - Remove the pen needle and dispose of it in a sharps container.
3. An **insulin pump** is a computerized device that is programmed to deliver small, steady doses of insulin throughout the day; additional doses are given to cover food intake and to lower high blood glucose levels. Most pumps now receive blood glucose values directly from the meter, but if not, the student must enter the blood glucose value as well in order for the pump to calculate the bolus dose.

Rapid-acting insulin is used in the insulin pump. Students using the insulin pump will not be taking any long-acting insulin. Therefore, a pump malfunction or extended disconnection from the pump (longer than 2 hours) increases the student's risk of developing DKA more quickly. The parents/guardians should provide the school with a backup supply of syringes and rapid-acting insulin or insulin pens in the event of a pump failure. Keep supplies in a secure location.

There are several types of insulin pumps. School personnel can be trained on each student's pump by contacting the pump manufacturer or the student's diabetes health care team.

- **Some pumps look like a pager,** and students usually wear it on their waistband, belt, or in their pocket. The pump holds a reservoir of insulin attached to an infusion set that leaves a very small needle or plastic cannula (a tiny, flexible plastic tube) under the skin. Infusion sets are started with a guide needle, then the cannula is left in place and taped with dressing, and the needle is removed. The cannula usually is changed every 2 or 3 days or when blood glucose levels remain above the target range or ketones are present. Routine site changes are a responsibility of the family and generally are done at home.
- **Other pumps look like a pod or a patch.** These pumps are attached directly to the skin, and a guide needle inserts the cannula under the skin automatically. The student usually wears the pod on his or her abdomen, buttocks, leg, or arm. The pod contains the insulin (there is no tubing). The pod-type pump is controlled by a small hand-held computer device that is kept nearby. This type of insulin pump needs to be changed every 2 to 3 days.

Some pumps have the data from continuous blood glucose monitoring displayed on the pump screen. In some pumps, technology has been developed to allow communication between the pump and the CGM, enabling the insulin pump to rely on CGM information to reduce or stop insulin delivery if a low glucose level is anticipated. Some of the newer CGM have transmitters that display blood glucose values on tablets, smartphones, and computers.

If a student uses a CGM, verify a low blood glucose level with a finger stick. Treat the student for hypoglycemia, if needed, as prescribed in the student's DMMP.

Trained diabetes personnel who assist with the student's diabetes care tasks should be knowledgeable about and trained in using and operating each student's insulin delivery system in the event that a school nurse is not available to administer insulin.

Why Do Many Students and Families Prefer Insulin Pump Therapy?

- Users are freed from multiple daily insulin injections.
- The pump delivers insulin in a way that is similar to what the body does naturally.
- Users may achieve improved blood glucose control.
- Basal insulin delivery can be fine-tuned to the user's needs, allowing for adjustments for the differences in insulin sensitivity that change over the course of 24 hours.
- The pump uses frequent pulses of rapid-acting insulin, allowing for more consistent action on blood glucose than with intermediate- or long-acting insulin.
- Users may be able to participate in unplanned physical activity without eating extra food.
- The pump is durable and contains many child safeguards.
- The pump can be preprogrammed with **insulin-to-carbohydrate ratios** and blood glucose correction factors.
- When additional insulin, called a bolus, is needed to balance the carbohydrates in a meal or snack, or when blood glucose levels are high, the pump calculates the bolus dosage after the student enters the number of grams of carbohydrates to be eaten.
- Innovations in pump and sensor technologies are allowing for automation of insulin delivery by the pump.

Plan for Disasters, Lockdowns, or Emergencies

The parents/guardians must provide an emergency supply kit in the event of natural disasters, lockdowns, or emergencies when students need to stay at school. This kit should contain enough supplies for at least 72 hours to carry out the medical orders in the DMMP.

Disaster, Lockdown, or Emergency Supply Kit for 72 Hours

- Blood glucose meter, testing strips, lancets, and batteries for the meter
- Urine and/or blood ketone test strips and meter
- Insulin, syringes, and/or insulin pens and supplies
- Insulin pump supplies
- Other medications
- Antiseptic wipes or wet wipes
- Quick-acting source of glucose
- Water sufficient for 72 hours
- Carbohydrate-containing snacks, such as whole grain crackers and dried fruit
- Hypoglycemia treatment supplies (enough for three episodes): quick-acting glucose and carbohydrate snacks
- Glucagon emergency kit

Follow an Individualized Meal Plan

Current nutrition recommendations for students with diabetes are designed to provide maximum flexibility to meet each **student's nutritional needs**, appetite, eating habits, and schedules. Insulin regimens are then individualized to fit each student's lifestyle. The student's diabetes care plan, as set out in the DMMP and IHP, must be followed to avoid hypoglycemia or hyperglycemia.

The nutritional needs of students with diabetes do not differ from the needs of students without diabetes.

All students need a variety of healthy foods to maintain normal growth and development. The meal plan recommended for students with diabetes is usually healthy for everyone. The major difference is that the timing, amount, and content of the food that students with diabetes eat, especially the carbohydrates (or carbs), are carefully matched to balance the action of the insulin and/or other diabetes medications that they take.

Although there usually are no forbidden foods for people with diabetes, students are advised to avoid "liquid carbs" such as sugar-containing soda and juices (including 100 percent fruit juice) and regular pancake syrup. The liquid carbs raise blood glucose rapidly, contain large amounts of carbs in small volumes, are hard to balance with insulin, and provide little or no nutrition. (Sugar-containing drinks are used, however, in treating hypoglycemia.)

Many students with type 2 diabetes follow a meal plan designed to help them achieve a healthy weight. These students may be prescribed a calorie target for the day as well as consistent carb amounts to aim for at each meal and snack to help manage their weight and blood glucose. Ensuring that healthy foods such as whole grains, low-fat protein and dairy, and fruits and vegetables are available is critical to their diabetes management.

With passage of the **Healthy, Hunger-Free Kids Act in 2010**, schools have been assisting students in achieving a more healthful diet. This legislation has resulted in sweeping changes in school meal programs, including more whole grains, fruits and vegetables, milk choices limited to low-fat or fat-free, and maximum calorie levels for all school meals based on grade level.

Carbohydrate Counting and Identifying the Carb Content in Foods and Beverages

Carbohydrate (carb) counting is the most popular meal planning approach for children and youth. This approach involves identifying and calculating the number of grams of carbohydrate the student eats and drinks in a meal or snack. Sources of carbs include: starches (breads, crackers, cereal, pasta, rice), fruits and vegetables, dried beans and peas, milk, yogurt, and sweets.

The food service manager or staff and/or the school nurse should provide the carb content of foods and beverages to the parents/guardians and the student. If the nutrient analysis is not available, the school nurse and parents/guardians should work with the district food service office to obtain this critical information.

If the food service manager or the school district does not have this information, there are additional resources to help identify the carb content in foods and beverages. The school can identify a registered dietitian nutritionist (RDN) to work with the food service staff to make this information available. To locate an RDN in your area, visit the Academy of Nutrition and Dietetics website at **Find an Expert**.

The U.S. Department of Agriculture (USDA) maintains a “**National Nutrient Database**” containing nutrient information on well over 8,000 foods and beverages. The Food and Drug Administration (FDA) requires “**Nutrition Facts**” labels on packages for most prepared foods such as breads, cereals, canned and frozen foods, snacks, desserts, drinks, etc. These labels include the carbohydrate content as well as other nutrient values for each serving in the package.

Meal Planning Approaches

Most students with diabetes have an individualized meal plan using a method of carbohydrate counting. The meal plan takes into account the student’s nutritional needs, insulin plan, oral medications, and physical activity level.

There are two methods of meal planning using carb counting: (1) following a consistent carb intake meal plan and (2) adjusting insulin for changing carb intake. This information will be provided in the student’s DMMP.

Method 1—Following a Consistent Carb Intake Meal Plan. Students who follow a consistent carb meal plan aim for a set amount of carb grams at each meal and snack and do not adjust their mealtime insulin for the amount of carb intake (e.g., 60 grams of carbs at each lunch). The student’s personal diabetes health care team helps determine the amount of carbs that is right for each student at each meal. This method of meal planning is often used by students who take an intermediate-acting insulin in the morning or students who receive a preset amount of rapid- or short-acting insulin at lunch.

Students who follow a consistent carb meal plan need to maintain consistency in the timing and content of meals and snacks. The student should eat lunch at the same time each day. Snacks often are necessary to achieve a balance with the peak times of insulin action and with physical activity.

Method 2—Adjusting Insulin for Changing Carb Intake. Students who use multiple daily injections or an insulin pump usually use this method of meal planning. This method requires adjusting insulin doses to cover the amount of carbs the student will consume by using an **insulin-to-carb ratio and an insulin correction factor (sometimes called an insulin sensitivity factor)**. These factors are individualized for each student and specified in the DMMP. This method gives the student with diabetes more flexibility with eating and requires a good understanding of the student’s insulin therapy and carb counting.

See the worksheet examples in **Advanced Insulin Management: Using Insulin-to-Carb Ratios and Correction Factors** for instructions on how to compute the insulin dose using a student’s insulin-to-carb ratio and insulin correction factor. Some students now may use a blood glucose meter that performs bolus calculations automatically. Insulin-to-carb ratios and insulin correction formulas are pre-programmed into the device.

Other Dietary-Related Medical Conditions

A small percentage of students with diabetes may have other medical conditions that require dietary restrictions. For example, **some students with type 1 diabetes may have celiac disease**. They should not eat any food products that contain gluten or that have been prepared in a gluten-contaminated environment. Gluten is found in many grains, including wheat, rye, and barley, which are found in many pastas, cereals, and processed foods. These dietary restrictions should be outlined in the student's DMMP. School food service staff will also need to be made aware of a student's need for gluten-free meals.

Some students with type 2 diabetes may need to limit fat for control of weight and/or lipids. Still others may need to limit salt intake to help manage high blood pressure.

Promote Regular Physical Activity

Physical activity is a critical element of effective diabetes management. Everyone can benefit from regular physical activity, but it is even more important for students with diabetes. In addition to maintaining cardiovascular fitness and managing weight, physical activity can help lower blood glucose levels.

Students with diabetes should participate fully in physical education classes and team or individual sports.

To maintain blood glucose levels within the target range during extra physical activity, students will need to adjust their insulin and food intake. To prevent hypoglycemia, they also may need to check their blood glucose levels more frequently before, during, and after engaging in physical activity. The student's DMMP should specify when physical activity should be restricted because the blood glucose level is either too high or too low or if ketones are present.

Physical education teachers, sports coaches, and staff supervising recess must be able to recognize the symptoms of hypoglycemia and be prepared to call for help in case of a hypoglycemia emergency. The student's Emergency Care Plan for Hypoglycemia, a quick-acting source of glucose, and the student's **blood glucose meter** should always be available, along with plenty of water.

Students using pager-type **insulin pumps** may disconnect from the pump for sports activities; the pod-type pump remains attached. If students keep the pump on, they may set a temporary reduced insulin delivery rate or suspend use of insulin while they are playing. School personnel should provide the student with a safe location for storing the pump when the student does not wear it. The student's DMMP and IHP should include specific instructions for pump use during physical activity.

Help to Maintain a Healthy Weight

Maintaining a healthy weight is very important for students with diabetes to help manage blood glucose levels and to establish habits for managing their weight as they grow older. Healthy habits include being active every day and choosing healthy foods for meals and snacks.

More children and adolescents in the U.S. are either overweight or obese than ever before. This excess weight is placing more students at risk for **type 2 diabetes**. School personnel can help all students reach and maintain a healthy weight by encouraging them to make healthful lifestyle choices while they are young. They also can provide nonfood rewards and encourage healthy foods for class parties.

Working with the school wellness committee and the school-parents organization (e.g., Parent Teacher Association [PTA]/Parent Teacher Organization [PTO]), the parents/guardians can help by encouraging schools to offer healthy food choices at breakfast and lunch and in vending machines, to sell nonfood items for school fundraisers, and to include physical education in the school curriculum. All foods sold at school during the school day now need to meet nutrition standards. The **Smart Snacks in School** regulation applies to foods sold a la carte, in the school store, and vending machines.

Tips for Helping Students Reach and Maintain a Healthy Weight

- Be active every day for at least 60 minutes.** Students do not have to join a gym or be on a sports team to stay active. Dancing, riding a bike, walking the dog, or doing any physical activity they enjoy for at least 60 minutes a day will work. Activity can be broken up into three 20-minute sessions or whatever works for the student.
- Limit play time in front of the computer, tablet, smartphone, and TV** to 2 hours per day.
- Limit portion sizes of foods high in fat, sugar, and salt.** Instead of eating a large serving of french fries, students can order a small serving or share a large serving with friends. Try measuring snacks in small portions instead of grazing.
- Cut some calories.** Some healthy ways to cut calories include drinking water instead of sweetened fruit drinks, soda, or sports drinks and eating fruit instead of chips or candy. Encourage students to read food labels or download an app to learn about the number of calories, carbs, and fat in the foods and beverages they consume.
- Eat a healthy breakfast.** Eating a healthy breakfast will help students stay focused during the day and help manage their blood glucose.
- Lose weight slowly.** No more than 1 or 2 pounds of weight loss per month is recommended, because students are still growing. Losing weight slowly may help students keep it off.

Plan for Special Events, Field Trips, and Extracurricular Activities

Meeting the needs of students with diabetes requires advance planning for special events such as classroom parties, field trips, and school-sponsored extracurricular activities held before or after school. The school food service staff can assist in the planning, especially when a student requires a modified snack or bag lunch for the event.

With proper planning for coverage by the school nurse or trained diabetes personnel and adjustments to insulin dosage and meal plans, students with diabetes can participate fully in all school-related activities.

Although there usually are no forbidden foods in a meal plan for students with diabetes, school parties often include foods high in carbohydrates and fats. Serving more nutritious snacks will be healthier for all students and will encourage good eating habits. The parents/guardians should decide whether the student with diabetes should be served the same food as other students or food provided by the parents/guardians. If possible, give the parents/guardians advance notice about parties so they can incorporate special foods in the student's meal plan or adjust the insulin dosage.

Students often view field trips among the most interesting and exciting activities of the school year. Students with diabetes must be allowed to have these school-related experiences. **Although it is not unusual to invite the parents/guardians to chaperone field trips, parental/guardians' attendance can never be a prerequisite for participation by students with diabetes.**

The school nurse or trained diabetes personnel should accompany the student with diabetes on field trips. They should ensure that all of the student's snacks and supplies for checking blood glucose, administering insulin, and treating hypoglycemia are packed and taken on the trip. Diabetes management strategies for school-sponsored field trips should be included in the student's health care and education plans.

The plan for coverage and care during school-sponsored extracurricular activities and field trips that take place outside of school hours also should be carefully noted in the student's health care and education plans. As with field trips, the school nurse or trained diabetes personnel must be available at these activities.

Deal with Emotional and Social Issues

Students with diabetes must deal not only with the usual developmental issues of growing up but also with learning to manage this complex chronic disease. **Diabetes affects every facet of life, complicating the task of mastering normal developmental challenges.**

For the most part, students with diabetes do not want to be singled out or made to feel different from their peers. **Diabetes care tasks, however, can set them apart and make them feel angry or resentful about having diabetes.** Depression is being recognized as quite common among children and teens and even more so in those with diabetes.

Students react differently to having diabetes. They may be accepting, resentful, open to discussing it, or attempt to hide it. Often, the same student will experience all of these feelings over time. School personnel should be aware of the student's feelings about having diabetes and identify ways to ensure the student is treated the same way as others.

Sometimes, students feel pressured to please their care providers but cannot always comply with their requests. To appease their parents/guardians or members of their personal diabetes health care team, students may report fictitious blood glucose levels and/or ketone results.

Others use their diabetes to assert their independence and control and do not comply with their diabetes care plan. Still other students may be afraid or embarrassed by the potential for hypoglycemia and do not take all their insulin to avoid a low blood glucose. If this is a concern, the parents/guardians and the student's personal diabetes health care team can check the information in the memory of the blood glucose meter or the insulin pump for problems or inconsistencies.

Students with diabetes are at risk for developing eating disorders, and school staff should be aware of this. Some students, particularly females, may omit insulin as a quick way to lose weight, putting them at risk for hyperglycemia and ketoacidosis. Binge eating and bulimia are also seen in students with diabetes. If there are concerns that a student may have an eating disorder, notify the school nurse or the parents/guardians.

Diabetes can be a focal point for conflict within families. It is important to minimize diabetes-specific family conflict to promote optimal health and quality of life outcomes. **The student's personal diabetes health care team and school health team must be aware of emotional and behavioral issues and refer students with diabetes and their families for counseling and support as needed.**

One of the biggest challenges for students with diabetes is gradually becoming more independent from their parents/guardians. Yet diabetes may compromise independence, because the parents/guardians are concerned about their child's ability to perform self-care tasks and take responsibility for their diabetes. The parents/guardians, who are ultimately responsible for their child's well-being, may be reluctant to allow normal independence in children or teens who have not been able to take care of themselves properly. This parental concern can lead to increasing struggles with dependence, oppositional behavior, and rebellion.

Current research suggests, however, that when parents/guardians provide support and stay involved with their teen's diabetes management tasks throughout adolescence, students achieve better health outcomes. Teamwork or "interdependence" between the parents/guardians and their child is an effective strategy.

To deal with psychosocial aspects of diabetes in students, there are many resources available. When problems are observed, the school health team and the student's diabetes health care team may need to refer the family to a counselor experienced in working with families living with diabetes.

Understand Why Diabetes Self-Management Is Important

Diabetes care depends upon self-management. The student's competence and capability for performing diabetes-related care tasks should be specified in the Diabetes Medical Management Plan (DMMP) and then applied to the school setting by the school health team, as outlined in the student's Individualized Health Care Plan and any education plan. Although students must receive assistance with and supervision of their diabetes care when needed, it is equally important to enable students to take on the responsibility of diabetes self-management with ongoing guidance and support from the parents/guardians, the student's personal diabetes care team, and the school health team. The age for transfer of responsibility from caregiver to student varies from student to student and from task to task, because students develop and mature at different rates.

Students' abilities to participate in self-care also depend upon their willingness to do so. It is medically preferable that students be permitted to perform diabetes care tasks in the classroom, at every campus location, or at any school activity.

Although the ages at which students are able to perform diabetes care tasks are highly individualized and differ for each student, their ability and levels of self-care generally occur as follows:

- **Toddlers and preschool-aged children** are unable to perform diabetes care tasks independently and will need an adult to provide all aspects of diabetes care. Many of these young children will have difficulty recognizing hypoglycemia, so it is important that the caregiver be able to recognize and provide prompt treatment. Children in this age range, however, usually can determine which finger to prick, choose an injection site, and are generally cooperative.
- **Some elementary school-aged students** are able to perform their own blood glucose monitoring, but most will require supervision. Older elementary school-aged students are beginning to self-administer insulin with supervision but may not yet have the cognitive capacity to adjust insulin doses based on blood glucose readings. Understanding the complex interactions among insulin, nutrition, and physical activity on blood glucose levels may not develop until early adolescence. Unless students have hypoglycemic unawareness (inability to tell when their blood glucose level is low), most should be able to let an adult know when they are experiencing hypoglycemia; however, this can depend on the distractions that are occurring in the school environment and the student's overall level of well-being.
- **Middle- and high school-aged students** should be able to perform self-care tasks depending upon the length of time since diagnosis and level of maturity, but they always will need help when experiencing hypoglycemia. As older students mature, they should be encouraged and empowered to perform diabetes care tasks on their own.

Ultimately, each person with diabetes becomes responsible for all aspects of self-care, including blood glucose monitoring and insulin administration. Regardless of their level of self-management, however, all students with diabetes may require assistance when blood glucose levels are out of the target range. Regardless of their age, there are times when all students who have diabetes need someone else to help them with their diabetes care tasks. Learning to ask for support and help is an important element of learning self-advocacy as a person living with diabetes.