

CHAPTER 2: DAILY MANAGEMENT OF DIABETES

Control of diabetes requires on-going balance between nutrition, physical activity and medications in order to maintain desired blood glucose levels. This section of the manual addresses each of these components as they affect daily management.

BLOOD GLUCOSE MONITORING

Blood glucose monitoring is done so that the student, family and health care providers can make appropriate decisions about the balance of medications, food and exercise. This section describes how to perform monitoring as well as how to interpret and act upon the results.

Monitoring Procedures: Times, record keeping, where to be performed and specific procedures are established at the planning meeting and are included in the Individual Care Plan (ICP).

Hypoglycemia: Low blood glucose is the most common event that needs attention in school. Hypoglycemia is discussed in detail in the section that follows.

Hyperglycemia: High blood glucose may also be seen in school. Hyperglycemia is generally not an emergency situation. Sick day guidelines are included.

Ketoacidosis: When the body has an inadequate amount of insulin and turns to alternative source of energy the result is the production of ketones, an acid. This is a result of acute illness or imbalance in diabetes management. It is not commonly seen in school.

Parents should inform the school about what blood glucose levels require specific intervention for their student in order to avoid either high or low blood glucose levels. This information should be in the Individual Care Plan (ICP).

Monitoring Versus Testing

“Monitoring” is a more appropriate term than “testing” to describe blood glucose measurement. This helps the student feel better about results and know that whether or not glucose measurements are within target range the results are not an indication of the student’s ability to take care of his/her diabetes. Blood glucose results should be described as “above, below or target range”. Avoid terms like “good or bad”. Attitudes are generally improved when feelings of good or bad, right or wrong, are not attached.

Check with parents for guidance as to which term you should use. Try to keep them consistent with those used by the student’s family and primary health care team.

When

Glucose monitoring in school should closely follow the monitoring schedule done at home. In general, when children and adolescents have type 1 diabetes monitoring is done four or more times per day, usually before meals and before bedtime. In addition, some students may need monitoring before or after exercise. Students with type 2 diabetes will have specific monitoring guidelines from their healthcare providers. Most students will need more frequent monitoring if they exhibit symptoms of high or low blood glucose or are ill. The Individual Care Plan (ICP) specifies when regular monitoring should occur and what symptoms require additional blood glucose checking.

Where

Monitoring should be done wherever a student with diabetes feels most comfortable, and where it will cause the least disruption to the student’s academic program. This may be in the classroom or in the nurse’s office.

If the student is exhibiting signs of hypoglycemia, blood glucose levels should be checked as soon as possible. If the student needs to go to the health office, he or she will need to have an escort. This is necessary because the student may become confused and may not be able to make it to the test site alone.

It is *unsafe and not appropriate* to ask another student to be responsible for accompanying a student who may be exhibiting signs of hypoglycemia or

hyperglycemia. Junior or senior high school students who are willing and able to accept the responsibility may be considered if the students and family members agree.

Who

The school nurse, teacher, or other staff members who have been trained should assist with or supervise the monitoring. Older students usually prefer to carry their own monitoring/insulin kits and may be independent in blood glucose monitoring and insulin administration.

Tools and Steps

Monitoring blood glucose requires pricking the skin with a lancet to obtain a drop of blood. This is placed on a specially prepared strip. The results are read by a handheld machine (meter). The information is then recorded. The specific steps are shown in Figure 1 on page 15.

Consult the student's Individual Care Plan (ICP) for specific responses and information pertaining to blood glucose levels, equipment and supply storage and disposal.

Special note on alternate site monitoring:

Meters and lancets devices now allow for alternate site blood sampling. These sites include the forearm, palm, abdomen and thigh. Research has shown that results may differ from fingertip samples when blood glucose levels are changing rapidly. Fingertips remain the preferred site for blood sampling.

Recommendations for alternate site use:

- Do not use an alternate if the student has hypoglycemic unawareness (cannot recognize symptoms of low blood glucoses).
- Do not use an alternate site when treating high or low blood glucoses.
- If symptoms do not match the alternate site blood glucose result, confirm with a finger tip sample.
- Always rub area prior to using the lancet device to increase circulation.
- Be sure the meter is approved for alternate site monitoring.

Figure 1

- Steps for Blood Glucose Monitoring**
- 1 Gather supplies.
 - 2 Wash hands in warm water.
 - 3 Load device with lancet.
 - 4 Wipe skin with warm soapy water. Let dry. Alcohol swabs should be used only if soap and water are not available. Make sure the alcohol is fully dried before using the lancet.
 - 5 Hold lancet device to skin and press button to stick skin. For fingertip sample, use side of finger. It may be helpful to massage from palm to fingertip before the stick. Follow instructions included with the meter for alternate sites.
 - 6 Put drop of blood on strip pad according to instructions. Do not smear the blood. Some strips draw blood onto the end or side of the strip. Cover the entire test strip window.
 - 7 Follow directions for using the meter.
 - 8 Dispose of lancet device properly and follow universal precautions.
 - 9 Record result.

Record Keeping

Record keeping is fundamental to the optimal management of diabetes. The diabetes record may travel with the student from home to school thereby enabling the communication of patterns of blood glucose values, food intake, variations to normal exercise and the possibility of developing an illness.

Frequent episodes of high or low blood glucose levels in school should alert the school nurse, classroom teacher and others of a need for more communication with the family and/or health care team in order to assess and plan appropriate interventions.

Classification of Numbers

70-100 mg/dl	Normal fasting plasma glucose
80-180 mg/dl	Target range – should be individualized for age
≤ 70 mg/dl	Hypoglycemia
≥ 240 mg/dl	Hyperglycemia

The Individual Care Plan (ICP) is the source of appropriate responses to blood glucose values outside of the student's target range.

Emergency Care

Low blood glucose is the condition most likely to escalate into an emergency in the school setting. ***It is critical to act quickly at the first signs of hypoglycemia so that an emergency situation does not occur.***

An emergency response is required under the following conditions:

1. Loss of consciousness, seizure or inability to take food by mouth. See *section on hypoglycemia for appropriate action.*
2. Blood glucose level does not increase with food ingestion. *Follow health care providers' instructions or section on hypoglycemia.*
3. Hyperglycemia with vomiting and with medium or large ketone levels. *See section on ketoacidosis.*

HYPOGLYCEMIA (low blood glucose without loss of consciousness)

Approximate Level

< 70 mg/dl

Causes

When the body gets too much insulin, too little carbohydrate, or increased physical activity or exercise. Greatest risk is for those on insulin.

Onset

Rapid. Most likely to occur at peak insulin action times. Can occur up to 24 hours after prolonged physical activity.

Symptoms

Low blood glucose feels differently to different people. It may include any of the symptoms below easily remembered by the "5 W's": wet, wacky, wobbly, white and weak, but it is important to be aware of a student's specific symptoms.

- faintness
- shakiness
- muscle cramping
- hunger
- nervousness
- stomachache
- blurred vision
- headache
- fatigue
- sweating
- dizziness
- weakness
- pale skin
- inappropriate actions
- confusion
- irritability
- crankiness
- convulsions
- unconsciousness

Treatment

Check blood glucose if possible. If the student is incoherent, is having difficulty following instructions or is combative and a blood glucose sample is difficult, treat as if it is a low blood glucose. It is better to treat a suspected low in order to prevent a severe low blood glucose. For students using a pump, see **Chapter 2 Insulin Pumps** for directions on suspending the pump.

1. Stop activity in order to prevent further reduction in the blood glucose level.
2. Have student eat 15 grams of simple carbohydrate such as a small juice box or 4-glucose tablets. If student is having difficulty eating or drinking, Glucose Gel (tubes) may be used. AVOID carbohydrate foods that also contain protein or fat (e.g. chocolate, cookies or chips). These foods are digested more slowly than pure carbohydrate foods.
3. Wait 15 minutes.
4. Check blood glucose level again. If blood glucose level is not in target range repeat Step #2.
5. If the blood glucose level is above 70, have the student eat a meal or snack. If the student is not scheduled for meal or snack, add a small snack of 15 grams of carbohydrate such as crackers and cheese. *Over-treatment can cause a rebound effect resulting in high blood glucose levels.*
6. If often takes 30 to 60 minutes for the symptoms of hypoglycemia to subside once target blood glucose values are achieved.

HYPOGLYCEMIA (low blood glucose with loss of consciousness or seizure)

Emergency Response is Indicated

Early recognition and treatment of *hypoglycemia* is extremely important. Left untreated, hypoglycemia can result in loss of consciousness and/or seizure activity. If that occurs, the student will need treatment with the administration of glucagon, a prescription hormone that causes a rise in blood sugar.

In agreement with the American Diabetes Association position statement “Diabetes Care in the School and Day Care Setting” (See Appendices), *it is recommended that all schools be responsible for providing a trained individual who can test blood glucose, and administer insulin and glucagon under the appropriate circumstances during all school functions and sponsored activities including those that take place off school premises.* These individuals do not need to be health care professionals. Parents should provide the Glucagon Emergency Kit and the physician’s order to administer it (ONLY THE KIT FORM SHOULD BE USED AT SCHOOL). The school should have a list of designated-trained individuals who can administer glucagon. This list should be kept in an accessible, agreed upon location.

INSTRUCTIONS FOR USING GLUCAGON*

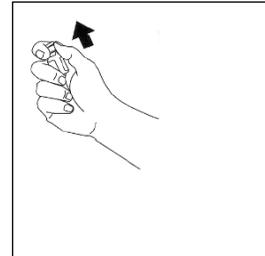
(copy for trained staff)

Use **only** when the student is unconscious or unable to be treated by mouth.

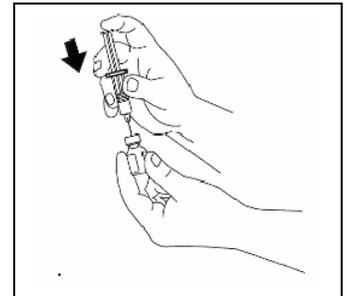
***** CALL 911 IMMEDIATELY *****

TO PREPARE GLUCAGON FOR INJECTION

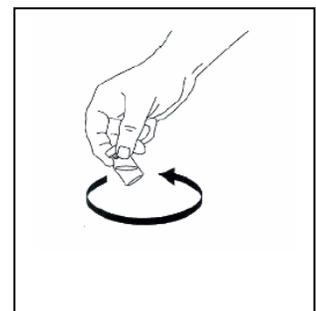
1. Remove the flip-off seal from the bottle of glucagon.



2. Remove the needle protector from the syringe, and inject the entire contents of the syringe into the bottle of glucagon. **DO NOT REMOVE THE PLASTIC CLIP FROM THE SYRINGE.** Remove syringe from the bottle.



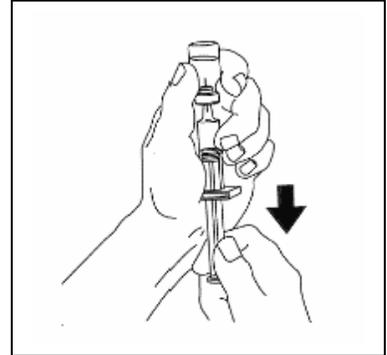
3. Swirl bottle gently until glucagon dissolves completely. **GLUCAGON SHOULD NOT BE USED UNLESS THE SOLUTION IS CLEAR AND OF A WATER-LIKE CONSISTENCY.**



TO INJECT GLUCAGON

Use Same Technique as for Injecting Insulin

- Using the same syringe, hold bottle upside down and, making sure the needle tip remains in solution, gently withdraw all of the solution (1 mg mark on syringe) from bottle. The plastic clip on the syringe will prevent the rubber stopper from being pulled out of the syringe; however, if the plastic plunger rod separates from the rubber stopper, simply reinsert the rod by turning it clockwise.



The usual adult dose is 1 mg (1 unit). For children weighing less than 44 lb (20 kg), give 1/2 adult dose (0.5 mg). For children, withdraw 1/2 of the solution from the bottle (0.5 mg mark on syringe).

Using the following directions, inject glucagon immediately after mixing.

- If possible, cleanse injection site on buttock, arm, or thigh with alcohol swab.
- Insert the needle into the loose tissue under the cleansed injection site, and inject the prescribed dose of the glucagon solution. (For children weighing less than 44 lb, the dose is half the amount or 0.5 mg). **There is no danger of overdose.** Apply light pressure at the injection site, and withdraw the needle.
- Turn the patient on his/her side. When an unconscious person awakens, he/she may vomit. Turning the patient on his/her side will prevent him/her from choking. Wait 10 minutes. The student should “come –around” but may continue to be confused. Check the blood glucose.

8. ***Feed the patient as soon as he/she awakens and is able to swallow.***
Give the patient a fast-acting source of sugar (such as a regular soft drink or fruit juice) and a longer acting source of carbohydrate such as crackers. If the patient does not awaken within 15 minutes, give another dose of glucagon and ***inform a doctor or emergency services immediately.***
9. A doctor should be notified whenever severe hypoglycemic reactions occur.
10. **Discard unused portion of glucagon.**

*Adapted From Eli Lilly Glucagon Patient Information Insert©

Additional comments for the school setting

1. Since glucagon kits at school should be sealed – not used, there is no need to wipe the top of the bottle after the top is flipped off.
2. Parents should be notified as soon as possible.
3. A physician order for glucagon use and permission form from parents should be obtained and included as part of the Individual Care Plan (ICP).
4. The ICP should indicate the individuals who are trained to administer the glucagon.

HYPERGLYCEMIA (high blood glucose)

Approximate Level

>240 mg/dl

Cause

Too little insulin, too much carbohydrate or too little physical activity. Infections, illness, and/or stress may precipitate the condition.

Onset

Can occur in only a few hours for those on insulin, especially for those using an insulin pump. It can occur over days for those on certain medications.

Symptoms

- thirst
- frequent urination
- dry mouth
- fatigue
- headaches
- abdominal pain
- ketones in the urine

About Ketones

When there is not enough insulin or insulin is not working effectively to use glucose for energy, the body uses fat for energy. The end product of burning fat is ketones. When ketone levels rise, they spill into the urine. If ketone levels are higher than the kidneys can process, ketoacidosis may occur.

Treatment

(For students using a pump – see Chapter 2, page 41, Insulin Pumps)

1. Check blood glucose levels.
2. Check for ketones if blood glucose levels are over 240 mg/dl and/or symptoms of stress or illness are present.

To Check for Ketones

1. Dip ketone test strips in a urine filled paper cup.
2. Wait as per package instructions.
3. Read results by visual comparison to a color chart. Refer to instructions printed on the test strip vial.
4. Record results.
5. Ketone test strips become out-dated. Be sure to read information on the bottle and discard when out-dated. Individually wrapped ketone strips are available and will not expire as quickly.

3. If ketones are not present, have student drink water.
4. If moderate or large ketones are present, call parents. Administer extra insulin as per Individual Care Plan (ICP).
5. Anytime ketones are moderate to large, have student drink 8 - 16 oz of sugar-free fluids per hour.
6. If ketones are negative or small, the student may return to the classroom and their regular routine. They must be allowed to have a water bottle in class and to leave to use the restroom when needed.

NOTE: Exercise should be avoided if ketones are present. Increased physical activity can lead to the production of more ketones. This is a result of fat used for energy as the glucose is “stuck” in the blood due to the lack of insulin. The end result is further ketone development.

KETOACIDOSIS

Hyperglycemic episodes may progress into a serious condition called *diabetic ketoacidosis or DKA*. When ketone levels rise to more than the kidneys can handle, ketoacidosis develops. Students with frequent high and low blood glucose are at greater risk of developing ketoacidosis than those whose blood glucoses are in the target range most of the time.

The risk of DKA occurring at school is extremely low, when insulin is being administered correctly.

Onset

Can be rapid for type 1 diabetes, and if not treated can lead to severe illness or even death. In type 2 diabetes, persistent hyperglycemia over several days can lead to non-ketotic acidosis (hyperosmolar nonketotic syndrome).

Symptoms

- dehydration, dry mouth and/or lips
- drowsiness
- abdominal pain
- flu like symptoms
- vomiting
- labored breathing
- fruity smelling breath

Treatment

1. Check blood glucose levels and ketones.
2. If over 240, and ketones are moderate to large, and the student has *any* symptoms of ketoacidosis, **call parents immediately**.
3. Administer extra insulin as per Individual Care Plan (ICP).
4. Have student drink 8 – 16 oz of sugar-free fluids per hour.
5. If the student is vomiting and is unable to take fluids, call the Rescue Squad (911).
6. Avoid all forms of exercise.
7. The student should be dismissed from school.

SICK DAY MANAGEMENT

‘Sick’ refers to a cold, flu, fever, infection, injury and/or physical or emotional stress. When a student is sick, their blood glucose will often be elevated even if they are eating less food. Sometimes high blood glucose levels are the first sign of illness. There are important guidelines that should be followed during illness to *prevent* the development of diabetic ketoacidosis. Usually the student will be treated at home during an illness but in the event the he or she is getting sick at school and contact with the parents has not been established, the school staff should be prepared to care for the student.

1. The student will continue to need insulin or medications. Do not omit insulin doses because the student is not eating. If there is a question about the dose, call the parents or healthcare provider (as per ICP). Substitute carbohydrate-containing fluids to match meal or snack carbohydrate needs.
2. Monitor blood glucose and urine ketones. Monitor blood glucose every 2 hours and check all urine for ketones.
3. Have the student rest in the nurse’s office.
4. Students need 4 – 8 oz. of fluid an hour to maintain hydration. If they are unable to eat their usual meals, alternate sugar-free fluids with fluids containing carbohydrate.
5. Seek input from the student’s health care provider if any of the following are present:
 - The student is vomiting or has diarrhea three or more times.
 - The student has moderate to large ketones.
 - Extra insulin has been given yet the blood glucose has not gone down.

Table 1: Sick Day Foods that contain 15 grams of Carbohydrates

½ cup of apple juice	1/3 cup sweetened yogurt
¾ double stick Popsicle ®	5 Lifesavers®
1 slice dry toast	½ cup cooked cereal
6 saltines	½ cup regular soda
1/3 cup frozen yogurt	1 cup Gatorade®
½ cup regular ice cream	¼ cup sherbet
¼ cup regular pudding	½ cup regular gelatin
1 cup <i>lite</i> yogurt	Milkshake 1/3 cup low fat milk and ¼ cup ice cream

Chart 1: Treating Low Blood Glucose

(Copy for classroom and field trips)

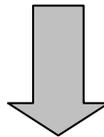
Name: _____ **Picture:**

Grade: _____

Teacher: _____

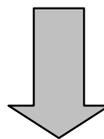
Causes:

- Too much insulin
- Too few carbohydrates
- Too much exercise



Symptoms:

Mild	Moderate	Severe
<ul style="list-style-type: none"> • Hunger • Irritable • Shaky • Sweaty • Pale • Other: 	<ul style="list-style-type: none"> • Weak • Dizzy • Tired • Lack of concentration 	<ul style="list-style-type: none"> • Sleepy • Poor coordination • Confused • Slurred speech • Other:
<ul style="list-style-type: none"> • Unable to swallow • Unconscious • Seizure • Other: 		



Action:

1. Check blood glucose if possible
2. Stop activity (If using an insulin pump, disconnect or suspend pump)
3. Always **treat suspected low blood glucose** when in doubt
4. Notify school nurse

Mild BG < 70 with or without symptoms	Moderate BG < 70 with symptoms	Severe- unable to treat by mouth
<ul style="list-style-type: none"> <input type="checkbox"/> If on insulin pump – suspend or disconnect. <input type="checkbox"/> Give 15 grams of simple carbohydrate. <input type="checkbox"/> Wait 15 minutes. <input type="checkbox"/> Re check blood glucose <input type="checkbox"/> If less than 70, repeat 15 grams of simple carbohydrate. <input type="checkbox"/> If next lunch or snack is not in one hour, give 15 gm snack of carbohydrate and protein/fat. <input type="checkbox"/> Communicate with parents. 	<ul style="list-style-type: none"> <input type="checkbox"/> If on insulin pump – suspend or disconnect. <input type="checkbox"/> Give 15 – 30 grams of simple carbohydrate. <input type="checkbox"/> Wait 15 minutes. <input type="checkbox"/> Re check blood glucose <input type="checkbox"/> If less than 70, repeat 15 grams of simple carbohydrate. <input type="checkbox"/> If next lunch or snack is not in one hour, give 15 gm snack of carbohydrate and protein/fat. <input type="checkbox"/> Communicate with parents. 	<ul style="list-style-type: none"> <input type="checkbox"/> If on insulin pump – suspend or disconnect. <li style="text-align: center;">CALL 911 <input type="checkbox"/> Give Glucagon. (stored: _____) Trained: _____) <input type="checkbox"/> Position student on side as vomiting is common. <input type="checkbox"/> Notify parents.

School Nurse # _____

Parent/Guardian Contact Information:

Home: _____

Work: _____

Cell: _____

Chart 2: Treating High Blood Glucose (Copy for classroom and field trips)

Name: _____

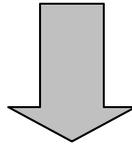
Picture: _____

Grade: _____

Teacher: _____

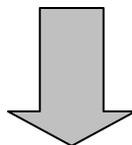
Causes:

- Not enough insulin
- Too much carbohydrate
- Illness, infection, stress
- Too little activity



Symptoms:

Mild	Severe - Ketoacidosis
<ul style="list-style-type: none">• Thirsty• Frequent urination• Tired• Hunger• Lack of concentration• Blurred vision	<ul style="list-style-type: none">• Sweet smelling breath• Rapid breathing• Nausea• Vomiting• Abdominal pain• Weakness• Confusion - Unconscious



Action:

1. Check blood glucose
2. Notify school nurse
3. If on pump, check site for redness, leaking, or detachment – if present, change infusion set.

Mild (BG ____ to ____)	Moderate (BG ____ to ____)	Severe (BG over ____)
<ul style="list-style-type: none"> ▪ Give insulin as ordered: ▪ Give 8 – 16 oz sugar- free fluids ▪ May resume classroom activities. ▪ Re-check BG in 2 hours. ▪ Document action. ▪ Other: 	<ul style="list-style-type: none"> ▪ Check urine for ketones (if moderate to large call parents) ▪ Give insulin as ordered: ▪ Give 8 – 16 oz. sugar- free fluids. ▪ Re-check BG in 2 hours. ▪ If on pump and still high, give injection and change infusion set. ▪ Notify parents. ▪ Stop physical activity. ▪ Other: 	<ul style="list-style-type: none"> ▪ Check urine for ketones (if moderate to large call parents) ▪ Give insulin as ordered: ▪ Contact parents. ▪ Call 911 if unconscious. ▪ Give 8 – 16 oz. sugar-free fluids. ▪ Stop physical activity. ▪ Other:

School Nurse # _____

Parent/Guardian Contact Information:

Home: _____

Work: _____

Cell: _____

NUTRITION – Food For Routine and Special Occasions

Food

Planning for meals, snacks, special events and emergency situations for a student with diabetes is an integral part of the diabetes management plan. Each student should have an established meal plan which the student and family have developed with a registered dietitian. This meal plan includes time, type and amount of food needed to balance the student's nutritional needs with his/her activity level and insulin regime. The student with type 2 diabetes will most likely have a meal plan that promotes weight loss.

There may be times when the balance or timing of insulin and food with activity and other aspects of the student's life will not be as precise as desired and the student will experience episodes of hypoglycemia. Emergency food supplies, usually called snack packs or low packs, will be needed. These should be supplied by the family.

Meal Planning

Meals for students with diabetes are based on the same principles of nutrition as for any child or adolescent. The primary difference is that the carbohydrate intake for the student with diabetes is usually "controlled" or "planned." Carbohydrates are the body's main source of energy and have the greatest effect on blood glucose levels. They are found in fruit, vegetables, grains, milk and many other foods including those containing sugar and flour. Proteins such as meat, chicken, seafood, eggs and cheese and fats contain no carbohydrate.

The key to good blood glucose control is balancing and spacing carbohydrate foods throughout the day at meals and snacks. The **total amount** of carbohydrate eaten at one time is the primary concern, not the **source** of carbohydrate. Research has shown that sugars and sweets included in meals do not raise the blood glucose any more quickly than the same amount of carbohydrate from starches or "complex carbohydrates." The healthy nutrition advice suitable for everyone should be followed: "Eat sugar and sweets in moderation."

The method of measuring carbohydrate is usually a combination of two systems:

- 1) "Carbohydrate Counting" and 2) "Exchanges" or "Carbohydrate Choices."

"Carbohydrate Counting" includes counting the specific number of grams of carbohydrate that are "assigned" to each meal and snack. Food labels and a variety of lists are available to provide the information about how many grams of carbohydrate are in a food. Consult food labels when possible, as this information is more accurate for specific foods. The **TYPE** of carbohydrate food eaten is not emphasized. For additional carbohydrate counting information, see page 93 of Appendices.

With the "Exchanges," a meal plan is established recommending a number of "exchanges" or "servings" from each food group at each meal or snack. Often, the food groups, which are primarily carbohydrate (starch, fruit, milk, and other), are grouped together and referred to as "carbohydrate choices." Each choice is equal to 15 grams of carbohydrate for the serving size listed. Vegetables also contain carbohydrate, but many contain lesser amounts than a similar size serving of starch, fruit and other carbohydrate-rich foods.

Although students with diabetes have the same nutritional needs as others, there are special considerations for the school setting. Students with diabetes may need to eat regular snacks and to eat their meals and snacks at consistent times.

Snacks

It is often necessary for a student with diabetes to have a snack mid way between breakfast and lunch, depending on his/her insulin regime, age and activity level. A mid-afternoon snack may be eaten at school or at home depending on the student's individual needs. The Individual Care Plan (ICP) should define the timing of snacks and alternatives in case of unforeseen circumstances. Students with type 2 diabetes should have a daily meal plan that might include snacks.

School Meals

The student with diabetes may not need modifications in the school meal but may need assistance with counting carbohydrates. The food service department should assist the care plan team by obtaining nutrition information regarding the carbohydrate content of the foods served.

If substitutions are necessary, the food service director should be a member of the care plan team and guide the necessary adaptations to the regular menu items. For additional information on school meal modification consult, *“Special Meals for Special Needs: A Manual for School Food Service Managers,”* available from the Department of Education, Child Nutrition Programs.

Federal regulations require that schools participating in the “National School Meals Program” modify meals for students whose disability restricts their diets. A physician must certify the necessary modifications. A copy of the “Medical Statement for Students Requiring Modifications in School Meals” form is included in Chapter 6, page 82.

Pump Therapy and Multiple Injection Therapy

Many students use an insulin pump or multiple daily injections for the delivery of their insulin therapy. The amount of insulin bolused is determined by the total of carbohydrates that will be eaten. Additional insulin to correct high glucose levels may also be bolused. The student may need assistance in calculating the carbohydrates for a meal and/or the amount of extra insulin needed.

Students using pump therapy or multiple injection therapy have flexibility in their schedule. They are not on a fixed schedule of meals or snacks.

Emergency Food Supplies (‘Low Kits’)

Good overall planning and access to carbohydrates ensures that the student with diabetes on insulin has the means of obtaining appropriate emergency responses during the school day.

The family should furnish emergency food supplies or “low kits” to provide the student’s preferred choice of food to respond to a low blood glucose. These kits should be in several locations and travel with the student. Appropriate locations for low kits include the classroom, the health office, physical education office, school office and school bus.

Table 2: Recommended Foods for Low Kits

Food	Grams of Carbohydrate
-------------	------------------------------

Immediate Treatment

3-4 Glucose tablets	15
1 Tube Glucose gel or small cake frosting (“CakeMate”)	15
½ cup of Juice (orange, apple, pineapple)	15
½ cup of REGULAR soda	15
½ cup of REGULAR Kool-Aid	15

Follow-up Snack

(15-30 minutes following hypoglycemia)

1 cup milk	12
Cracker snack pack (cheese or peanut butter)	(as listed on food label)
Granola Bar	(as listed on food label)

Special Occasions

There are NO forbidden foods or activities in the lives of people with diabetes. Advance planning will allow the student to participate fully in the non-routine activities of the school.

Food carries many emotional overtones. It is wise to avoid giving food any special power. This can be accomplished by avoiding terms such as “diet” and “cheat” in dealing with food issues. **Remember** that there are no forbidden foods in a meal plan for a student with diabetes.

School Parties

High sugar treats are often high in fat and low in nutritional value. These foods should be discouraged from inclusion at school parties. Providing more nutritious foods, such as low-fat fruit desserts is healthier for all students. Serving more nutritious foods gives the message that healthy foods are fun and taste good. This can also serve as a reminder that parties provide an opportunity to share and celebrate important events in our lives; the focus need not be food.

When parties include high sugar/high fat foods a notice should be sent to the parents. With appropriate planning, students with diabetes may have small amounts of high- sugar, high-fat party foods, such as cake or ice cream.

Field Trips

Field trips and bus trips require advance planning. Parents should provide written instructions concerning the special needs of the student while traveling. Supplies that should travel with the student include the items needed to monitor blood glucose level, snack packs, glucose tablets/gel, insulin and glucagon. The chaperone on the bus and/or the driver must be informed and provided with instructions regarding the student’s care. The student should be allowed to eat on the bus if necessary.

Staying after School

Staying after school should be planned in advance. Monitoring, mid-afternoon snacks or insulin injections may be part of the routine for students with diabetes and must be accommodated in any after-school activity. Glucagon and a designated person trained in its administration *must* be available. The after-school routine should be outlined in the Individual Care Plan (ICP). If the school nurse is not available during after-school events, another staff member must be identified as the primary contact for questions or concerns.

EXERCISE AND SPORTS

Exercise is important to all people but especially for people with diabetes. It is important to begin good health habits early in life and to make exercise a part of the student's everyday activities. A minimum of 30 minutes of moderate activity most days of a week should be the goal. The best exercise for a student is the one that he or she enjoys most. With a few special considerations, the student with diabetes can fully participate in all opportunities available in schools. Students with diabetes can and should be encouraged to participate in any extracurricular activity.

Routine Exercise

Exercise improves diabetes management in many ways including burning excess glucose, keeping the body in good shape, keeping the heart rate and blood pressure lower, keeping blood fat levels normal and making people more sensitive to insulin. Students will also feel better and it may help them to maintain normal blood circulation in their feet. Since physical exercise will help the body to burn more glucose, it may result in a decreased requirement for insulin, and/or an increased need for extra food depending on the length and intensity of the activity. (See Table 3)

Table 3: Physical Activity / Blood Glucose / Carbohydrate Needs

(For students taking insulin)

These are guidelines and should be individualized to each student.

Type of Activity	Blood Glucose Level before activity	Carbohydrate needed before activity	Carbohydrate need during activity
Short duration ½ hour mild-moderate intensity	Less than 100	15 grams	May not be needed
	Greater than 100	May not be needed	May not be needed
Moderate intensity for 1 hour or more	Less than 100	25 – 50 grams	15 to 30 grams each hour
	100 – 180	15 grams	
	180 - 240	May not be needed	
	> 240 and ketones	Should not exercise	
Strenuous intensity for 1 hour or more	Less than 100	50 grams	25 – 50 grams each hour
	100 – 180	25 – 50 grams	
	180 - 240	15 grams	
	> 240 and ketones	Should not exercise	

Students who use insulin pumps may decrease their basal rates or suspend the pump during exercise.

Often students are told not to exercise if blood glucose levels are high but this is **only true** if urine ketones are present. There may be an increase in hypoglycemic episodes if no dietary accommodations are made for the increase in activity. To be sure that the student exercises safely the following should be observed:

- Eat before extended periods of exercise
- Have extra snacks available during exercise
- Always carry a sugar source
- Reduce insulin dose if necessary
- Change injection site if necessary, abdomen may be the best site for most exercises

- Check blood glucose levels before and after any new exercise to establish blood glucose patterns
- Wear an ID bracelet or necklace
- Try to exercise with someone who knows about low blood glucose reactions
- Make sure that teachers and coaches know about low blood glucose reactions
- Do not exercise if ketones are present
- Drink plenty of water, especially in hot weather
- Watch for delayed hypoglycemia which can happen up to 24 hours after prolonged physical activity
- Have Glucagon Kit available

Team Sports

Team sports should be encouraged if the student expresses an interest. The student, parents and the Individual Care Plan (ICP) will provide the guidance necessary to accommodate full participation. Be sure that all coaches are aware that the student has diabetes and that a responsible person is present to provide any necessary help if the student has a low blood glucose reaction (including administration of glucagon). If a low blood glucose reaction occurs during a game, the student will need to rest at least 10 minutes after treatment before rejoining the game. The accommodations to ensure safe diabetes management during sports include monitoring supplies, glucagon and snacks at the site of the activity and staff trained regarding their use. Most students old enough to participate in school sports are able to monitor their own blood glucose and can adjust their snacks accordingly. Many students will choose to sip Gatorade or other sports beverages during practice and games to keep their blood glucose levels from getting too low.

INSULIN

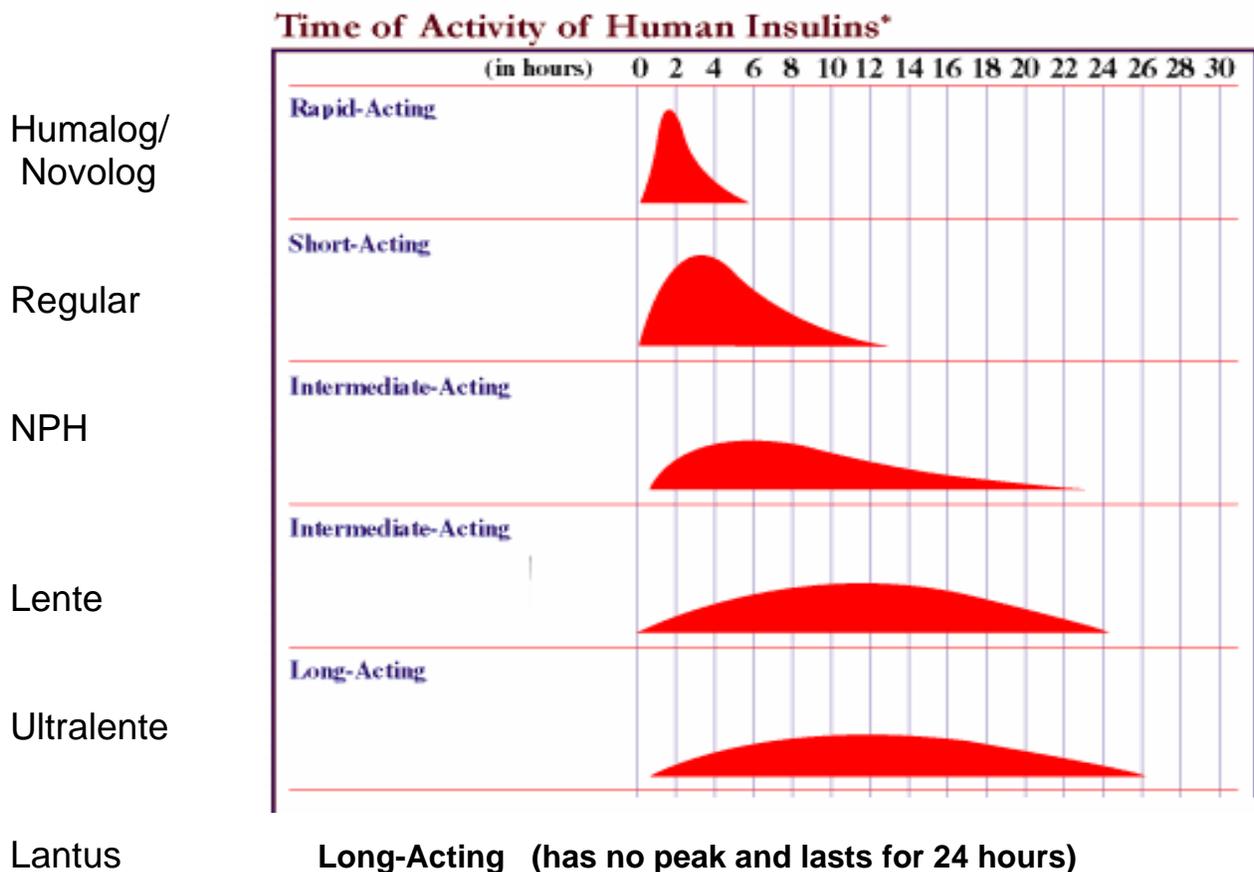
Students with type 1 diabetes **must** inject insulin daily or use a continuous infusion pump. Students with type 2 diabetes may require insulin. The health care providers determine the insulin types, dosages and times needed. Insulin needs vary with each student. Students who inject insulin at school may need assistance and supervision.

Types and Characteristics

Insulins vary in their onset of action, peak action, and in their duration of action. Most students will be on a schedule that includes a combination of rapid/short and intermediate/long acting insulin, taken before or directly after meals. Blood glucose is lowest when insulin has its peak effect. Thus, meals and snacks may be planned for this time.

The following table summarizes the available insulins according to the onset, peak, and duration of action. The times of onset, peak and duration of effect vary among individuals. All bottles of insulin sold in the United States have 100 units per milliliter of fluid, thus are labeled U-100. The appropriate syringes are also labeled U-100.

Table 4: Types of Insulin



Administration

The school nurse or designated person is responsible for injecting insulin or in assisting a student who can self-inject insulin. Humalog, Novolog, and Regular insulins are the only insulins used for spot dosing, and are most likely to be administered during school hours.

Inspect the insulin

Check the expiration date printed on the label. Insulin will only last for 30 days once the vial is opened. Humalog, Novolog, Regular and Lantus insulins are clear, others are cloudy. There should be no clumping of particulate in the insulin. Do not use insulin that is not uniform in consistency. Cloudy insulin vials should be gently rolled between hands to mix.

Select injection site

Injections may be given in the abdomen, thighs, buttocks or arms in the fatty tissue (not muscle). Insulin sites should be rotated in order to avoid tissue damage, which results in poor absorption of the insulin. Speed of absorption decreases with each of the following sites: abdomen, arms, legs and buttocks.

STEPS FOR INSULIN INJECTION

1. Gather supplies.
2. Wash hands.
3. Roll cloudy insulin vial to mix. Wipe top with alcohol swab.
4. Pull plunger back to desired units.
5. Push needle into vial. Push plunger to inject air.
6. Pull plunger back to desired units. (Make sure there are no bubbles.)
7. Choose injection site. Wipe with alcohol swab.
8. Pinch up skin. Push needle into skin and push plunger in. (Be sure to inject into fatty tissue, not muscle.)
9. Pull needle out.
10. Dispose of syringe per care plan.

INSULIN CARE AND STORAGE

Effectiveness of insulin is dependent on its careful handling and storage. Date the insulin when it is opened and discard 30 days after opening. Check the expiration date of unopened insulin bottles regularly.

- Keep insulin refrigerated for longer shelf life, if a refrigerator is not available, a cool pack may be used. Un-refrigerated insulin should be kept as cool as possible.
- Do not let insulin freeze, if it does, discard it immediately.
- Keep insulin away from heat and light.
- Clumping or frosting results from too much shaking or rough handling and the insulin should be discarded.

INSULIN PENS

Insulin pens – pre-filled disposable pens or reusable pens are easy to load, allow for accurate dosing, flexibility, and easy to read numbers for dose selection. These devices hold 3.0 ml (300 units) and come in the various types of insulins including: rapid acting, short acting, intermediate and long acting insulins. Ultra-fine pen needles allow for pain free injections. The various pens can be dosed in ½ unit increments - to 1 unit increments. The use of insulin pens can help minimize dose errors.

Disposable Pens

Innolet
BD Pen
Lilly Disposable Pen
NovoNorduc Flex Pen

Reusable Pens

Innovo
Novo Pen 3
Indue
Autopen
Opticlick Pen

½ Unit Dosing Pen

NovoPen Junior

Disposable pen needles are available in 29 and 31 gauge and 5, 8 and 12.7mm in length. (Each pen needle should be removed immediately after use; when left in place, they create an open passage to the insulin chamber. The open passage may allow bacteria into the chamber or fluid to leak out, which may alter the strength of the insulin.)

INSULIN PUMPS

Insulin pumps – also referred to as Continuous Subcutaneous Insulin Infusion (CSII). The pump is worn on the outside of the body, and is the size and weight of a beeper. It holds a reservoir of insulin inside the pump and is programmed to deliver the insulin through a thin plastic tube called an infusion set. The infusion set is inserted via a needle that is covered by a cannula just below the skin. Once inserted, the needle is removed and the cannula remains in place for 2-3 days. When it is time to change the infusion sets, a new infusion set is placed in a different site. Insulin pumps without tubing are currently being introduced to the market.

Insulin pump therapy provides a continuous infusion of insulin subcutaneously known as the basal rate (background insulin), and provides insulin to cover food and hyperglycemia when programmed, which is referred to as a bolus.

The pump uses rapid acting insulin as opposed to conventional injections, which combine long acting and short/rapid acting insulins. If the supply of insulin is interrupted due to mechanical pump failure, dislodgement of the cannula, accidental severing of the tubing, or clogged or obstructed tubing, the blood glucose can rise rapidly. Subsequent hyperglycemia and possible ketoacidosis can occur in as little as *three hours* due to the lack of insulin.

The parents, student, and health care providers in the school should discuss and outline the responsibilities of all involved in caring for a student with diabetes using a pump. These responsibilities should take into consideration the maturity, knowledge level, and competence of the student. Completing a pump skills checklist at the beginning of each school year will facilitate a smooth transition.

The specific pump manufacturer instructions must be followed. Manuals, booklets, and videos are usually available free of charge by calling the number listed on the back of the pump or by contacting the student's diabetes health care providers.

Treating hypoglycemia with pump therapy

Low blood glucose can occur while using the pump for the same reasons as an individual who is using injection therapy. Follow the same protocol for treating hypoglycemia. (Chart 1 Treating Low Blood Glucose) Disconnect pump while treating.

Treating Hyperglycemia with pump therapy

Hyperglycemia can occur rapidly for a student on an insulin pump. The health care team and the Individual Care Plan (ICP) will give specific guidance on determining the appropriate correction bolus to treat hyperglycemia. *If one blood glucose reading is above 250 mg/dl, the following steps should be taken:*

- Immediately take a correction bolus.
- Check blood glucose in one hour.
- If the second blood glucose is above 250, suspend or disconnect the pump.
- Take a correction insulin bolus by syringe.
- Check urine for ketones.
- Change entire infusion set system.
- Drink calorie-free liquids every 30 minutes.
- Check blood glucose every 2 hours and continue to take correction bolus insulin until blood glucose reaches target.
- Call health care provider if blood glucose and ketones remain elevated.

INFECTION CONTROL

Schools should have established procedures for responding to infection control and blood borne pathogens. The following is provided as general guidance.

In response to the increase in hepatitis B and C, and human immunodeficiency virus (HIV) infections, the Centers for Disease Control have recommended “standard blood and body-fluid precautions.” These measures are intended to prevent transmission of these and other infections, as well as to decrease the risk of exposure for care-providers and students. As it is currently not possible to identify all infected individuals, these precautions must be used with every student, regardless of their medical diagnosis.

Standard precautions pertain to blood and body fluids containing blood, cerebrospinal fluid, synovial fluid, vaginal secretions, semen, and pericardial fluid. These precautions do not apply to other body products such as saliva, sputum, feces, tears, nasal secretions, vomitus and urine unless blood is visible in the materials. However, these fluids and body wastes can be sources of other infections and should be handled as if infectious.

The single most important step in preventing exposure to and transmission of any infection is anticipating potential contact with infectious materials in routine as well as emergency situations. Based on the type of possible contact, the caregiver should be prepared to use the appropriate precautions and techniques prior to providing care. Diligent and proper hand washing, the use of barriers, appropriate disposal of waste products and needles, and proper decontamination of spills are essential techniques of infection control. Using common sense in the application of these measures will enhance protection of both the caregiver and the student.

Hand Washing

Proper hand washing is crucial to preventing the spread of infection. Textured jewelry on the hands or wrists (such as rings with stones) should be removed prior to washing and kept off until completion of the care procedure and hands are rewashed. Use of running water, lathering with soap and using friction to clean all surfaces of remaining jewelry and hands is key. Rinse well with running water and dry hands with paper towels. If soap and water are unavailable, an alcohol based hand sanitizing agent may be used.

- Hands should be washed before physical contact with student and after the contact is completed.
- Hands should be washed after contact with any used equipment.
- If hands (or other skin) become soiled with blood or body fluids, they should be washed immediately before touching anything else.
- Hands should be washed whether gloves are worn or not and after gloves are removed.

Barriers

Barriers include disposable gloves, protective eyewear, masks and gowns. The use of barriers is intended to reduce the risk of contact with blood and body fluids for the caregiver as well as to control the spread of infectious agents from student to student. It is essential that appropriate barriers be used when contact with potentially infectious materials is possible.

Gloves should be worn when direct care of the student may involve contact with blood or body fluids. For infection control, it is recommended that gloves be worn as well for contact with urine, feces and respiratory secretions. Gloves should be disposed of after each use and not reused.

DISPOSAL OF “SHARPS”

Needles, syringes, lancets and other sharp objects should be placed in a puncture-proof container immediately after use. To reduce the risk of an accidental needle stick or cut, needles should not be recapped, bent or removed from the syringe before disposal. Once it is full, the container should be sealed, labeled with a warning “do not recycle” and then disposed of in the garbage away from the reach of children. See Appendices, page 90 - “Safe Disposal of Syringes and Lancets”.

ADDITIONAL CONCERNS IN THE MANAGEMENT OF TYPE 2 DIABETES

Diet, weight control and exercise are critical for controlling blood glucose in type 2 diabetes. Some students can avoid the need for medication by adhering to lifestyle changes and achieving weight loss. Medications may be added if needed.

Medications approved for youth with type 2 diabetes:

- **Metformin** (Glucophage) is the most commonly prescribed medication for type 2 diabetes. This can be taken once or twice daily. Generally it will not be necessary to administer it during school hours. Metformin can cause gastrointestinal upset which usually improves in one to two months. In general it is well tolerated, but in rare instances can cause a life-threatening buildup of lactic acid in the blood. Therefore, students taking Metformin should be carefully evaluated if they develop severe vomiting, unusual weakness, abdominal pain and rapid deep breathing (called Kussmaul respirations). Metformin does not usually cause hypoglycemia, but low blood glucose may result if it is used in combination with other diabetes medicines.
- **Insulin** may also be required to maintain healthy blood glucose levels. If oral medications are not sufficient to control the blood glucose levels, then insulin will be prescribed. Often, it can be given as a single injection with long-acting insulin at night. In some cases, students will need insulin coverage for every meal.