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Patient education: Hypoglycemia (low blood sugar) in diabetes mellitus (Beyond the Basics)

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LOW BLOOD SUGAR OVERVIEW — Hypoglycemia, also known as low blood sugar, occurs when levels of glucose (sugar) in the blood are too low. Hypoglycemia is common in people with diabetes who take insulin and some (but not all) oral diabetes medications.

WHY DO I GET LOW BLOOD SUGAR? — Low blood sugar happens when a person with diabetes does one or more of the following:

- Takes too much insulin (or an oral diabetes medication that causes your body to secrete insulin)
- Does not eat enough food
- Exercises vigorously without eating a snack or decreasing the dose of insulin beforehand
- Waits too long between meals
- Drinks excessive alcohol, although even moderate alcohol use can increase the risk of hypoglycemia in people with type 1 diabetes

LOW BLOOD SUGAR SYMPTOMS — The symptoms of low blood sugar vary from person to person, and can change over time. During the early stages low blood sugar, you may:

- Sweat
- Tremble
- Feel hungry
- Feel anxious

If untreated, your symptoms can become more severe, and can include:

- Difficulty walking
- Weakness
- Difficulty seeing clearly
- Bizarre behavior or personality changes
- Confusion
- Unconsciousness or seizure

When possible, you should confirm that you have low blood sugar by measuring your blood sugar level (see ["Patient education: Self-blood glucose monitoring in diabetes mellitus \(Beyond the Basics\)"](#)). Low blood sugar is generally defined as a blood sugar of 60 mg/dL (3.3 mmol/L) or less.

Some people with diabetes develop symptoms of low blood sugar at slightly higher levels. If your blood sugar levels are high for long periods of time, you may have symptoms and feel poorly when your blood sugar is closer to 100 mg/dL (5.6 mmol/L). Getting your blood sugar under better control can help to lower the blood sugar level when you begin to feel symptoms.

Hypoglycemia unawareness — Hypoglycemia unawareness occurs when you do not have the early symptoms of low blood sugar. As a result, you cannot respond in the early stages, and severe signs of low blood sugar, such as passing out or seizures, are more likely. Being unaware of low blood sugar is a common occurrence, especially in people who have had type 1 diabetes for greater than 5 to 10 years.

Hypoglycemia and hypoglycemia unawareness occur more frequently in people who tightly control their blood sugar levels with insulin (called intensive therapy).

People who drink excessive amounts of alcohol, are tired, or who take a beta blocker (commonly used to control high blood pressure) may not notice their low blood sugar symptoms, or may not recognize that the symptoms are due to low blood sugar.

Hypoglycemia unawareness can also occur in people who take certain oral diabetes medications (eg, glyburide [brand name: Micronase]), especially in older adult people with heart or kidney disease.

Nocturnal hypoglycemia — Low blood sugar that occurs when you are sleeping (nocturnal hypoglycemia) can disrupt sleep but often goes unrecognized. Nocturnal hypoglycemia is a form of hypoglycemia unawareness. Thus, if you have nocturnal hypoglycemia, you are less likely to have symptoms that alert you to the need for treatment. Nocturnal hypoglycemia can be difficult to diagnose, and can increase the risk of hypoglycemia unawareness in the 48 to 72 hours that follow.

LOW BLOOD SUGAR PREVENTION — The best way to prevent low blood sugar is to monitor your blood sugar levels frequently and be prepared to treat it promptly at all times. You and a close friend or relative need to learn the symptoms and should **always** carry glucose tablets, hard candy, or other sources of fast-acting carbohydrate.

Glucose tablets are recommended since they have a pleasant taste, but you are not likely to eat them unless your blood sugar is low. Candy can be tempting to eat, even when blood sugar levels are normal, especially for children with diabetes.

Low blood sugar can be frightening and unpleasant, and it is common to be fearful of future episodes. This may lead you to keep your blood sugar level high, which can lead to long-term complications.

It may be helpful to discuss fears of low blood sugar with a health care provider. In addition, ask about blood sugar awareness education. Blood sugar awareness training can improve your ability to recognize low blood sugar earlier.

LOW BLOOD SUGAR TREATMENT — When you are low, you should check your blood sugar level as soon as possible. However, go ahead and treat yourself for low blood sugar if your monitoring equipment (blood glucose meter, test strips, lancet) is not readily available. Treat yourself quickly, especially if your blood sugar is less than 40 mg/dL (2.2 mmol/L).

- If your blood sugar is 51 to 70 mg/dL (2.8 to 3.9 mmol/L), eat 10 to 15 grams of fast-acting carbohydrate (eg, 1/2 cup fruit juice, 6 to 8 hard candies, 3 to 4 glucose tablets).
- If you are less than 50 mg/dL (2.8 mmol/L), eat 20 to 30 grams of fast-acting carbohydrates.

This amount of food is usually enough to raise the blood sugar into a safe range without causing high blood sugar levels (called hyperglycemia). Avoid foods that contain fat (like candy bars) or protein (cheese) initially, since they slow down your body's ability to absorb glucose.

Retest after 15 minutes and repeat treatment if needed. If your next meal is more than an hour away, eat an additional 15 grams of carbohydrate and 1 ounce of protein. Examples of this include crackers with cheese or one-half of a sandwich with peanut butter. It is important not to eat too much because this can raise your blood sugar above the target level and lead to weight gain over the long-term.

Glucagon — If your low blood sugar is severe, you may pass out or become too disoriented to eat. A close friend or relative should be trained to recognize severe low blood sugar and treat it quickly. Dealing with a loved one who is pale, sweaty, acting bizarrely, or is passed out and convulsing can be scary. An injection of glucagon stops these symptoms quickly.

Glucagon is a hormone that raises blood glucose levels. Glucagon is available in emergency kits, which can be bought with a prescription in a pharmacy ([picture 1](#)). Directions are included in each kit; a roommate, spouse, or parent should learn how to use the injection before an emergency occurs.

It is important that the glucagon kit is easy to locate, is not expired, and that the friend or relative is able to stay calm. You should refill the kit when the expiration date approaches, although using an expired kit is unlikely to cause harm.

Procedure — Glucagon should be injected in the thigh or abdomen. The injection sites and technique are similar to an insulin injection.

- Remove the needle protector and inject the entire content of the syringe (a clear solution) into the glucagon powder. Do not remove the plastic clip on the syringe. Remove the needle from the bottle.

- Swirl the mixture gently until the powder is dissolved. The solution should be clear. Do not use the solution if it is discolored.
- Hold the bottle upside down and withdraw the contents into the syringe (1 mg mark on syringe for adults and children over 44 pounds [20 kilograms]). Children under 44 pounds need one-half the dose, and only 1/2 the solution should be withdrawn (0.5 mg mark on syringe).
- Choose an injection site in the abdomen or thigh ([figure 1](#)).
- Insert the needle into the skin ([picture 2](#)).
- Press the plunger to inject the glucagon.
- Withdraw the needle, and replace the syringe in the storage case (do not attempt to re-cap the needle). Press lightly at the injection site.
- Turn the person to his or her side. This prevents choking if he/she vomits.

Symptoms should resolve within 10 to 15 minutes, although nausea and vomiting may follow 60 to 90 minutes later. As soon as the person is awake and able to swallow, offer a fast-acting carbohydrate such as glucose tablets or juice. After the person begins to feel better, he or she should eat a snack with protein, such as crackers and cheese or a peanut butter sandwich.

If the patient is not conscious within 10 minutes, another glucagon injection should be given, if a second kit is available. Emergency help should be called immediately.

LOW BLOOD SUGAR FOLLOW-UP CARE — After your blood sugar level normalizes and your symptoms are gone, you can usually resume your normal activities. If you required glucagon, you should call your health care provider. Your provider can help you to determine how and why you developed severely low blood sugar, and can suggest adjustments to prevent future reactions.

In the first 48 to 72 hours after a low blood sugar episode, you may have difficulty recognizing the symptoms of low blood sugar. In addition, your body's ability to counteract low blood sugar levels is decreased. Check your blood sugar level before you eat, exercise, or drive to avoid another low blood sugar episode.

WHEN TO SEEK HELP — A family member or friend should take you to the hospital or call for emergency assistance (911 in many United States communities) immediately if you:

- Remain confused 15 minutes after being treated with glucagon
- Are unconscious (or nearly unconscious) and glucagon is not available
- Continue to have low blood sugar despite eating adequate amounts of a fast-acting carbohydrate or receiving glucagon

Once in a hospital or ambulance, you will be given treatment intravenously (IV) to raise your blood sugar level immediately. If you require emergency care, you may be observed in the emergency department for a few hours before being released. A friend or relative should drive you home.

WHERE TO GET MORE INFORMATION — Your health care provider is the best source of information for questions and concerns related to your medical problem.

This article will be updated as needed on our web site (www.uptodate.com/patients). Related topics for patients, as well as selected articles written for health care professionals, are also available. Some of the most relevant are listed below.

Patient level information — UpToDate offers two types of patient education materials.

The Basics — The Basics patient education pieces answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials.

[Patient education: Type 1 diabetes \(The Basics\)](#)

[Patient education: Low blood sugar in people with diabetes \(The Basics\)](#)

[Patient education: Diabetes and diet \(The Basics\)](#)

[Patient education: Should I switch to an insulin pump? \(The Basics\)](#)

Beyond the Basics — Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are best for patients who want in-depth information and are comfortable with some medical jargon.

[Patient education: Diabetes mellitus type 1: Insulin treatment \(Beyond the Basics\)](#)

[Patient education: Diabetes mellitus type 1: Overview \(Beyond the Basics\)](#)

[Patient education: Diabetes mellitus type 2: Alcohol, exercise, and medical care \(Beyond the Basics\)](#)

[Patient education: Diabetes mellitus type 2: Overview \(Beyond the Basics\)](#)

[Patient education: Diabetes mellitus type 2: Treatment \(Beyond the Basics\)](#)

[Patient education: Preventing complications in diabetes mellitus \(Beyond the Basics\)](#)

[Patient education: Self-blood glucose monitoring in diabetes mellitus \(Beyond the Basics\)](#)

Professional level information — Professional level articles are designed to keep doctors and other health professionals up-to-date on the latest medical findings. These articles are thorough, long, and complex, and they contain multiple references to the research on which they are based. Professional level articles are best for people who are comfortable with a lot of medical terminology and who want to read the same materials their doctors are reading.

[Hypoglycemia in adults without diabetes mellitus: Diagnostic approach](#)

[Diagnostic dilemmas in hypoglycemia: Illustrative cases](#)

[Factitious hypoglycemia](#)

[Management of blood glucose in adults with type 1 diabetes mellitus](#)

[Insulin therapy in type 2 diabetes mellitus](#)

[Insulin-induced hypoglycemia test](#)

[Insulinoma](#)

[Management of hypoglycemia during treatment of diabetes mellitus](#)

[Hypoglycemia in adults: Clinical manifestations, definition, and causes](#)

[Physiologic response to hypoglycemia in normal subjects and patients with diabetes mellitus](#)

[Postprandial \(reactive\) hypoglycemia](#)

The following organizations also provide reliable health information.

- National Library of Medicine

(www.nlm.nih.gov/medlineplus/healthtopics.html)

- National Institute of Diabetes & Digestive & Kidney Diseases

(www.niddk.nih.gov)

- American Diabetes Association (ADA)

(800)-DIABETES (800-342-2383)

(www.diabetes.org)

- The Endocrine Society

(www.endo-society.org)

- Hormone Health Network

(www.hormone.org/diseases-and-conditions/diabetes)

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GRAPHICS

Glucagon kit



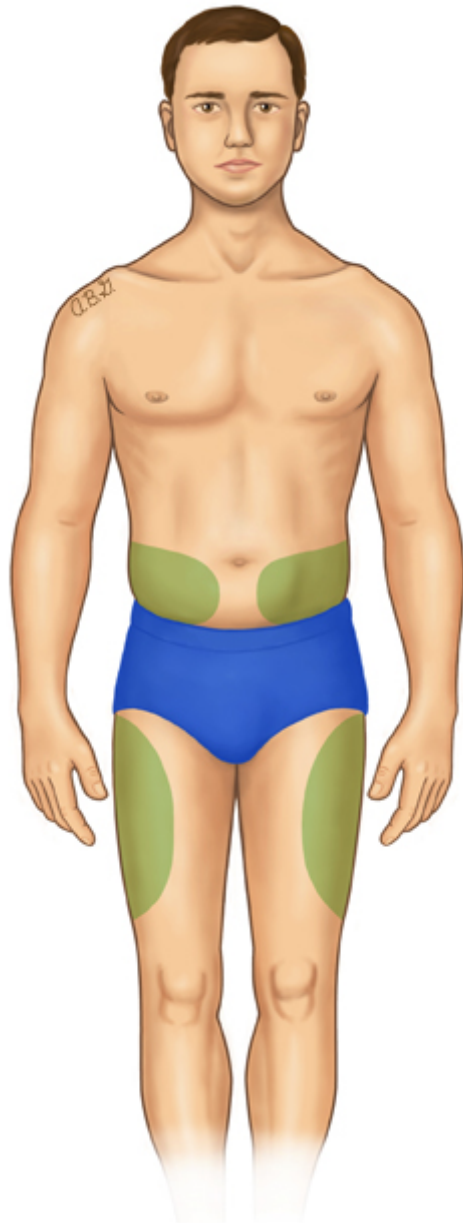
This photograph shows a glucagon shot kit. The kit includes a syringe and needle, a small vial of glucagon powder, and a carrying case. The way to give a glucagon shot is:

1. Stick the needle into the top of the vial, and inject the fluid in the syringe into the vial of powder.
2. Gently swirl the vial to mix the powder and liquid, until the powder dissolves.
3. Draw up the liquid in the vial into the syringe.
4. Stick the needle into the side of the lower belly or upper leg and inject the liquid.

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Graphic 50427 Version 6.0

Where to give a glucagon shot



A glucagon shot can be given in the side of the lower belly or upper leg (as shown by the shaded areas).

Graphic 74461 Version 4.0

Glucagon shot



To give a glucagon shot:

1. Hold the syringe at a 90 degree angle to the lower belly or upper leg (as shown in the photograph).
2. Quickly stick the needle in the skin and push the plunger down all the way.
3. Remove the needle from the skin.
4. Press down lightly on the skin where the shot was given.
5. Turn the person onto his or her side in case he or she vomits.

Graphic 61722 Version 5.0

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