

# Diabetes Management During Cancer Treatment





# Table of Contents

## **Diabetes and Cancer Treatment... 2**

### **Diabetes ..... 2**

#### **Types of Diabetes ..... 2**

Type 1 Diabetes

Type 2 Diabetes

Secondary Diabetes

### **Steroids ..... 3**

### **Insulin ..... 3**

#### **Types of Insulin ..... 4**

### **Self-Monitoring Blood Sugar Levels ..... 5**

Blood Sugar Testing at Home

Testing Your Blood Sugar

When to Check Your Blood Sugar

Extra Blood Sugar Checks

Storage and Disposal of Supplies

Record Keeping

### **Storage of Insulin..... 7**

### **Traveling with Insulin ..... 7**

### **Insulin Injection ..... 7**

Insulin Injection Sites

Gather Supplies

### **Injections Using Insulin Vial and Syringe ..... 8**

### **Injection Using Insulin Pen and Pen Needle ..... 9**

### **Hypoglycemia: Managing Low Blood Sugar ..... 10**

Causes

Symptoms of Hypoglycemia

Actions to Treat Low Blood Sugar

Food and Drinks to Treat Low Blood Sugar

Preventing Low Blood Sugar

### **Hyperglycemia: Managing High Blood Sugar ..... 11**

Causes

Symptoms of Hyperglycemia

Managing Diabetes When You are Sick

### **Lifestyle Changes ..... 12**

Make Healthy Food Choices

Eat Healthy Carbohydrates

Control Serving Sizes

Eat Less Fat and Fewer Calories

Avoid Skipping Meals

Maintain a Healthy Weight

### **Medicine ..... 13**

### **Food Recommendations ..... 13**

Food Groups to Choose, Limit or Avoid

### **Blood Sugar Log ..... 15**

### **Notes ..... 16**



## Diabetes and Cancer Treatment

Between 8% and 18% of cancer patients have diabetes, a chronic condition that impacts the ability to regulate blood sugar levels. For many patients with cancer, diabetes management takes a backseat to cancer treatment. However, managing your blood sugar levels can help your overall health.

Radiation therapy, steroids and some types of chemotherapy may impact your blood sugar levels. Uncontrolled high blood sugar can lead to dehydration, diarrhea and loss of appetite. Taking extra care to manage your blood sugar levels can help you feel better during cancer treatment. Also, uncontrolled blood sugar levels can have a negative impact on your other organs. Monitoring your blood sugar levels can help keep them healthy and strong during cancer treatment. Remember, if you have diabetes, the best thing you can do is to make sure your blood sugar levels are under control. That's true before, during and after cancer treatment.

## Diabetes

Glucose (sugar) is the body's major source of energy which comes from the food we eat. Sugar is found in the blood. The pancreas makes a hormone called insulin which helps sugar in the blood move into the cells to use for energy.

A person living with diabetes may have a problem with not making enough insulin or the body is not able to use insulin to move sugar from the blood into the cells.

Diabetes may cause the sugar in the blood to go high leaving your body starving for energy.



## Types of Diabetes

### Type 1 Diabetes

Type 1 diabetes is when the body cannot produce insulin. It often appears suddenly in children or young adults. This may also be called “juvenile diabetes.” However, people of all ages can develop type 1 diabetes if the pancreas stops making insulin. Without insulin, blood sugar levels in the body get too high. As a result, the body tries to flush sugar out by frequent urination. This leads to excessive thirst and may result in drinking lots of water. People with untreated type 1 diabetes often lose weight despite being hungry. Because people with type 1 diabetes cannot make insulin, they must take insulin for life by injection. A severe episode of hyperglycemia or high blood sugar may lead to diabetic ketoacidosis (DKA), a potentially life-threatening complication requiring hospitalization.

### Type 2 Diabetes

People with type 2 diabetes usually produce some insulin, but not enough to regulate the blood sugar properly. Although some people with type 2 diabetes may have increased thirst, urination, and hunger, often there are no symptoms at all.

Type 2 diabetes may go undiagnosed for years. Type 2 diabetes is much more common than type 1 diabetes. Over 90% of patients with diabetes have type 2. Type 2 diabetes is more frequent with increasing age but is becoming more common in overweight children and adolescents. Diet and various medicines often can control type 2 diabetes. Patients may or may not need insulin therapy.

### Secondary Diabetes

Secondary diabetes occurs because of other diseases or treatments. It may or may not go away over time. Patients have symptoms like type 1 and type 2 diabetes. Potential causes include:

- Cancer treatments, such as steroids and some chemotherapy medicines
- Disorders of the pancreas, such as pancreatic cancer or pancreatitis
- Cushing's syndrome, acromegaly and other hormonal disorders





## Steroids

Steroids cause blood sugar levels to be higher than usual. This occurs for many reasons. One reason is that steroids cause your liver to release sugar into your bloodstream. This causes your blood sugar level to rise. Another reason is that steroids weaken the effect of insulin. Insulin works to lower your blood sugar. Thus, the weakened effect of insulin causes your blood sugar level to rise.

The effect that steroids have on blood sugar level is related to the strength or dose of the steroid you are taking. Most often, higher doses of steroids cause higher blood sugar levels. This causes you to need more insulin to control blood sugar level. Diabetes pills may help, but very often, insulin is needed while steroids are being used.

## Insulin

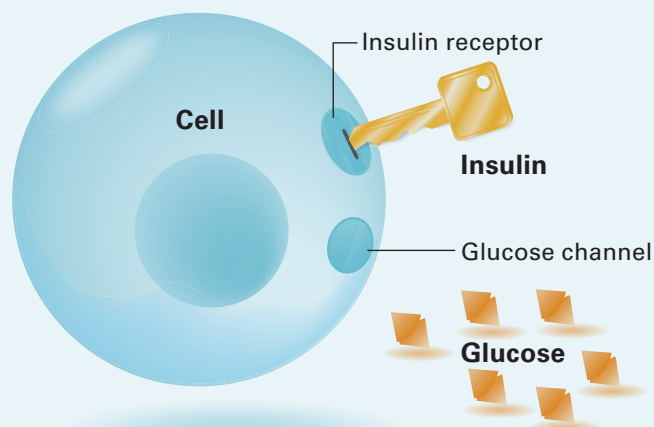
Insulin is a hormone that is made by your pancreas. Insulin works by helping digested blood sugar move from the bloodstream into the cells of the body, where the sugar is used for growth and energy.

When blood sugar is higher than normal, it is because either the pancreas does not make enough insulin for your body, or it does not use insulin the way it should. Insulin may be given to bring the blood sugar level down quickly.

You may need medicine for a few months or you may need it long term depending on other factors. Steroids and other medicines can cause high blood sugar levels that require treatment with insulin to lower your blood sugar levels to the goal needed for the best treatment. Discuss your goal for blood sugar levels with your care team.

### Importance of Insulin

**Insulin acts as the key which unlocks the cell to allow glucose to enter the cell and be used for energy.**



Source: Getty Images

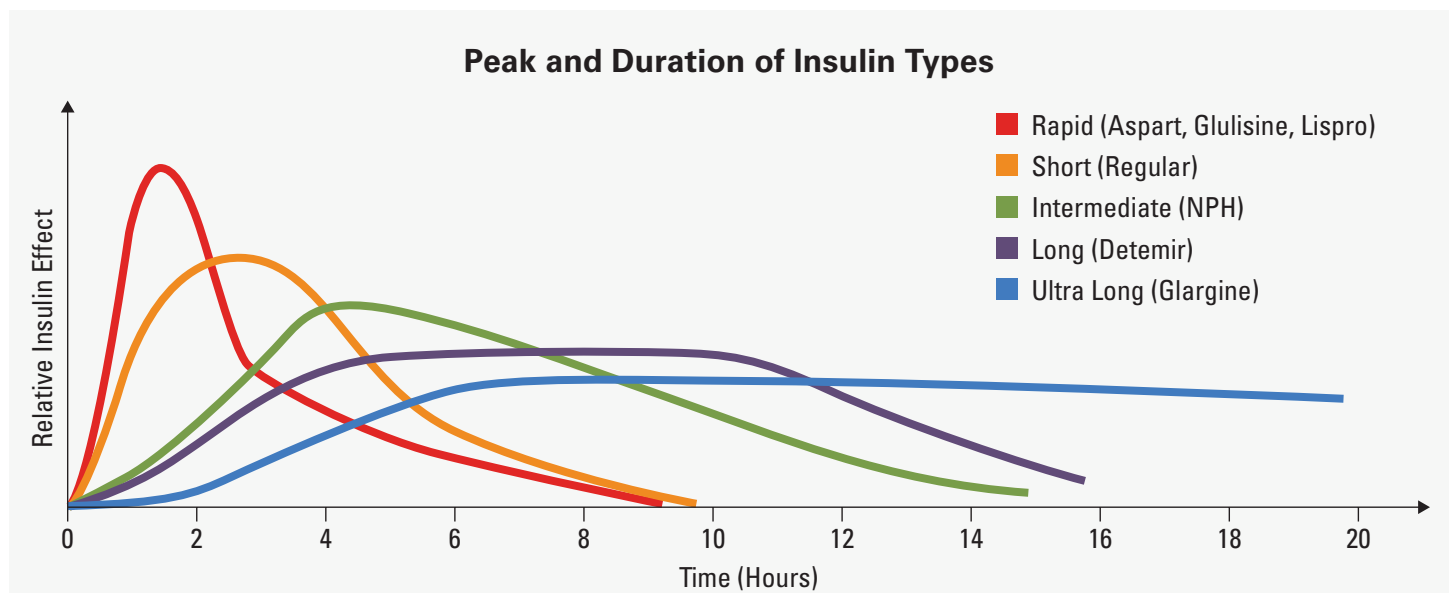
## Types of Insulin

Response time to **insulin onset**, **peak** and **duration** may vary for each person due to many factors.

Insulin and Action						
Classification	Generic Name	Brand Name	Onset	Peak	Duration	Color
Rapid-Acting	Aspart Glulisine Lispro Aspart Lispro	Novolog® Apidra® Humalog® Fiasp® Lyumjev®	5-15 minutes	1-2 hours	4-6 hours	Clear
	Inhaled Insulin	Afrezza®	12-15 minutes	1 hour	3 hours	N/A
Short-Acting	Regular, human	Humulin® R Novolin® R Relion®/Novolin® R	30-60 minutes	2-4 hours	6-10 hours	Clear
Intermediate-Acting	Isophane, human (NPH)	Humulin® N Novolin® N Relion®/Novolin® N	1-2 hours	4-8 hours	10-18 hours	Cloudy
Long Acting	Detemir Glargine Glargine	Levemir® Lantus® Basaglar®	1-2 hours	No Peak	Up to 24 hours	Clear
Ultra-Long Acting	Glargine Degludec	Toujeo® Tresiba®	6 hours	No Peak	36 hours	Clear

References: Sisson, E., Kim, C & Smith, S. (2019). AADE quick guide to medications.

American Association of Diabetes Educators (2016). Diabetes Education Curriculum-A Guide to Successful Self-Management.







## Self-Monitoring Blood Sugar Levels

### Blood Sugar Testing at Home

Checking your blood sugar level daily is very important to managing your diabetes. Blood sugar that is too low or too high can harm your body. Testing and recording allow you to see the connection between your medicines, foods and activity to your blood sugar levels. This allows good control. Good control reduces complications.

### Testing Your Blood Sugar

Here are the supplies you need:

- **Finger stick device**
  - Pricks the finger to get a drop of blood
  - Uses lancets
- **Test strips**
  - Flat strips with a reagent on the end
  - Place test strip in blood glucose meter first
  - Place a drop of your blood on the end of the strip

- **Blood glucose meter (glucometer)**

- A hand-held unit
- Purchased at a pharmacy (often provided free)

You will be shown how to use the equipment. Each meter may be different.

Always wash your hands before testing. Warm water helps bring up a drop of blood. Pricking the side of the finger instead of the finger pad is more comfortable. Use different sites so one finger does not get too sore.

### When to Check Your Blood Sugar

Follow your health care team's instructions on when to check your blood sugar. The usual times to check are:

- Before breakfast
- Before lunch
- Before dinner
- At bedtime

People taking insulin injections or using an insulin pump will test several times a day. Those taking pills usually check less often.





## Extra Blood Sugar Checks

There may be times when you need to test your blood sugar in addition to the regular checks.

These may include:

- If you feel bad. Your sugar may be too high or low. The only way to tell is to measure it.
- When you change your dose or type of diabetes medicines
- At times of increased stress, illness or surgery
- If you begin new medicines, such as steroids

## Storage and Disposal of Supplies

Be sure to store your testing supplies in a cool dry place.

- Keep the test strip container cap on tightly.
- Check the expiration date on your test strips.
- Throw away any outdated test strips.
- Lancets can only be used one time. Throw away used lancets in a safety container.
- A thick plastic container with a screw top works well as a safety container. A used laundry detergent bottle is an example. When the container is nearly full, seal it with tape and properly dispose of it.

## Record Keeping

Keeping an accurate record helps you and your doctor manage your diabetes. Most meters record and store blood sugar results. Take your meter with you to your appointments. Some doctors may ask you to write down your results. Discuss this with your doctor and use the chart on page 15 to help you record your information.





## Storage of Insulin

Unopened, unused insulin vials and pens should be kept refrigerated 36°F to 46°F (2°C to 8°C) and protected from light. Refrigerated, unopened insulin vials and pens may be used until the expiration date. If unopened, unused insulin vials and pens are kept at room temperature, they must be thrown away after 1 month. Most brands of insulin are good for 1 month at room temperature after opening, and insulin will not be effective over time. Refer to your insulin package insert for details. Never freeze insulin. If insulin has been frozen, throw it away and do not use.

## Traveling with Insulin

Store insulin vials and pens that are open and being used at room temperature not to exceed 86°F (30°C).

## Insulin Injection

Insulin lowers the amount of sugar in the blood. People with diabetes often need to take insulin injections. Your doctor will decide the right type of insulin for you, how much to give and instructions on when to give it.

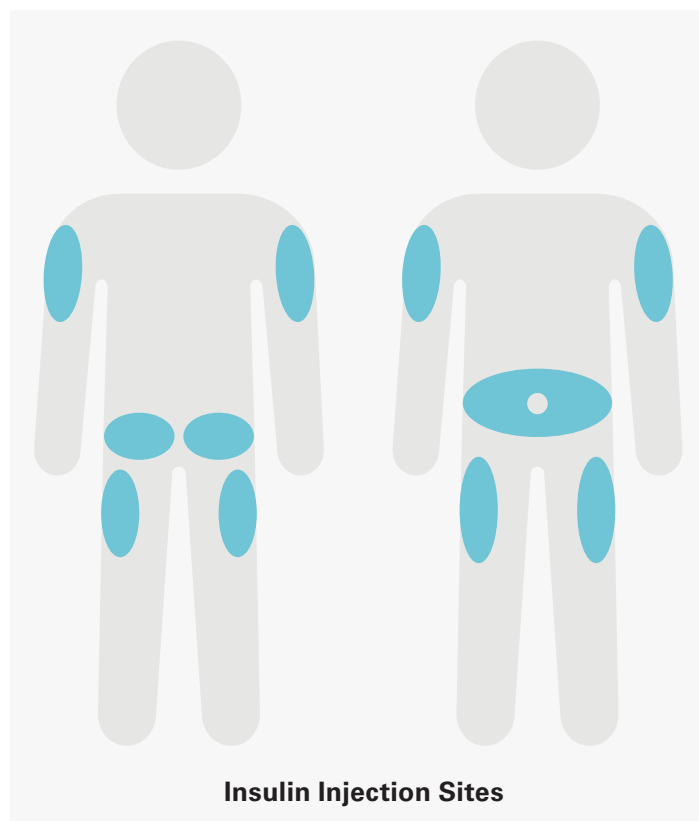
## Insulin Injection Sites

Inject insulin into the subcutaneous fat in the abdomen, thigh, buttocks and upper arm.

- Use a different location each day.
- Using different sites prevents scar tissue.

## Gather Supplies

- Insulin pen or vial
- Insulin pen needle or syringe
- Alcohol pad or bottle of alcohol and cotton balls
- Band-Aid (optional)
- Sharps container to throw away pen needles or syringes. Never reuse or share insulin pen needles or syringes. Always throw away after each use.



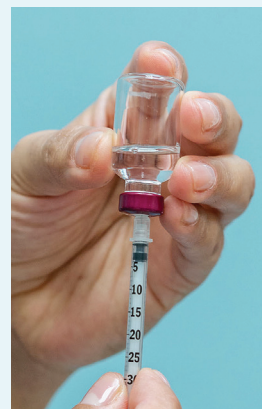


# Injections Using Insulin Vial and Syringe

**1** Wash your hands with soap and water, gather supplies and wipe the top of the insulin vial with alcohol pad.



**5** Leave the needle in the insulin vial and turn the vial and syringe upside down. Pull the plunger down slowly and line up to the bottom of the plunger. Look for air bubbles. Air bubbles in the syringe means you will get less insulin. If you have air bubbles push the insulin back into the vial and start from step 3.



**2** If you are taking cloudy insulin, gently roll vial in between hands until evenly mixed.



**6** Check your syringe to make sure you have the correct amount of insulin. Pull syringe and needle out of the vial. Clean the skin with an alcohol pad and allow alcohol to dry completely.



**3** Expose the needle by twisting off cap and remove plunger cap by pulling straight off. Pull plunger down to draw air into the syringe equal to the amount of insulin you need.



**7** Pick up the syringe and hold it like a pencil. Do not let the needle touch anything. Quickly push the needle straight into the skin at a 90° angle. Push the plunger to inject the insulin and hold for 10 seconds before pulling the needle out.



**4** Push the needle through the top of the rubber stopper straight into the vial.



**8** Throw away the needle in a sharps container. Once your sharps container is full, seal the cap with tape. Properly dispose of the container or take it to a local pharmacy for disposal.





# Injection Using Insulin Pen and Pen Needle

- 1** Wash your hands with soap and water and gather supplies.



- 5** Turn the dial to the insulin dose given to you by your provider.



- 2** Remove the pen cover and wipe the top with alcohol pad.



- 3** Pull the paper seal off the pen needle and screw the pen needle onto the insulin pen. Carefully remove the clear outer needle cover and inner needle cover to expose the needle.



- 4** Check the flow of insulin by dialing up to 2 units and pressing down on the back of the pen until the dial returns to zero. Repeat until insulin drops or a stream of insulin appears.



- 6** Double check the dose window to make sure you have selected the proper dose. Clean the skin with an alcohol pad and allow alcohol to dry completely.



- 7** Pick up the insulin pen and quickly push the needle straight into the skin at a 90° angle. Use your thumb or index finger to press down on the dose knob until it goes back to zero. Hold the needle in place for 10 seconds to prevent leaking and pull the needle out.



- 8** Recap insulin pen needle with outer cover and unscrew pen needle off pen. Throw away the needle in a sharps container. Once your sharps container is full, seal the cap with tape. Properly dispose of the container or take it to a local pharmacy for disposal.



# Hypoglycemia: Managing Low Blood Sugar

Hypoglycemia is a condition in which the amount of sugar in the blood is too low. The body needs some sugar in the bloodstream to support your normal brain function. However, if blood sugar levels are either too high or too low, problems can occur.

## Causes

There are many reasons low blood sugar can occur, including:

- Diabetes medicines, including tablets and insulin
- Skipping or delaying meals while you are taking diabetes medicines
- Drinking alcohol
- Interactions of diabetes medicines with other medicines



Hypoglycemia is a serious condition. It can cause you to pass out because the brain is not getting enough sugar. Symptoms usually go away with immediate treatment. Call your doctor **right away** if your symptoms do not go away after you have taken extra sugar for treatment.

## Symptoms of Hypoglycemia

Low blood sugar may happen very quickly. It is important for you and anyone close to you to recognize the warning signs of hypoglycemia. You can then act quickly to treat it. Symptoms include:

- Shaking
- Blurred vision
- Fast heartbeat
- Tingling around the mouth or lips
- Cold, pale, moist skin
- Being unresponsive
- Slurring words or garbled speech
- Irritability, or sudden changes in personality
- Drowsiness
- Fatigue
- Confusion
- Hunger
- Sweating

## Actions to Treat Low Blood Sugar

1. Test your blood sugar as soon as possible. Always carry your glucose meter with you when you go out. Bring glucose tablets or a fast-acting sugar source with you when you leave your house.
2. If your blood sugar is less than 70 mg/dL, drink 4 ounces of juice or take 3 to 4 glucose tablets or 15 to 20 grams of simple carbohydrates (fast-acting sugar). See the Food and Drinks to Treat Low Blood Sugar list below.
3. Wait 15 minutes and test your blood sugar again.



4. If your blood sugar is still less than 70 mg/dL, **repeat step 2**. Call your doctor or clinic to report your condition.

5. Wait 15 minutes then test your blood sugar again. If it is still less than 70 mg/dL, continue to take a fast-acting sugar until your glucose is above 70 mg/dL.
6. Once your blood sugar is 70 mg/dL or higher, eat a snack or meal containing protein to help keep your blood sugar level above 70 mg/dL. The protein helps to keep the blood sugar level stable.
7. Sulfonylurea medicines cause repeated and extended low blood sugar (less than 70 mg/dL). People on sulfonylureas need to continue monitoring closely for repeated low blood sugar. If low blood sugar does not resolve with steps 1 to 6, go to the nearest hospital emergency center.
8. If you have hypoglycemia 1 or more times a week, contact your prescribing doctor as you may need to change your diabetes medicine.

These are general guidelines. Ask your care team if they apply to you.

## Food and Drinks to Treat Low Blood Sugar

- ½ cup regular carbonated soda (not diet)
- ½ cup fruit juice (orange or apple juice)
- 4 teaspoons sugar
- 1 tablespoon honey
- 2 tablespoons raisins
- 8 Lifesavers® candies or 10 jellybeans
- 3 to 4 glucose tablets

## Preventing Low Blood Sugar

- Eat meals and snacks as instructed.  
**Do not** skip or delay meals.
- Check blood sugar as instructed.
- Take insulin as directed.
- Always carry some form of fast-acting sugar.
- Monitor your blood sugar during and after exercise, especially with activities that are more vigorous and more prolonged than usual for you.
- Carry a snack containing protein with you in case you have a delayed meal or need to eat after treatment of low blood sugar.

## Hyperglycemia: Managing High Blood Sugar

Hyperglycemia is a condition in which the amount of sugar in the blood is too high. The body needs some sugar in the bloodstream. This feeds the cells of the body and supports brain activity. If sugar levels are either too high or too low in the body, problems can occur.

### Causes

Reasons for high blood sugar may include:

- Taking medicines such as steroids (prednisone, dexamethasone or cortisone)
- Having surgery or a medical condition such as diabetes or infection
- Having enteral and parenteral nutrition treatments (tube feedings and IV nutrition)
- Eating foods, especially those high in carbohydrates (fried foods, sugar-sweetened beverages, desserts, sweets)



## Symptoms of Hyperglycemia

It is important for you and anyone close to you to know the warning signs of hyperglycemia. It is important to act quickly to treat high blood sugar. Symptoms of hyperglycemia include:

- Hot, dry warm skin
- Thirsty (cotton mouth feeling)
- Frequent need to urinate, especially during the night
- Headache
- Blurred vision
- Muscle aches
- Nausea
- Excessive hunger
- Abdominal pain
- Fruity smelling breath
- Bad odor to urine
- Yeast or urinary tract infections

## Managing Diabetes When You are Sick

Your body releases extra sugar into the blood to fight the infection when you are sick. This can cause high blood sugar. You may also become less sensitive to insulin. Take the following actions when you are sick:

- Check your blood sugar level every 3 to 4 hours.
- Follow your meal plan as best you can. If you can't eat normally, drink 4 ounces of beverages containing sugar every hour to keep your blood sugar from falling too low.
- Ask your doctor if you should take your diabetes medicine if you are unable to eat.
- Call your doctor if:
  - You begin to vomit and unable to keep down liquids or take your medicines
  - You are ill longer than 24 hours
  - Blood sugar levels remain above 240 mg/dL for more than 24 hours

Diabetic ketoacidosis (DKA) can occur within hours when you do not have enough insulin. If you use insulin, test for ketones every 4 to 6 hours or if your blood sugar is higher than 240 mg/dL.



## Lifestyle Changes

Take these actions to help control your blood sugar levels and stay in your goal range.

### Make Healthy Food Choices

- Include non-starchy fruits, vegetables, whole grains and other minimally processed foods.
- Choose foods that are low in sugar and avoid refined carbohydrates.
- Read the nutrition label on all packaged foods to check grams of carbohydrates.

### Eat Healthy Carbohydrates

- Choose complex instead of simple carbohydrates.
- Complex carbohydrates are foods such as beans, whole grains and vegetables. Their sugars are strung together in longer chains. Because these sugar structures must be broken, blood sugar rises slower.
- Limit simple carbohydrates (sugar-containing foods) such as sweets, desserts, candy, cookies, sodas, etc. These foods have fewer chains and break down quickly. Therefore, blood sugar rises rapidly and can be harder to control.

### Control Serving Sizes

- Keep a journal of the foods you eat with portion sizes (½ cup, 1 cup or ounces). Share the journal with your dietitian or nurse.
- Weigh or measure foods to become familiar with serving sizes, and learn how to estimate ½ cup portions for most foods.
- To visually estimate the portion sizes of foods, 1 cup is approximately the size of a tennis ball and 3 ounces is the size of a standard deck of playing cards.

### Eat Less Fat and Fewer Calories

- Eating less fat and fewer calories may not directly lower blood sugar, but it is important for staying healthy.
- Choose lean meats and protein.
- Eat protein alternatives such as beans, tofu and eggs. Egg yolks are high in fat so eat these less often. Try using egg substitutes without fat. Less fat equals fewer calories.
- Bake, broil, roast, grill or boil meats instead of frying.
- Limit eating meats dipped in batter or breading and those cooked in a sweet sauce or marinade (BBQ, honey, molasses, fruit juice, etc.) as these will cause your blood sugar to rise.
- Choose non-fat or reduced-fat dairy products.
- Eat a meatless meal once or twice a week.





### **Avoid Skipping Meals**

- Long periods between meals can lead to an unsafe drop in blood sugar.
- Low blood sugar can cause some people to consume unhealthy, sugary food that can lead to more instances of high blood sugar.
- Skipping meals can also lead to overeating.
- Follow a meal plan or pattern that works for you.

### **Maintain a Healthy Weight**

- Talk to your dietitian or doctor to determine a healthy weight for you.
- Discuss weight control with your dietitian and doctor.
- Avoid extra calories. Ask for help to learn about your calorie needs.
- Be active every day.



- Consult with your doctor before you begin an exercise program.

- Find activities that you enjoy and do them regularly.
- Activities such as walking and gardening are simple ways to burn calories.
- Exercise for 30 to 60 minutes on 5 or more days every week.

### **Medicine**

Your doctor may give you a pill or shot to keep your blood sugar under control. You may need this only for a short time. This may happen if a treatment is causing your hyperglycemia. Once the treatment is stopped, your blood sugar may return to normal. Or, you may have a medical condition like diabetes that requires continued medical care. Talk with your doctor to understand more.

If you have diabetes or prediabetes, learn to check your blood sugar levels at home. This will help you understand what your symptoms and blood sugar levels are. Treatment depends on the amount of sugar in your blood.

### **Food Recommendations**

This chart of food recommendations eliminates foods that contain high amounts of simple carbohydrates. Simple carbohydrates are sugars found in desserts, beverages, candy, sweets and syrups. These foods usually have low nutritional value and can cause your blood sugar to be high. Choose foods with little or no added sugar. Other names for sugar to watch for include corn syrup, and words that end in “ose” such as dextrose, fructose, sucrose and maltose. This diet is best for people who have elevated blood sugar levels and/or need a basic plan for diabetes management.





Food Group	Choose	Limit or Avoid
<b>Beverages</b>	<p>Sugar-free drinks, sugar-free carbonated beverages, sugar-free instant breakfast, plain tea, plain coffee, seltzer</p> <p>These beverages may be sweetened with sugar substitutes.</p>	<p>Avoid having more than ½ cup of fruit juice daily.</p> <p>Avoid sugar-sweetened carbonated beverages including natural flavored drinks, drinks sweetened with sugar, milkshakes, sports drinks.</p>
<b>Breads and Cereals</b>	Whole grain breads and cereals	<p>Avoid sweetened cereals, granola and granola-type bars, breakfast bars, pastries, doughnuts.</p> <p>Limit portions of rice and pasta.</p>
<b>Fruits</b>	Fruits canned in water or their own juice, fruits sweetened with sugar substitute, fresh or frozen fruits without added sugar	Avoid fruits canned in syrup or sweetened with sugar. Limit 100% fruit juice to ½ cup daily.
<b>Vegetables</b>	Fresh or frozen non-starchy vegetables	Limit portions of starchy vegetables such as potatoes, corn, beans and peas.
<b>Meat and Meat Substitutes</b>	Beef, pork, chicken, fish, eggs, beans, shellfish, cheese, tofu	Avoid meats that are high in sodium or fat such as cold cuts, hot dogs, bacon, sausage and any meat that has been fried.
<b>Milk</b>	Low-fat milk or buttermilk, plain or light yogurts, soy milk	Avoid flavored or sweetened milk and yogurt.
<b>Desserts and Snacks</b>	Choose sugar-free versions of syrup, jelly, jam, gelatins, puddings, ice cream, angel food cake; plain graham crackers and vanilla wafers, sugar substitutes such as NutraSweet®, Splenda®, Sugar Twin®, Equal®, Aspartame®, Acesulfame-K®	Avoid sugar (brown, white, powdered, natural, raw), honey, syrup, candies, molasses, frosting, marmalade, jam, jelly, cookies, marshmallows, ice cream, cakes, pies, gelatin, pudding, custard, condensed milk, sherbet, sorbet, fruit bars.

# Blood Sugar Log

The American Diabetes Association clinical practice guidelines and your provider recommend a fasting blood sugar (before breakfast) of 80 to 130 mg/dL. Blood sugar levels before meals and 2 hours after meals should be less than 180 mg/dL. Talk with your health care team about your personal blood sugar goals.

My blood sugar goals:

		Breakfast		Lunch		Dinner		Bedtime
Date		Before	After	Before	After	Before	After	
	Blood Sugar							
	Medicine							
	Blood Sugar							
	Medicine							
	Blood Sugar							
	Medicine							
	Blood Sugar							
	Medicine							
	Blood Sugar							
	Medicine							
	Blood Sugar							
	Medicine							
	Blood Sugar							
	Medicine							



## Notes

[illegible]





