

Diabetes: Medicines

Information for Patients

Diabetes pills

Some people with Type 2 diabetes can control their blood glucose (sugar) with diet and exercise alone. Others will need to take diabetes pills. Diabetes pills help keep your blood glucose level within a good range. Some people with Type 2 diabetes may need to take insulin shots. Other people may need both pills and shots.

Several kinds of pills may help people who have Type 2 diabetes. The groups of drugs listed below work in different ways. Some people with Type 2 diabetes may need 2 or 3 kinds of pills to control blood glucose.

It is important for you to know that every medicine has 2 names. A medicine has a generic (jun-AIR-ik) name and a brand name. The generic name is the basic name of the drug. The brand name is the name that a specific company uses when it makes that drug. For an example, look at a common headache medicine. Many people use acetaminophen (uh-SEET-uh-MINN-uh-fin) for a headache. Acetaminophen is the generic name of the drug. The brand names include Anacin Aspirin Free, Bayer Select Headache, and Tylenol.

Sulfonylurea drugs

Sulfonylurea (SULL-fon-il-your-EE-uh) drugs help the pancreas produce more insulin. The table below lists examples of this type of drug.

Brand Name	Generic Name
Diabinese	chlorpropamide
Tolinase	tolazamide
Orinase	tolbutamide
Glucotrol Glucotrol XL	glipizide
Amaryl	glimepiride
Micronase DiaBeta Glynase	glyburide
Dymelor	acetohexamide

Follow your doctor’s instructions on how often to take your sulfonylurea drugs. You should take all of the drugs listed in the sulfonylurea drug chart 30 minutes before meals at the same time each day, except Glucotrol XL.

Glucotrol XL is an extended release drug. This means that the drug helps the pancreas produce more insulin all day. You should take this drug with breakfast. If you forget to take a dose, do NOT double the next dose.

These drugs can cause low blood glucose (any level below 70 mg/dl). Symptoms of low blood glucose include:

- feeling anxious
- dizziness
- feeling clammy
- fast heart beat
- blurred vision
- headache
- heavy sweating

Low blood glucose needs to be treated by eating or drinking foods that contain glucose. These foods include 4 to 6 ounces of fruit juice, 4 to 6 ounces of a sugary (non-diet) soft drink, 8 to 10 ounces of milk (fat-free or low-fat), 2 tablespoons of raisins, or 3 to 4 glucose tablets. Repeat treatment every 15 minutes if needed, until blood glucose remains at least above 70 mg/dl.

Tell your doctor about any episodes of low blood glucose. If you have an allergy to sulfa drugs, tell you doctor, because you might be allergic to the sulfonylurea drugs. Some common side effects are rash, itchiness, low blood glucose, and weight gain. These drugs could react with alcohol, so limit alcohol while taking a sulfonylurea.

Meglitinide drugs

Meglitinide (meh-GLIT-in-ide) drugs help the pancreas to produce more insulin. The amount of insulin released by these drugs are related to the amount of sugar (glucose) in the body. The amount of insulin released goes up as the amount of sugar in the body goes up. The following table gives two examples of these types of drugs:

Brand Name	Generic Name
Prandin	repaglinide
Starlix	nateglinide

Follow your doctor’s instructions about how to take these drugs. If you forget to take a dose, do NOT double the next dose. Take these medicines 15 to 30 minutes before a meal. If you skip a meal, do not take that dose. If you add a meal, check with your doctor or pharmacist if you should take an added dose. Do not change your dose or stop using this medicine without talking to your doctor.

These drugs can cause low blood glucose (any level below 70 mg/dl). Symptoms of low blood glucose include:

- feeling anxious
- dizziness
- feeling clammy
- fast heart beat
- blurred vision
- headache
- heavy sweating

Low blood glucose needs to be treated by eating or drinking foods that contain glucose. These foods include 4 to 6 ounces of fruit juice, 4 to 6 ounces of a sugary (non-diet) soft drink, 8 to 10 ounces of milk (fat-free or low-fat), 2 tablespoons of raisins, or 3 to 4 glucose tablets. Repeat treatment every 15 minutes if needed, until blood glucose remains at least above 70 mg/dl. Tell your doctor about any episodes of low blood sugar. Weight gain and some muscle aches can occur with these drugs.

Alpha-glucosidase inhibitors

Alpha-glucosidase (AL-fa-gloo-CO-sud-ace) inhibitors cause the body to slowly break down and digest the sugar that we eat. This process causes a slower absorption of food and makes the body take glucose into the blood stream at a more even rate. These drugs are mainly for people in the early stages of diabetes.

The following are examples of these types of drugs:

Brand Name	Generic Name
Precose	acarbose
Glyset	miglitol

Follow your doctor’s instructions on how to take these drugs. If you forget to take a dose, do NOT double the next dose. These drugs should be taken with the first bite of each meal. You may experience gas, bloating, and diarrhea, but these side effects usually disappear after 4 to 8 weeks of taking the drugs.

Tell your doctor if you have a history of digestive disorders or inflammatory bowel disease. If you have symptoms of low blood glucose, such as feeling anxious, dizzy, clammy, having fast heart beats, blurred vision, headache, or heavy sweating, give yourself a simple sugar. You may take 3 to 4 glucose tablets or drink 8 to 10 ounces of milk (fat-free or low-fat), and repeat every 15 minutes as needed until blood glucose remains at least above 70 mg/dl. Complex sugars, such as table sugar, will take longer to improve your low blood sugar because of how this drug works.

Biguanide drugs

Biguanide (bye-GWAN-ide) drugs decrease the amount of glucose that is made in the liver and help the body use the glucose better. These drugs are commonly used with sulfonylurea drugs or insulin. The drugs listed are examples of biguanides:

Brand Name	Generic Name
Glucophage	metformin
Glucophage XL	metformin extended release
Riomet	metformin liquid

Follow your doctor’s advice about how often and when to take metformin. You should take metformin with meals, and if you miss a dose, you should NOT double the next dose. Modest weight loss and a lowering of total cholesterol and triglycerides can sometimes occur while taking metformin. This drug might cause mild stomach upset, such as diarrhea, and nausea. After you take this drug for a few weeks, these side effects usually stop.

By taking metformin with food, you can reduce the amount of stomach and gastrointestinal problems. Tell your doctor if you have a history of alcohol abuse, liver disease, congestive heart failure, folic acid deficiency, or vitamin B12 deficiency. You should also tell your doctor if you have unusual weakness or fatigue while taking metformin. If you are scheduled for any

medical testing or surgical procedures that will include injecting dye into your veins, be sure to tell the doctor that you are taking metformin.

Thiazolidinedione drugs

Thiazolidinedione (THIGH-uh-ZO-li-deen-DYE-own) drugs help make you more sensitive to insulin and help the body use glucose better. These drugs also slow the release of glucose by the liver. Following is a table of the thiazolidinedione (TZD) drugs:

Brand Name	Generic Name
Avandia	rosiglitazone
Actos	pioglitazone

Follow your doctor’s advice about how often to take these drugs. If you forget to take a dose, do NOT double the next dose. These drugs do not work right away. Be patient. It takes 2 to 4 weeks for these drugs to make a noticeable decrease in your blood glucose levels. The maximum effect is seen in 12 weeks.

You should let your doctor know if you have a heart condition, liver disease, or problems with edema (retaining a surplus of fluid and swelling in ankles and limbs). Weight gain and edema are common side effects of this drug. Contact your doctor if

you notice that you easily become short of breath, you have difficulty fitting into your shoes, or you develop swelling around your ankles. If you notice that your vision is getting worse, you should tell your doctor immediately. Your doctor might want to do a blood test to check your liver function. He or she also may do a vision test before and while you are taking these drugs.

Combination drugs

Combination drugs contain 2 types of medicine in 1 pill. A benefit to taking a combination pill is that instead of taking 2 pills, you can take 1 pill and get both medicines. The next table presents some combination drugs that are used in diabetes care. Follow your doctor’s advice on how often to take these medications.

Brand Name	Generic Name
Actoplus Met	pioglitazone and metformin
Avandamet	rosiglitazone and metformin
Avandaryl	rosiglitazone and glimepiride
Duetact	pioglitazone and glimepiride
Glucovance	glyburide and metformin
Metaglip	glipizide and metformin

DPP-4 Inhibitor

These drugs work by slowing the breakdown of incretin hormones, which are naturally occurring hormones from the intestines. These hormones increase insulin release and decrease the release of liver glucose. These actions help to lower your blood glucose when it is high, especially after meals. Currently there is only one drug available in this class.

Brand Name	Generic Name
Januvia	sitagliptin

Follow your prescription directions when you take this drug. It is taken as a pill once a day with or without food. The most common side effects are upper respiratory infection, stuffy nose, and headache. If you miss a dose, take it as soon as you remember. If you do not remember until it is time for your next dose, skip the missed dose and go back to your regular schedule.

Non-Insulin Injections

Incretin Mimetic (IN-cre-tin mi-MET-ik) drugs “mimic” (copy) the effect of naturally occurring hormones from the intestines and can help the body make more of its own insulin. They decrease the release of glucose from the liver, slow the emptying of your stomach, and reduce food intake by making you feel “full” longer.

Currently, there is one drug available of this type:

Brand Name	Generic Name
Byetta	exenatide

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You should follow your doctor’s instructions on how often to take this drug. This shot (injection) is for people with Type 2 diabetes not currently taking insulin. You should take it within 60 minutes before your morning and evening meals. Do not take this shot after a meal. If you have kidney disease or gastrointestinal disease, tell your doctor.

Common side effects of this drug include nausea, vomiting, diarrhea, and weight loss. The side effects such as nausea, vomiting, and diarrhea, are based on the size of the dose you are taking and will decrease over time. If Byetta is used with a sulfonylurea drug, low blood glucose can occur (your doctor may lower your dose of sulfonylurea when first starting on Byetta).

Symptoms of low blood glucose include feeling anxious, dizzy, clammy, having fast heart beats, blurred vision, headache, or heavy sweating. Low blood glucose needs to be treated by eating or drinking foods that contain glucose. These foods include 4 to 6 ounces of fruit juice, 4 to 6 ounces of a sugary (non-diet) soft drink, 8 to 10 ounces of milk (fat-free or low-fat), 2 tablespoons of raisins, or 3 to 4 glucose tablets. Repeat treatment every 15 minutes

if needed, until blood glucose remains at least above 70 mg/dl. Tell your doctor about any episodes of low blood sugar.

Byetta comes in pre-filled pens. The pens must be refrigerated until first use. Once you start a new pen, it can be left at room temperature, no more than 77 F (25 C) for 30 days. The pen should be discarded 30 days after its first use.

Amylinomimetic drugs

Amylinomimetic (AH-my-lin-o-mi-MET-ik) drugs decrease the production of glucose by the liver. This lowers your blood glucose levels. These drugs also slow stomach-emptying, increase how long you feel “full”, and reduce food intake. Currently there is one drug available of this type:

Brand Name	Generic Name
Symlin	pramlintide

You should follow your doctor’s instruction on how often to take this drug. This drug is given by injection and is used for people with Type 1 or Type 2 diabetes who are taking insulin. This drug should be given immediately before major meals. You should only be prescribed this drug if you have failed to get blood glucose control with intensive insulin treatment and you are receiving support by a diabetes educator.

You should not use this drug if you have problems following your current insulin therapy, slowed stomach emptying (gastroparesis), or frequent and severe low blood glucose episodes (hypoglycemia). Common side effects include nausea, vomiting, anorexia, and fatigue. After taking the drug for a few weeks, the nausea eases and appetite improves.

Insulin

When people have Type 1 diabetes, their bodies do not make insulin (IN-suh-lin). To lower their blood glucose, they must take insulin. Some people with Type 2 diabetes also may need to take insulin to lower blood glucose. Insulin is given by injection or inhaled. Most types are given by injection with a syringe (suh-RINJ), an insulin pen device, or an insulin pump. Ask your doctor or nurse about these different methods.

Types of insulin

Each type of insulin works on a different schedule. Each type has its own **onset time**, **peak time**, and **duration**. Onset is the length of time from when you take the insulin until it begins working. Peak is the length of time the insulin works at its best. Duration is the entire time the insulin stays in effect.

Timing of insulin is important. Short or rapid acting insulin such as Regular, Humalog, Novolog, and Apidra work quickly to lower blood glucose and typically should be taken shortly before meals. Intermediate or long acting insulin may peak much later or have little or no peak. Timing of meals later in the day may be important as well. Check with your doctor about how your insulin works and the best schedule for you.

The time course of insulin onset, peak, and duration of effect may vary among different people. Times may differ for the same person depending on the size of the insulin dose, physical activity level, injection site, and the temperature.

The following chart gives examples of insulin types. The onset, duration, and peak times are estimated. Several factors affect actual times for each type of insulin.

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Insulin Type	Onset	Peak	Duration	Appearance
Rapid acting: <ul style="list-style-type: none"> • Humalog (insulin lispro) • Novolog (insulin aspart) • Apidra (insulin glulisine) 	5 to 15 minutes	30 to 90 minutes	3 to 5 hours	Clear
Short acting: <ul style="list-style-type: none"> • Humulin R (Regular insulin) • Novolin R (Regular insulin) 	30 minutes	2 to 4 hours	4 to 8 hours	Clear
Intermediate acting: <ul style="list-style-type: none"> • Humulin N (NPH insulin) • Novolin N (NPH insulin) 	1½ to 4 hours	4 to 12 hours	10 to 24 hours	Cloudy
Combination intermediate acting and rapid acting: <ul style="list-style-type: none"> • Humalog Mix 75/25 (75% lispro protamine, 25% lispro) • Novolog Mix 70/30 (70% aspart protamine, 30% aspart) • Humalog 50/50 (50% lispro protamine, 50% lispro) 	15 to 30 minutes	1 to 6½ hours	18 to 24 hours	Cloudy
Combination intermediate acting and short-acting: <ul style="list-style-type: none"> • Humulin 70/30 (70%NPH/30%R) • Novolin 70/30 (70%NPH/30%R) • Humulin 50/50 (50%NPH/50%R) 	30 minutes	2 to 12 hours	18 to 24 hours	Cloudy
Long acting <ul style="list-style-type: none"> • Lantus (insulin glargine) • Levemir (insulin detemir) 	1 to 4 hours	Minimal peak	24 hours	Clear

How to take insulin

You can learn to give yourself insulin. Your doctor, nurse, pharmacist, or diabetes educator can teach you. Before taking your insulin, always look at it to see if it looks normal. Rapid-acting, short-acting, and long-acting insulin is clear. Intermediate-acting and mixed insulin is cloudy. If the insulin looks discolored, clumped, or frosted, do not use it. Always keep an extra bottle of insulin in the refrigerator.

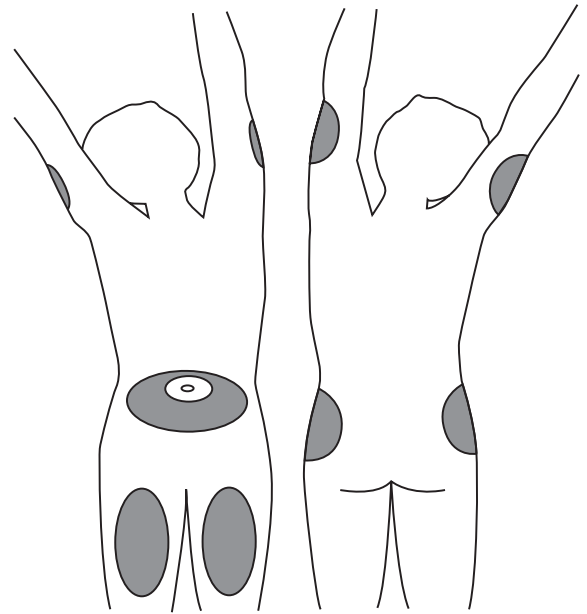
Before you take a normally cloudy insulin, gently turn the bottle upside down several times to mix the insulin. **Do not** shake insulin hard or handle it roughly. For more detailed information about insulin, look at the UPMC patient education sheet [Insulin: How to Give a Shot.](#)

Where to give insulin shots

The area of your body where you give yourself an insulin shot is called a site. The shot should be given in the fleshy (fatty) part of the skin at the site. The recommended sites for insulin shots are your abdomen (stomach area), thigh, upper arm, buttocks, and hip area.

You should give the shot at different sites each time at least 1 to 2 inches away from the previous shot, any scars, or your navel area. This is called site rotation.

Rotating sites helps to prevent puffy, lumpy spots. Insulin attracts fat into the area of the shot. In time, fat and scar tissue can form lumps. Your body has a hard time absorbing insulin from lumps, and then insulin cannot go to work as fast. Your blood glucose levels may start to go up and down too much.



Insulin gets absorbed most quickly in the abdomen. Insulin is absorbed a bit more slowly in the arms, even more slowly in the legs, and slowest of all in the hips. Some studies show that exercise makes a site absorb insulin faster. For example, if you give yourself an insulin shot in the arm and then play tennis, insulin may be absorbed faster. When you give yourself a shot, you may want to avoid active exercise of that site for about an hour.

A plan to rotate sites can help make sure that insulin gets absorbed the same way from day to day. For example, if you take 3 shots a day, you could start with your morning shot in the abdomen. Then you could give your dinnertime shot in the arm and the evening shot in the hip. It is best to keep the same pattern. Work with your diabetes educator to find a pattern that is best for you.

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Storing insulin

Do not freeze insulin. Do not store insulin in sunlight or in a hot car. Take insulin onboard with you when traveling by airplane. Do not put insulin into luggage that will be stored away from you.

Bottles of insulin. Store unopened bottles of insulin in the refrigerator at a temperature of about 40 F (4.45 C). Unopened insulin can be stored (if refrigerated) until the expiration date listed on the bottle. You can store opened bottles of insulin at room temperature, but not above 86 F (30 C). Use opened bottles of insulin within 1 month (except for Levemir, which can be used for up to 42 days at room temperature).

Insulin pens. Store unopened insulin pens in the refrigerator at a temperature of about 40 F (4.45 C). Insulin pens can be stored (if refrigerated) until the expiration date listed on the pen. Store opened pens at room temperature, but not above 86 F (30 C). Discard opened pens according to the following chart:

Opened Insulin Pens Storage

Insulin Type	Discard Opened Pens After
Regular	28 days
Humalog (lispro)	28 days
NovoLog (aspart)	28 days
Lantus (glargine)	28 days
Apidra (glulisine)	28 days
NPH	14 days
70/30 or 75/25	10 days
Levemir (detemir)	42 days

This medication information does not include all of the possible side effects or warnings that are associated with the medications prescribed for the treatment of diabetes. For more detailed information, please consult your doctor, pharmacist, or diabetes educator.

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