Diabetes SOLUTIONS

Your Answer to a Better Tomorrow!

Insulin Information

JAMES C. KENNEDY Wellness Center | MISSISSIPPI DIABETES NETWORK | Diabetes SOLUTIONS

INSULIN INJECTION **KNOW-HOW**

Understanding Insulin

Welcome to the ranks of nearly 26 million Americans diagnosed with diabetes. By now you've probably been given enough information about diabetes to make your head spin. But two important facts should stand out:

DIABETES CAN BE CONTROLLED, AND IT IS VERY IMPORTANT TO DO SO.

No doubt, you and your healthcare team will develop a plan for managing your diabetes. The plan may include some changes to the way you eat, the way you move, and the medications you take. Even if insulin injections are not currently part of the plan, it is important that you familiarize yourself with the concept of taking insulin. Here's why.

DIABETES IS EVER-CHANGING

Insulin is a hormone produced by the pancreas. Insulin's job is to shuttle glucose (sugar) out of the bloodstream and into the body's cells (the tiny components of all parts of our bodies). This helps to nourish the body's cells and keep the blood sugar level from climbing too high.

All people with type 1 diabetes require insulin—not just to control blood sugar levels, but simply to stay alive. The human body cannot survive without insulin, and people with type 1 diabetes produce little or no insulin of their own. Upon diagnosis, some people with type 1 diabetes still make a small amount of insulin. This is called a "honeymoon" phase. However, no honeymoon lasts forever. After a period of weeks or months, insulin injections almost always become necessary.

insulin injection know-how

understanding insulin

More than 90% of people with diabetes have type 2 diabetes. Type 2 is very different from type 1 in that the pancreas continues to produce insulin. The problem is that the body's cells don't utilize the insulin very well. This is called insulin resistance, and may be the root cause of type 2 diabetes. Insulin resistance develops as a result of faulty genes (our heredity) and an unhealthy lifestyle. Excess body fat is perhaps the greatest contributor to insulin resistance. The aging process plays a role as well.

When insulin resistance is present, the pancreas needs to produce more insulin than usual to keep blood sugar levels within a normal range, kind of like an air conditioner that has to work extra hard to keep the house cool on a hot summer day. Over time the pancreas, like an overworked air conditioner, begins to break down. It starts losing the ability to produce insulin. Although very few people with type 2 diabetes require insulin when they are first diagnosed, nearly one in three will eventually require insulin to control their diabetes.

A FEW FACTS ABOUT TAKING INSULIN

Fear of the unknown is common in our society. Remember the first time you tried a strange, new type of food? Chances are that once you gave it a try, you found it wasn't so bad. It might have even become a personal favorite. How about the first time you were introduced to a computer? What seemed intimidating at first has probably become an important part of your daily life.

We all have preconceived (and often incorrect) notions of what it means to take an insulin injection. Here are a few common assumptions, and the honest facts:

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ASSUMPTION	FACT
Going on insulin means I've failed at taking care of my diabetes.	As described above, it is perfectly natural for many people with diabetes to eventually need insulin–especially those who have had diabetes for quite some time.
Taking insulin puts me one step closer to the grave.	Just the opposite! What puts people with diabetes at risk of serious health problems and death is uncontrolled blood sugar. By improving blood sugar control, insulin reduces these risks.
Insulin injections hurt like the dickens.	Insulin is injected into the fat below the skin, where there are no nerve endings. Today's insulin syringes and pen needles are so small and thin that most people feel no discomfort at all when giving their injections.
Insulin will make me gain weight.	Eating more calories than you burn is what makes you gain weight. if you get more exercise and eat less, you can lose weight even when taking insulin.
Once I start taking insulin, I'll be on it forever.	Many people with type 2 diabetes are able to reduce or eliminate their need for insulin by adopting healthy lifestyle habits, losing weight, and using other newly-developed diabetes medications.
I'll never be able to give myself a shot.	Just about anyone, from age four to 104, can be taught to take an injection. There are special adaptive devices for those with poor dexterity, limited vision, or fear of sharp objects.
Insulin can make my blood sugar go too low.	While anyone who takes insulin can experience occasional bouts of low blood sugar, the chances are extremely small – especially with the new long-acting insulin products.

INSULIN INJECTION **KNOW-HOW**

Learning How to Inject Insulin

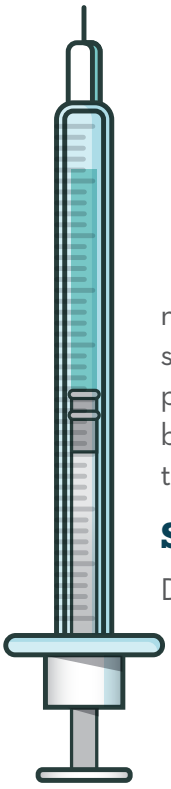
Now that you've made the move to insulin therapy, it won't be long before you start enjoying better blood glucose (blood sugar) management, more energy and a host of other benefits.

The prospect of taking insulin injections may have you feeling a bit anxious. That's OK! Just about everyone feels that way. Just know that your anxiety will vanish soon enough. Here are some valuable facts and tips to help make your transition to insulin smooth and easy.

WAYS TO GIVE INSULIN

Because insulin is broken down by digestive enzymes, it cannot be taken in pill form. Instead, it is delivered with a syringe into the layer of fat below the skin, also called the "subcutaneous" tissue. The layer of fat on the stomach, hips, thighs, buttocks and backs of the arms are common sites for injecting insulin. From there, the insulin absorbs into the bloodstream where it circulates to the cells throughout the body.

The really good news about delivering insulin into the layer of fat below the skin is that there are no nerve endings in this area, so injections are usually painless. There are a number of options for administering insulin:



SYRINGES

Disposable plastic insulin syringes are still widely used, but the popularity of pens and pumps (see next page) is growing. Syringes vary in terms of how much insulin they hold as well as the length and thickness of the needle. Syringes can be used to deliver insulin directly into the layer of fat below the skin, or they can inject insulin into a temporary "port" that sits on the skin. The port, which is changed every 2-3 days, features a small flexible plastic tube that sits below the skin. A needle is used to place the tube under the skin, so only one needle stick is required every 2-3 days when a port is used.

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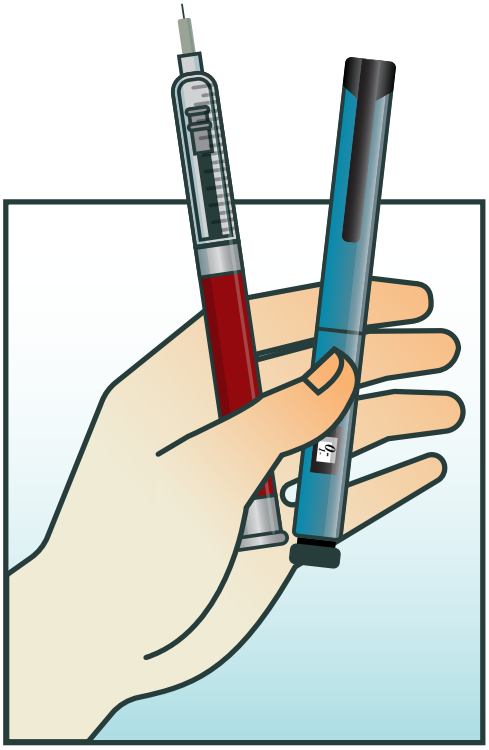
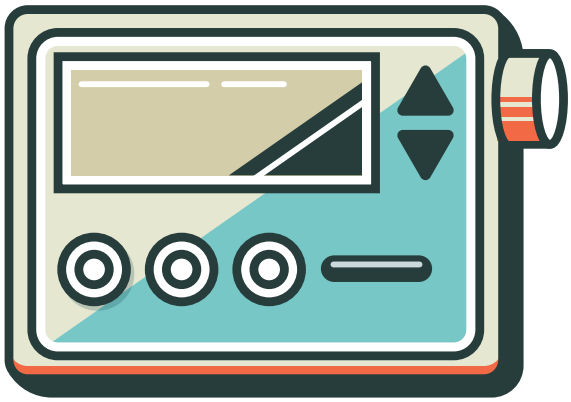


PENS

Insulin pens got their name because they are about the size and shape of a writing pen. They contain insulin (instead of ink) and have a dial for setting the dose. A disposable pen needle is attached to the end of the pen prior to injecting. As was the case with syringes, pen needles are available in a variety of lengths and thicknesses. Because they cut down on medical waste and are considered by most to be more convenient, accurate and easy to use than syringes, insulin pens are growing in popularity among people of all ages.

PUMPS

Insulin pumps are electronic devices that are worn continuously and deliver insulin into the fat layer below the skin by way of a flexible plastic tube (similar to the "port" described above). Insulin pumps are popular among those who require multiple daily injections of insulin. Safe and successful use of a pump requires considerable education and training, and their cost can be relatively high. Insulin pumps are not typically used by those who are new to insulin, but can be an effective option once you have a bit more experience.



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CHOOSING AN INJECTION DEVICE

The decision to use syringes or pens is a personal one. If you have an opportunity to sample both at your healthcare provider's office, certainly do so. It is best to speak with your healthcare provider and check with your diabetes care team to find out what is covered under your plan.

Most pens hold 300 units of insulin and allow delivery of up to 60 to 80 units at a time. "Prefilled" disposable pens deliver in single-unit increments. "Durable" pens utilize replaceable/ insulin cartridges, and may deliver insulin in $^1/_2$ unit increments. Pens can be used to deliver a variety of long-acting and rapid-acting insulin types, as well as premixed insulin formulations.

Disposable syringes hold up to 100 units per injection. If you decide to use syringes, select a type that holds enough to cover your largest dose with a little room to spare. The markings on a syringe allow dosing in 2-unit, 1-unit, or $^1/_2$-unit increments. Once you have a size that meets your needs, select a type that allows you to dose as precisely as possible.

The needles on syringes vary as well. Syringe and pen needles as short as 4mm and as long as 12.7mm are available. Thickness is measured in gauge. The higher the gauge, the thinner the needle. Gauges as high as 32 and as low as 28-gauge can be obtained. In general, it is best to use the shortest, thinnest (highest gauge) needles available. Skin thickness doesn't vary much from person to person. Even if you are considered overweight or obese, it is unlikely that you will need a needle longer than 6mm. Needles that are too long may produce painful intra-muscular injections, with insulin absorbing faster than it should.

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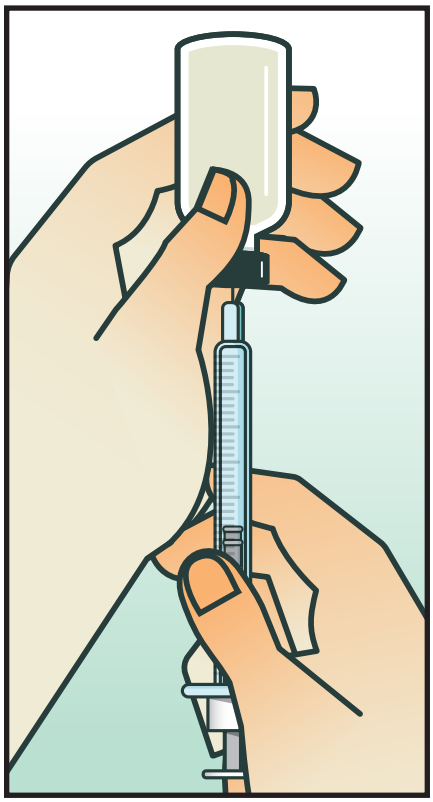
INJECTION TECHNIQUE

Technique is everything when it comes to making insulin injections easy.



TO DRAW ONE TYPE OF INSULIN INTO A SYRINGE:

- **Gather your insulin supplies:** Get your insulin vial and a fresh syringe. Check the insulin vial to make sure it is the right kind of insulin and that there are no clumps or particles in it. Also make sure the insulin is not being used past its expiration date.
- **Gently stir intermediate or premixed insulin:** Turn the bottle on its side and roll it between the palms of your hands. Clear (fast-acting, long-acting) insulin generally does not need to be mixed.
- **Prepare the insulin bottle:** If the insulin bottle is new, remove the cap. It is not necessary to wipe the top of the bottle with alcohol as long as it is clean.
- **Pull air into the syringe:** Remove the cap from the needle. Pull back the plunger on the syringe to draw in an amount of air that is equal to your insulin dose. The TIP of the black plunger should correspond to the number on the syringe.
- **Inject air into the vial:** Hold the syringe like a pencil and insert the needle into the rubber stopper on the top of the vial. Push the plunger down until all of the air is in the bottle. This helps to keep the right amount of pressure in the bottle and makes it easier to draw up the insulin.
- **Draw up the insulin into the syringe:** With the needle still in the vial, turn the bottle and syringe upside down (vial above syringe). Pull the plunger to fill the syringe to the desired amount.
- **Check the syringe for air bubbles:** If you see any large bubbles, push the plunger until the air is purged out of the syringe. Pull the plunger back down to the desired dose.
- **Remove the needle from the bottle:** Be careful to not let the needle touch anything until you are ready to inject!

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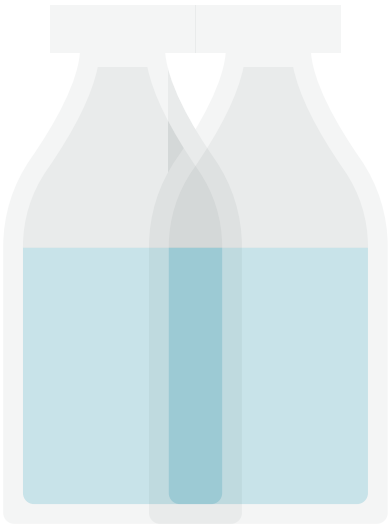

WHEN COMBINING TWO TYPES OF INSULIN (INTERMEDIATE AND RAPID) IN THE SAME SYRINGE:

- **Gather your insulin supplies:** Get your insulin vial and a fresh syringe. Check the insulin vial to make sure it is the right kind of insulin and that there are no clumps or particles in it, and that the expiration date has not passed.
- **Gently stir intermediate or premixed insulin:** Turn the vial on its side and roll it between the palms of your hands. Clear (fast-acting, long-acting) insulin generally does not need to be mixed.
- **Prepare the insulin vials:** If the insulin vial is new, remove the cap. It is not necessary to wipe the top of the bottle with alcohol as long as it is clean.
- **Inject air into the intermediate insulin vial:** Remove the cap from the needle. With the vial of insulin below the syringe, inject an amount of air equal to the dose of intermediate insulin that you will be taking. Do not draw out the insulin into the syringe yet. Remove the needle from the vial.
- **Inject air into the rapid-acting insulin vial:** Only inject an amount equal to the rapid-acting insulin dose. Leave the needle in the vial.
- **Draw up the rapid-acting insulin:** With the needle still in the vial, turn the vial upside down (vial above the syringe) and pull the plunger to fill the syringe with the desired dose.
- **Check the syringe for air bubbles:** If you see any large bubbles, push the plunger until the air is purged out of the syringe. Pull the plunger back down to the desired dose.
- **Remove the needle from the vial:** Recheck your dose.
- **Draw up the intermediate-acting insulin:** Insert the needle into the vial of cloudy insulin. Turn the vial upside down (vial above syringe) and pull the plunger to draw the dose of intermediate-acting

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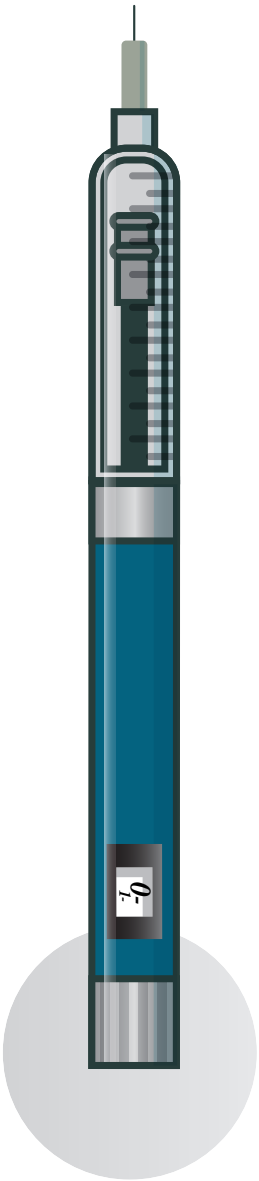

insulin. Because the short-acting insulin is already in the syringe, pull the plunger to the total number of units you need. Do not inject any of the insulin back into the vial, since the syringe now contains a mixture of intermediate and rapid-acting insulin.

- **Remove the needle from the vial:** Be careful to not let the needle touch anything until you are ready to inject!

PREPARING A PEN FOR INJECTION:

- **Check the pen:** Ensure that it contains the proper type of insulin and contains enough to cover your full dose. Also check to make sure that the expiration date has not passed.
- **Gently stir intermediate or premixed insulin:** Turn the pen on its side and roll it between the palms of your hands. Clear (fast-acting, long-acting) insulin generally does not need to be mixed.
- **Attach a fresh pen needle:** Screw or click the needle securely in place according to the manufacturer's instructions. Remove the cap(s) from the pen needle to expose the needle.
- **Prime the pen:** Pointing the needle up in the air, dial one or two units on the pen and press the plunger fully with your thumb. Repeat until a drop appears.
- **Dial your dose:** Turn the dial on the pen to your prescribed dose.

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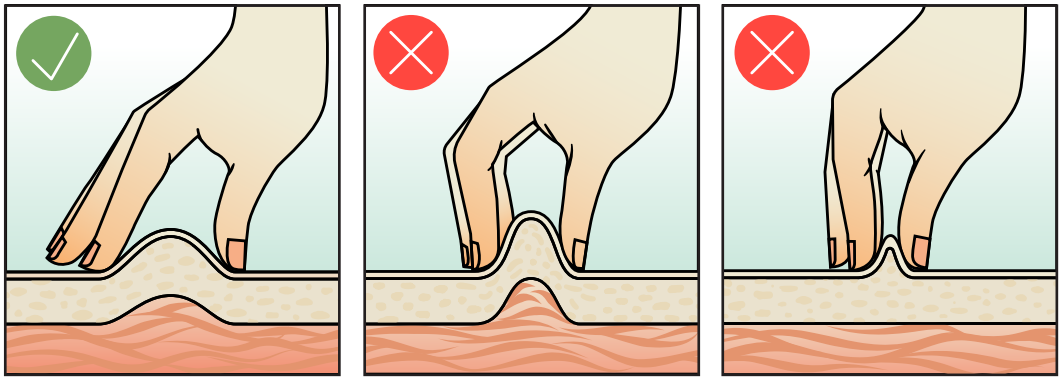
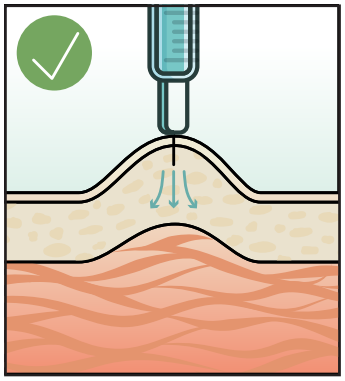


Correct (left) and incorrect (right) ways of performing the skin fold.



The correct angle of injection when lifting a skin fold is 90°

DELIVERING AN INJECTION:

- **Select a site:** Choose a spot on your skin that you can see and reach. It is important to not "overuse" any particular area of skin. See the information below on "rotating" injection sites.
- **Make sure skin is clean:** It is generally not necessary to wipe the skin with alcohol before injecting. Those at a high risk of infection should discuss site-preparation procedures with their healthcare team.
- **Pinch the skin:** For those with limited body fat, it may be necessary to pinch a one-to-two-inch portion of skin and fat between your thumb and first finger.
- **Push the needle into the skin:** With your other hand, hold the syringe or pen like a pencil at a 90-degree angle to the skin and insert the needle with one quick motion. Make sure the needle is all the way in.
- **Inject the insulin:** Let go of the skin pinch before you inject the insulin. Push the plunger with your thumb at a moderate, steady pace until the insulin is fully injected. If using a syringe, keep the needle in the skin for 5 seconds. If using a pen, keep the needle in the skin for 10 seconds.
- **Pull out the needle:** Remove at the same 90-degree angle at which you inserted the needle. Press your injection site with your finger for 5-10 seconds to keep insulin from leaking out.
- **Remove the needle:** If using a pen, remove the needle from the pen by replacing the large cover and unscrewing. Leaving the needle on the pen can result in leakage or air bubbles.
- **Dispose of your used needle:** It is important to protect yourself, your loved ones, sanitation workers and pets from accidental needle sticks. Do not recap syringes before throwing them away. Place used syringes and pen needles in a thick plastic container (sharps container, detergent bottle, etc.). When nearly full, close the container tightly with a screw-on cap and tape closed. Dispose according to standards set forth by your local department of sanitation.

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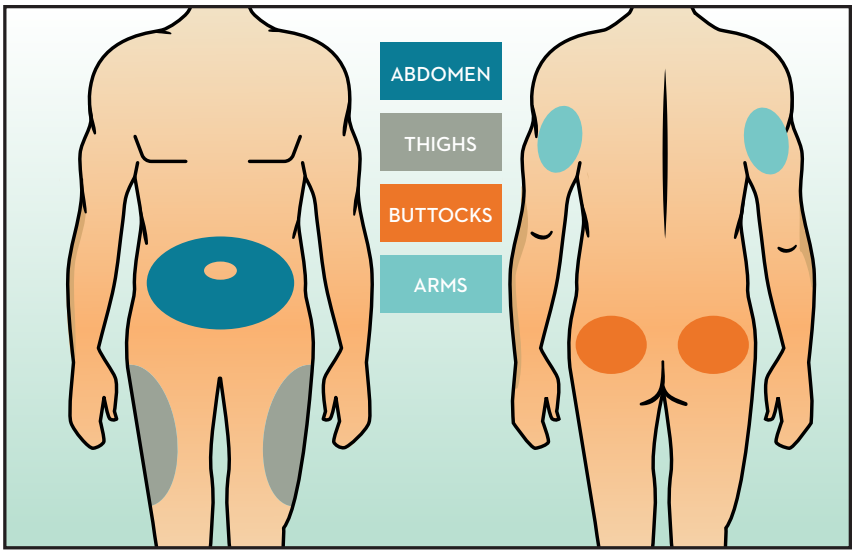


ROTATING (CHANGING) INJECTION SITES:

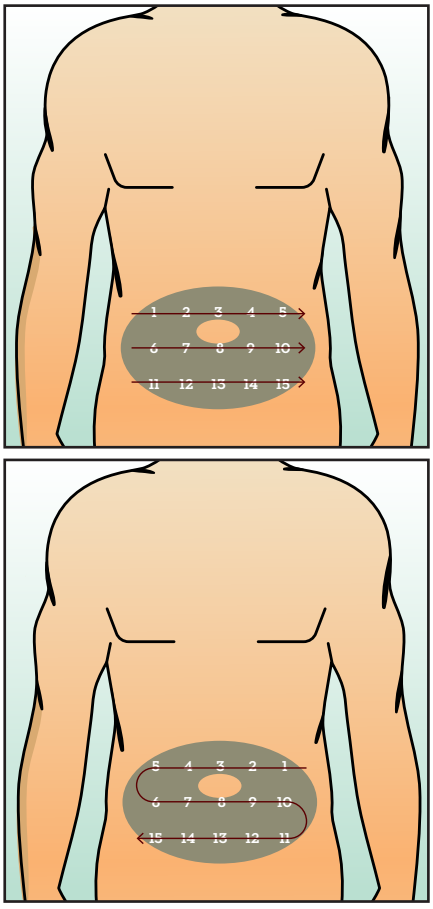
Insulin is injected into the fat layer below the skin on the abdomen (staying two fingers or a few inches away from the belly button), outer thighs, hips, buttocks, or backs of the arms. Although insulin injections are usually painless, injecting the same spot repeatedly can cause inflammation or fat tissue breakdown. Lipodystrophy, as this is called, can cause lumps/swelling and thickened skin, and it may keep insulin from absorbing properly. Nearly half of all people who take insulin develop lipodystrophy, particularly when injection sites are not changed often.

Most forms of rapid and long-acting insulin absorb consistently from just about any body part, so feel free to use a variety of body parts for your injections, and use a variety of spots within each body part.

Intermediate-acting (cloudy) insulin and premixed insulin absorbs differently in different body parts. It is best to inject intermediate-acting insulin into one part of the body consistently, but use a variety of spots within that body part.

NEEDLE RE-USE

Use of a new, fresh syringe or pen needle for each injection is the best way to minimize discomfort and ensure the accuracy/effectiveness of the insulin dose. Using someone else's needle puts you at danger of contracting Hepatitis and HIV.



Recommended way to rotate injection sites.

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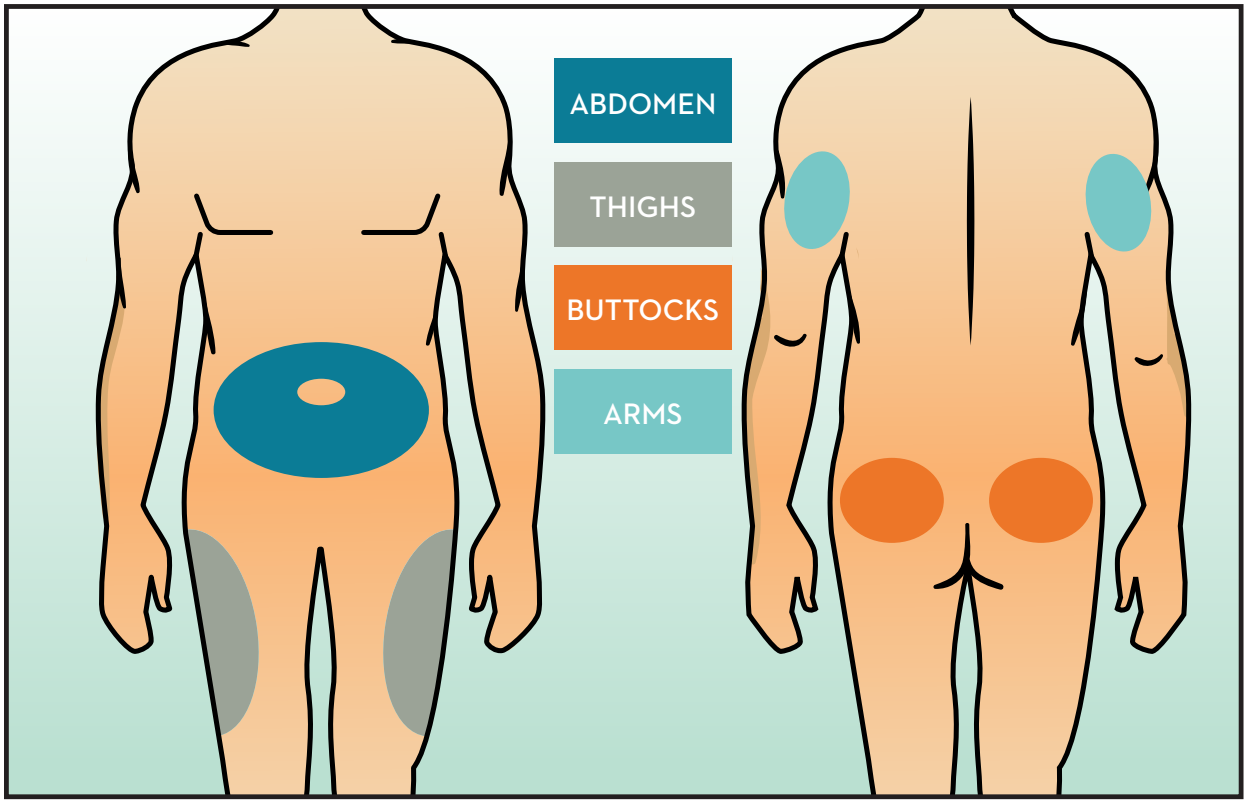
Pro Tips (and Tricks) for Easier and Better Insulin Injections



Recommended injection sites

WHERE IS THE BEST PLACE TO GIVE INJECTIONS?

Insulin and other injected diabetes medications are meant to be delivered into the fat layer just under the skin. Popular areas to inject include the abdomen (staying two fingers or a few inches away from the belly button), outer thighs, hips, upper buttocks, lower back, and backs of the arms. Modern insulin products are well absorbed and act about the same regardless of where they are injected. However, for best results it is important to stick with a consistent body part for your injections in order to avoid variations in insulin action. Ultimately, the choice is up to you. Select a part of your body that you can see, reach, and access easily. But be sure to use a number of different

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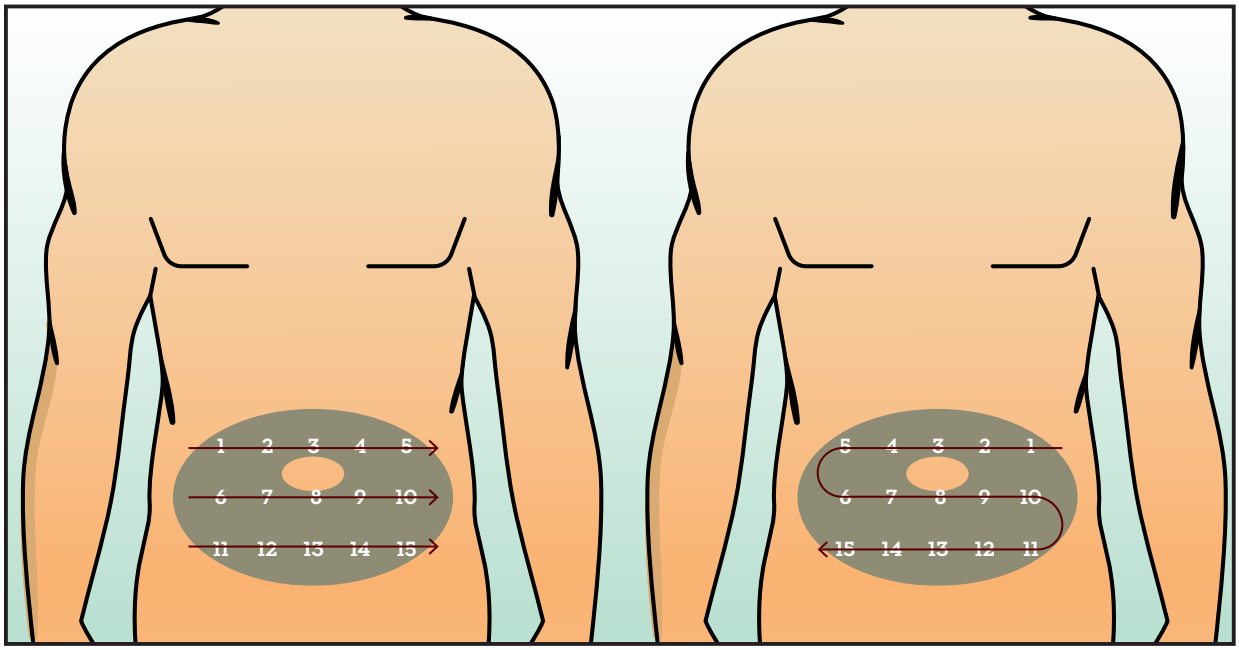
spots within that body part. This is called "rotating" injection sites. Injecting into the same spot too often can cause skin problems and can impair your body's ability to absorb the insulin.

For example, if you choose to use your abdomen, rotate (change) injection spots on a daily basis like these:

With this type of pattern, you'll stay on the left side of your abdomen for 12 days and then switch to the right side for 12 days. That way, each spot has 24 days to "heal" before you use it again! Regardless of which body part and rotation pattern you choose, avoid spots on your skin that have scar tissue, moles, swelling/inflammation, or unusual changes in appearance or texture.



Recommended way to rotate injection sites.

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IS THERE A TRICK FOR REMEMBERING TO TAKE MY INJECTIONS?

Missed injections (or taking injections much too late) can cause serious blood glucose (blood sugar) management problems. Research has shown that missing just one insulin injection per week can raise your A1c by more than 0.5%!

Here are some techniques for helping you to remember to take your injections:

- Attitude is important, so take your diabetes seriously!
- Write down your injection doses after taking them
- Use reminder alarms on a watch or mobile phone
- Take your injection at the same time that you perform another daily task, such as taking oral medications or brushing your teeth
- Keep your injection materials in a strategic location so that you notice them at the right times
- If you take insulin at mealtimes, take it before eating (with your doctor's approval).

DO I HAVE TO KEEP MY INSULIN REFRIGERATED ALL THE TIME?

Yes and no. Insulin is a large protein molecule that breaks down gradually when exposed to warm temperatures. It is best to keep your extra insulin and other injected diabetes medications refrigerated. However, once you begin to use a vial or pen, it is usually fine to keep it at room temperature for up to a month. Do not store your insulin near extreme heat (above 86°) or extreme cold (below 36°). (3) Never store insulin in the freezer, direct sunlight, or in the glove compartment of a car.

All insulin vials and pens should be replaced monthly, if not more often, to ensure that they are working at full potency. Be sure to check the expiration date before opening the box, and do not use insulin past its expiration date without your physician's approval. Examine the insulin closely to make sure it looks normal. Clear insulin should not have crystals or discoloration, and cloudy insulin should not have clumps or pieces stuck to the sides of the vial/pen.

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IS IT NECESSARY TO MIX INSULIN BEFORE INJECTING IT?

In general, clear insulin does not need to be mixed before injecting. This includes Regular insulin, rapid-acting insulin analogs (aspart, lispro and glulisine) and long-acting basal insulin (glargine and detemir). However, any vial or pen that contains NPH — including premixed formulations such as 75/25 and 70/30 — must be mixed until they are uniformly cloudy before injecting. The best way to ensure an even mixture is to roll the pen or vial between your palms ten times, then inspect to make sure there are no "clumps" settling at the bottom. Injecting insulin that is not properly mixed can result is serious high or low blood glucose.

HOW CAN I KEEP THE INJECTIONS FROM HURTING?

In most cases, insulin injections hurt very little, if at all. However, there are a few things you can do to make the injections as painless as possible:

- Use fresh needles for each injection. Even after just one or two uses, syringe and pen needles can become dull. Sharp needles cause the least amount of trauma to the skin.
- Inject your insulin at room temperature. Cold insulin has a tendency to sting. When using a pen or vial for the first time, take it out of the fridge a half hour early so that it has time to warm up to room temperature.
- Relax the muscles in the area where you are injecting. Tense muscles make the nerves in the area more sensitive.
- For those with limited body fat, it may be necessary to pinch the area where you will inject so that the skin surface is hard. This ensures a quick, clean injection. A quick needle insertion causes the least amount of pain.
- If you clean your skin with an alcohol pad, wait until it has dried completely before you inject.
- Doses of 30 units or more may cause pressure to build up under the skin. Ask your physician if you can split large doses.
- Avoid injecting into sensitive muscle by using a short needle (6mm or less).
- Choose the thinnest needle possible. Remember, the higher the gauge, the thinner the needle.

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- If pain persists despite using these techniques, try rubbing ice on your skin for a few minutes before injecting, or ask your doctor about using an injection port instead of injecting directly into your skin.

WHAT SHOULD I DO IF INSULIN LEAKS OUT AFTER THE INJECTION?

Occasionally, insulin may leak out of the skin after you remove the needle, even if you have left the needle in the skin for 5-10 seconds. Research has shown that the amount of insulin lost in these situations is usually minimal and will probably not affect blood glucose management. Unless large drops appear that run down your skin, you should not have to worry about replacing what is lost.

However, to ensure accurate and consistent dosing, it is best to do what you can to prevent leakage. Here are a few tricks:

1. When injecting, release the "pinch" on your skin before pressing down on the plunger.
2. Keep the needle in your skin a few seconds longer than usual.
3. If leakage occurs often, insert the needle and inject at a 45-degree angle rather than going straight into the skin.

IS IT OK TO THROW MY USED NEEDLES IN THE TRASH?

There are two things to consider when it comes to disposing sharp objects (often referred to as sharps) such as syringes, pen needles and lancets:

Local ordinances

Every municipality has its own rules about the handling of medical waste. Check with your local department of sanitation for details. Each state also has established guidelines regarding sharps disposal. The Centers for Disease Control (CDC) has more information about safe needle disposal in your area: www.cdc.gov/needledisposal.

The safety of those around you

Being a responsible person with diabetes means taking steps to ensure the safety of family, friends, domestic employees, sanitation workers and yes, even pets. Accidental needle sticks can produce serious pain and infections. One way to protect those around you is to place your used syringes, pen needles and lancets in a non-clear heavy-duty plastic jug with a secure screw-on cap. Don't bother recapping the needles... just throw them into the jug, and keep the jug in an out-of-the-way place. When the jug

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is full, seal the cap with strong tape and dispose according to local regulations (usually it is OK to just place in your normal trash). When traveling, bring a smaller container with you for your used items, and bring it home with you for safe disposal.

Another way to protect those around you is to purchase and use a device that clips, catches, and contains the needles. Do not break the needles off with your fingers, as you can easily stick yourself. And do not use scissors to clip off needles – the flying needle could hurt someone or become lost.

ARE LONGER NEEDLES BETTER THAN SHORTER NEEDLES?

Good news! In almost all cases, shorter needles are better than longer ones. For insulin to work, it only needs to get into the fat layer below the skin. While the amount of fat varies from person to person, skin thickness tends to be about the same – around 2mm. So needles that are at least 4mm long do the job quite well, producing normal absorption/action and no increase in leakage back onto the skin surface. Glucose management does not suffer when switching from long to short needles, even in those who are considered obese. Needles that are too long can cause accidental injection into muscle, which alters the normal action of the medication and can be quite painful.

For these reasons, most healthcare organizations now recommend the use of shorter needles. Rarely is there a medical reason to use needles longer than 6mm. For those with a great deal of fat below the skin, use of short needles also eliminates the need to pinch the skin when administering the injection.

ADCES Association of Diabetes Care & Education Specialists

Supported by an educational grant from BD

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