

All About Insulin

Purpose

This section is intended to provide information on the purpose, action, use, and side effects of insulin.


Objectives

At the end of this section you will be able to:

- Define insulin and how it works.
- Describe the color of the insulin(s) you are taking.
- Explain the length of action (in hours) of the insulin(s) you are taking.
- Demonstrate the steps of giving an insulin injection.
- Identify the times you need to take your insulin(s) and eat meals and snacks.

Outline

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 American Diabetes Association®	*The American Diabetes Association Recognizes this education service as meeting the National Standards for Diabetes Self-Management Education and Support.
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Questions and answers about insulin

What does insulin do?

Insulin is a hormone made by the pancreas in the body. Insulin helps your body use glucose for energy. Insulin lowers blood glucose levels. Diabetes is a disease in which the pancreas is unable to make enough insulin to keep blood glucose at normal levels.

What should the insulin look like?

Before using your insulin, look at it carefully.

- Humulin® R, Novolin® R, Humalog®, Novolog®, Lantus®, Apidra®, Levemir®, Toujeo®, Lyumjev® and Tresiba® insulin should be clear (with no color).
- Do not use Humulin® R, Novolin® R, Humalog®, Novolog®, Lantus®, Apidra® Levemir® or Tresiba® insulin if it is cloudy, thick, or discolored; it may not work correctly.
- All other insulins should appear evenly clouded after you gently mix the insulin.
- Do not use a vial of insulin if it does not mix well and/or the insulin remains on the bottom of the vial.
- Do not use a vial of insulin if you notice clumps of insulin in the liquid, or stuck to the bottom or side of the vial.

What do I do if I miss a dose of insulin?

- This depends on the type of insulin you are taking; check with your health care provider for directions.
- Taking your insulin at the same time each day will help establish the habit of taking your insulin.

If I am sick, do I take my insulin?

Illness can increase your blood glucose levels. Take your insulin when you are sick and closely watch your blood glucose levels. For more information refer to “Sick Day Guidelines” in chapter J-Acute Complications.

Can I drink alcohol when I am taking insulin?

- Alcohol can affect your blood glucose levels; if you drink alcohol on an empty stomach, you may experience hypoglycemia (low blood glucose levels); for more information, see “Hypoglycemia” in chapter J-Acute Complications.
- Refer to the “Guidelines for Alcohol” in chapter H-Cooking and Eating Out Tips.

Do I take my insulin if I am fasting for lab work?

There are many types of insulin and treatment plans available. You will need to talk with your diabetes health care provider about possible adjustments in the amount and time of your insulin injections. Carry your insulin and other supplies with you to the doctor's visit in case additional changes may need to be made.

How do I travel with insulin

Before taking a trip:

- Get two papers from your doctor
 - A letter explaining medicines and glucose testing you do for your diabetes; also include allergies.
 - A prescription in case you lose your insulin.
- Pack twice as much medicine and testing supplies as you think you need; half in your carry-on bag and half in your luggage.
- Keep insulin cool with a travel pack including ice pack.
- Keep carry-on supplies with you at all times; even if you are traveling by car.
- Check batteries used and pack extra.
- Pack your diabetes ID card and wear your ID.
- Pack snacks to easily prevent or treat low blood glucose.
- Pack other medicine or medical supplies such as anti-diarrhea, anti-nausea medicine, antibiotic ointment, Band-Aids®, and acetaminophen for fever or headache.

Traveling abroad:

Insulins in the U.S. are all U-100 (100 units per milliliter) strength and syringes are designed for U-100 strength. In foreign countries insulin may come in U-40 (40 units per milliliter) or U-80 (80 units per milliliter) strength and you will need to purchase syringes in the correct strength to prevent overdose or under-dose of insulin.

Traveling across time zones:

Talk to your health care provider and make a schedule as you will need to take your insulin at different times because you will be eating at different times.

- Check your glucose often to prevent hypoglycemia, your meal times as well as your activity levels will vary. **Always carry snacks!**
- Wear comfortable shoes – avoid sandals and **never go barefoot.**

For more information visit American Diabetes Association Web site – treatment and care – when you travel.

Comparison of insulin, insulin action, and delivery

There are several different types of insulin. Some insulins work rapidly, while others last longer in the body. Some insulins available are a combination of two types of insulin.

Strength of insulin

- U-100 – Most common strength of insulin; U-100 means 100 units of insulin per milliliter (ml)

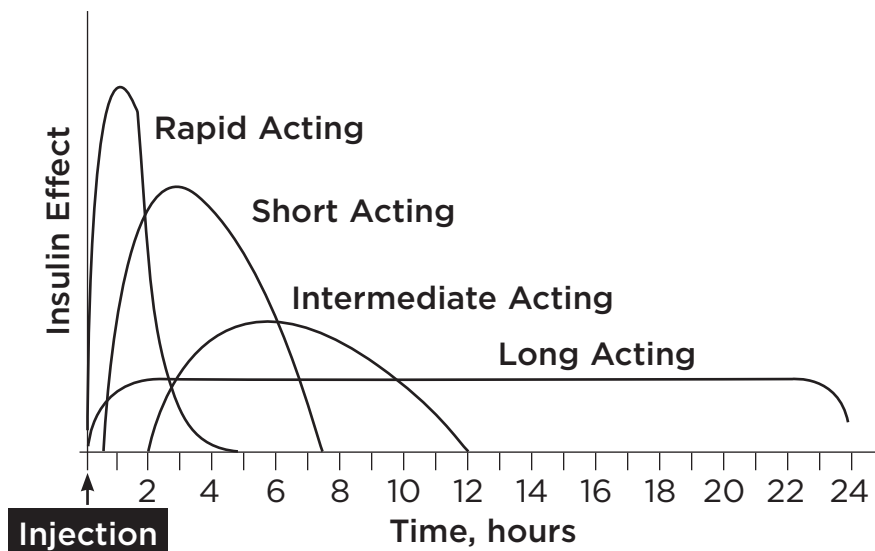
Types of insulin

- Rapid-acting: aspart (Fiasp[®], Novolog[®], and authorized generic), glulisine (Apidra[®]), lispro (Admelog[®], Humalog[®], and authorized generic), lispro-aabc(Luymjev[®])
- Short-acting: regular (Humulin[®]R, Novolin[®]R)
- Intermediate-acting: NPH (Humulin[®] N, Novolin[®] N)
- Long-acting: detemir (Levemir[®]), glargine (Lantus[®], Basaglar[®], Toujeo[®]), degludec (Tresiba[®])
- Combinations: Humalog[®] Mix 75/25, Humulin[®] 70/30, Novolin[®] 70/30, Novolog[®] Mix 70/30

Insulins are classified into types depending on their onset, peak, and duration times (action time).

- Onset = the time it takes for the insulin to get into the blood stream and start to lower the blood glucose levels
- Peak = the time the insulin is at it's maximum ability in lowering blood glucose levels
- Duration = the length of time insulin works in the blood stream to lower blood glucose levels

Comparison of Equal Amounts of Different Types of Insulin



Insulin

Type of Insulin (Trade name)	Appearance	Onset	Peak	Duration	When to Administer
Rapid Acting					
Lispro (Humalog®), Admelog®	Clear	5 – 15 min	1 – 2 hours	3 – 5 hours	0 – 15 min before meals*
Aspart (Novolog®)	Clear	10 – 20 min	1 – 2 hours	3 – 5 hours	
Aspart (Fiasp®)	Clear	5 min	1.5 – 2 hours	3 – 7 hours	
Glulisine (Apidra®)	Clear	5 – 15 min	0.5 – 1.5 hours	2 – 4 hours	
lispro-aabc (Lyumjev®)	Clear	10-20 min	2 – 3 hours	4.5 – 7.5 hours	at start of meal or 20 minutes after starting
Short Acting					
Regular Humulin® R Novolin®R	Clear	½ – 1 hour	1 – 5 hours	4 – 12 hours	30 – 45 min before meals
Intermediate Acting					
NPH Humulin® N Novolin® N	Cloudy	2 – 4 hours	4 – 12 hours	10 – 18 hours	Before a.m. and p.m. meals or before a.m. meal & bedtime
Long Acting					
Glargine (Basaglar®)	Clear	1 – 2 hours	No peak	Up to 24 hours	Once or twice a day as directed
Detemir (Levemir®)	Clear	1 – 2 hours	No peak	Up to 24 hours	
Glargine (Lantus®)	Clear	1 – 2 hours	No peak	Up to 24 hours	Do Not mix
Glargine (Toujeo®)	Clear	1 – 2 hours	No peak	More than 24 hours	Once a day (any time of day)
Degludec (Tresiba®)	Clear	1 – 2 hours	No peak	42 hours	Once a day (any time of day)
Combinations					
Humulin® 70/30	Cloudy	½ – 1 hour	3 – 12 hours	Up to 24 hours	Before breakfast & dinner
Novolin® 70/30	Cloudy	½ hour	3 – 8 hours	Up to 24 hours	
Humalog® Mix 75/25	Cloudy	10 – 15 min	1 – 6½ hours	Up to 24 hours	
Novolog® Mix 70/30	Cloudy	10 – 15 min	1 – 4 hours	Up to 24 hours	

*If carbohydrate intake cannot be predicted before the meal, injection of rapid-acting insulin can be given immediately after the meal.

The action time of any insulin may vary in different individuals or at different times in the same individual. Variables include size of dose, injection site, physical activity, and body temperature.

Sources: <https://dailymed.nlm.nih.gov/dailymed/index.cfm>

(1) Admelog is a less-costly follow-on insulin of lispro insulin.

Taking insulin and eating

- Timing is important when you take insulin with meals.
- Blood glucose levels begin to rise about 10 minutes after you start eating.
- Rapid-acting insulin like lispro (Humalog®), aspart (Novolog®) or glulisine (Apidra®) will start working 10 to 20 minutes after taking the insulin; you will want to plan on eating 5 to 15 minutes after taking this insulin.
- Short-acting insulin (regular insulin) has an onset of 30 minutes; with short-acting insulin (including mixtures that contain regular insulin), you will want to wait 30 minutes after taking the insulin before eating.
- NPH, glargine and detemir do not have fast onsets; it is important to take these insulins at the same time each day; your health educator will help you decide the best time to take these insulins.

The most common side effect of insulin is **hypoglycemia** – low blood sugar. Treat hypoglycemia immediately. If your blood glucose level is 70 mg/dl or less follow the Rule of 15. See “Treatment of Low Blood Glucose – Rule of 15” in chapter J-Acute Complications (page J-5).

Allergic reactions rarely occur. Signs of a local allergic reaction to insulin are:

- Dents under the skin at injection sites
- Redness at injection site which may be persistent
- Groups of small bumps (hive-like)
- Swelling at injection site

Consult your health care provider if this is occurring.

Types of insulin delivery systems

Insulin can be given using:

- Insulin pen and needle
- Insulin pump
- Insulin vial and syringe

Insulin pen and needle

An insulin pen is a compact, portable device, about the size of a large marker that serves exactly the same function as a syringe and needle. Insulin pens are available in many models and brands. Two general types of insulin pens are reusable insulin pens or disposable insulin pens.

- Reusable insulin pens
 - Use insulin-containing cartridges. They are cartridges loaded into the pen, and when empty, the cartridges are replaced.
 - Can be used for several years.
- Disposable pens
 - Pre-loaded with insulin
 - Thrown away when empty
- Advantages of using an insulin pen
 - Convenient way to carry insulin when away from home
 - Easy to use
 - May be easier to use for visually impaired
 - Eliminates the need to draw insulin from vials, saving time and reducing errors
 - Easier to obtain an accurate dose of insulin
 - May be more economical if using small doses of insulin
- Disadvantages of using an insulin pen
 - Not all types of insulin are available in pens
 - Cannot mix insulin with the pens, mixed dose regimens require more injections
 - May be more expensive
 - Insurance coverage may vary
- Things to consider when selecting a pen:
 - What is the brand and type of insulin available?
 - Will insurance cover the pen?
 - How much insulin will the pen hold?
 - What is the maximum dose it can deliver?
 - How much strength and dexterity is needed to operate the pen?
 - Can the displays be easily read?
 - Work with your diabetes educator to evaluate the needs you have and which pen would be your best choice

How to use a pen for insulin injections

You will need to carefully read the directions for use of your specific insulin pen. However, the steps for using the insulin pen are similar.

1. Wash hands with soap and warm water. Clean the skin where you plan to inject the needle with an alcohol pad. Let the alcohol air-dry.
2. Check the label on the pen/cartridge to make sure you will be using the correct insulin.
3. Look at the insulin for any discoloration, clumping or solid white particles as this insulin should not be used. Check expiration date on package. Outdated insulin loses its potency (power).
4. Remove the pen cap.
5. If using cloudy insulin, roll the pen in your hands about 10 times; this step is not necessary with clear insulin.
6. Wipe the rubber end of the pen with an alcohol swab.
7. Peel the cover off the needle and screw or snap the capped needle to the end of the pen. Always use a new needle.
8. Remove the outer and inner needle shields, and save the outer shield for later use, discard the inner needle shield.
9. Prime the pen to remove extra air. To prime the pen turn the dose dial to 2 units. Hold the pen so the needle is up in the air and push the injection button until a drop of insulin appears at the tip of the needle. If a drop of insulin does not appear, repeat the step. If no insulin comes out of the needle after four tries, change the needle. This is an essential step to guarantee an accurate dose.
10. Set the dose of insulin needed by turning the dial until you see the number of your insulin dose.
11. Pinch the skin at the injection site and quickly insert the needle into your skin. Push in the injection button firmly and hold while slowly counting to five to deliver the full dose.
12. Check the dose window, to assure the full dose has been given.
13. Remove the needle from your skin, and carefully replace the outer needle shield over the needle.
14. Remove the capped needle and discard. Never store the pen with the needle attached.
15. Replace the cap on the pen. Store at room temperature.



Insulin pump

- Size of a pocket pager, which can attach to your belt or be tucked in a pocket
- Delivers insulin through a flexible plastic tubing to a tiny catheter inserted in the skin
- Delivers a steady more precise amount of insulin which can mimic the body's normal release of insulin; steady insulin delivery allows for greater control of blood glucose
- Not for everyone; pumps do not necessarily make diabetes management easier; increased monitoring of blood glucose levels is required; extensive education on diet, exercise, and diabetes pattern management is needed
- Discuss with your diabetes educator if an insulin pump will work for you



Storage of insulin

- If refrigerated, unopened insulin vials, pens, or cartridges are good until the expiration date stamped on the package; never use insulin if it is past the expiration date.
- Do not use insulin that has been exposed to extreme temperature, less than 32°F or greater than 86°F, as insulin loses its potency (power).
- Do not use insulin that has been frozen.
- Pens you are currently using should not be stored in the refrigerator. Their expiration varies 10 to 56 days. Check page O-13 for details.
- Keep insulin away from direct heat or sunlight.
- The vial of insulin you are currently using can be stored at room temperature below 86°F for 28 to 42 days. Check page O - 13 for details. When you open it, write the date on the vial.
- If receiving insulin through the mail, always confirm that it will be stored under proper temperatures.

The following tables address specific expiration dating that applies to insulin products that have been opened. Opened is when the seal or rubber stopper has been punctured.

Storage Guidelines for Insulin Vials	Refrigerated 36 – 46°F		Room Temperature 59 – 86°F
Product Name	Opened	Unopened	Opened/Unopened
Apidra®	28 days	Until expiration date stamp	28 days*
Admelog	28 days	Until expiration date stamp	28 days
Fiasp	28 days	Until expiration date stamp	28 days
Humalog® and insulin lispro	28 days	Until expiration date stamp	28 days
Humalog® 75/25 Mix	28 days	Until expiration date stamp	28 days
Humalog® 50/50 Mix	28 days	Until expiration date stamp	28 days
Humulin®N	31 days	Until expiration date stamp	31 days
Humulin® R	31 days	Until expiration date stamp	31 days
Humulin® 70/30	31 days	Until expiration date stamp	31 days
Lantus®	28 days	Until expiration date stamp	28 days
Levemir®	42 days	Until expiration date stamp	42 days
Lyumjev vials	28 days	Until expiration date stamp	28 days
Novolin® N		Until expiration date stamp	42 days*
Novolin®R		Until expiration date stamp	42 days*
Novolin® 70/30		Until expiration date stamp	42 days*
Novolog® and insulin aspart	28 days	Until expiration date stamp	28 days
Novolog® 70/30 Mix	28 days	Until expiration date stamp	28 days
Tresiba vials	56 days	Until expiration date stamp	56 days

*Stored at room temperature below 77°F

Storage Guidelines for Insulin Pens	Refrigerated 36 – 46°F		Room Temp. 59 – 86°F
Product Name	Opened	Unopened	Opened/Unopened
Apidra SoloSTAR®	Do not refrigerate	Until expiration date stamp	28 days*
Admelog SoloStar	Do not refrigerate	Until expiration date stamp	28 days
Basaglar KwikPen (insulin glargine)	Do not refrigerate	Until expiration date stamp	28 days
Degludec (Tresiba®)		Until expiration date stamp	56 days
Fiasp FlexTouch	28 days	Until expiration date stamp	28 days
Humalog KwikPen®	Do not refrigerate	Until expiration date stamp	28 days
Humalog® Mix 75/25	Do not refrigerate	Until expiration date stamp	10 days
Humalog® Mix 50/50	Do not refrigerate	Until expiration date stamp	10 days
Humulin® N Pen	Do not refrigerate	Until expiration date stamp	14 days
Humulin® 70/30 Pen	Do not refrigerate	Until expiration date stamp	10 days
Lantus SoloSTAR®	Do not refrigerate	Until expiration date stamp	28 days
Levemir FlexPen®	Do not refrigerate	Until expiration date stamp	42 days
Lyumjev KwikPen and Tempo Pen	Do not refrigerate	Until expiration date stamp	28 days
Novolog FlexPen®	Do not refrigerate	Until expiration date stamp	28 days
Novolog® Mix 70/30	Do not refrigerate	Until expiration date stamp	14 days
Novolin N FlexPen®	Do not refrigerate	Until expiration date stamp	28 days
Novolin R FlexPen®	Do not refrigerate	Until expiration date stamp	28 days
Novolin 70/30 FlexPen®	Do not refrigerate	Until expiration date stamp	28 days
Toujeo & Toujeo Max SoloStar®	Do not refrigerate	Until expiration date stamp	56 days

Storage Guidelines for Insulin Cartridges	Refrigerated 36 – 46°F		Room Temp. 59 – 86°F
Product Name	Opened	Unopened	Opened/Unopened
Humalog®	Do not refrigerate	Until expiration date stamp	28 days
Novolog®	Do not refrigerate	Until expiration date stamp	28 days
Lyumjev cartridge	Do not refrigerate	Until expiration date stamp	28 days

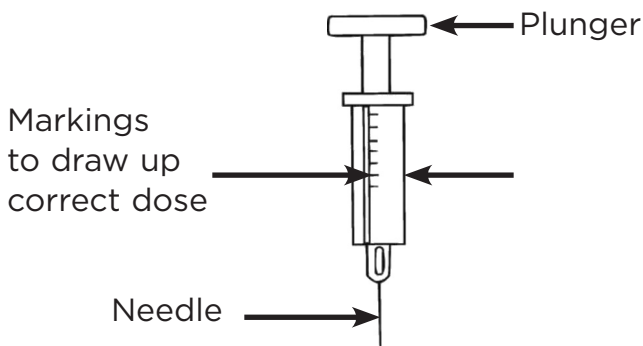
Sources: <https://dailymed.nlm.nih.gov/dailymed/index.cfm>

Premixing of insulin

- With all current options of insulin pens and ready-mixed insulins, it is rarely necessary for two different insulins to be mixed in the same syringe.
- Basaglar®, Lantus®, Levemir®, Toujeo®, or Tresiba® should never be mixed with another insulin.
- Novolog® and Humalog® mixed with NPH should be used immediately.
- Roll syringe in hands to mix insulin before injecting.
- Regular and NPH insulins may be premixed and stored in the refrigerator. Speak to your health care provider regarding the maximum length of time the mixture can be stored.
 - Store in the main part of the refrigerator.
 - Do not freeze.
 - The needle should be pointed upward to prevent blockage.
 - Store syringes in a sealable container labeled with the date, what type of insulin, what dose, and who drew up the insulin.

Syringes, needles, and guidelines for reusing and disposal of syringes

Parts of a syringe



Sizes of syringes available

- $\frac{3}{10}$ mL (30 units)
- $\frac{1}{2}$ mL (50 units)
- 1 mL (100 units)
- Use U-100 syringes with U-100 insulin

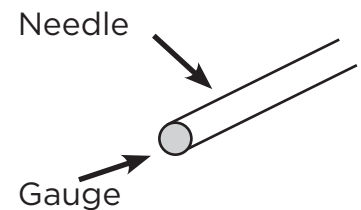
What to consider when buying syringes

- Insulin dose
- Ease of reading
- Accuracy
- Insurance coverage
- Markings: the numbered lines on the syringe. With some syringes each line marked is $\frac{1}{2}$ unit, some 1 unit and others 2 units

What to consider when buying needles

Features of a needle are:

- Gauge (G): width or diameter of the inside of the needle; the larger the number the smaller the size; for example: drawing blood requires a larger gauge needle (16 gauge needle), where as an insulin needle is a finer needle (30 gauge needle)
- Length: how long the needle is; current recommendation to use $\frac{5}{64}$ inch (6mm) needle for syringes and $\frac{5}{32}$ inch (4 mm) with a pen.



Never resuse pen needles

Guidelines for reusing syringes

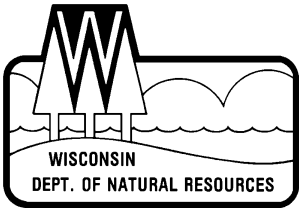
For years, patients were told to use their insulin syringes only once. This was to prevent infection. Recent research indicates the risk of infection from reusing a syringe is very small. “For many patients it appears both safe and practical for the syringe to be reused if the patient so desires.” (American Diabetes Association)

Disadvantages of reusing syringes

- Slight risk of getting an infection
- Needle may become dull after several uses
- Unit markings on the syringe may wear off, making it difficult to draw up the correct dose

Advantages of reusing syringes

- The main advantage is saving money; the amount in a year depends on how often you take insulin and how frequently you change syringes
- Plastic syringes do not biodegrade; using fewer syringes will decrease the environmental waste; plastic syringes can not be recycled

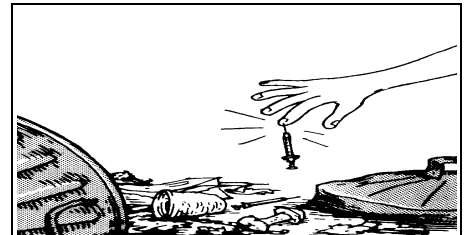


Medical Waste

DISPOSING OF HOUSEHOLD SHARPS

Used sharps pose health risk

As the number of home health care patients rises, sharps (needles, syringes and lancets) are increasingly being mixed in with household garbage and recyclables or flushed down the toilet. These sharps pose a health risk to garbage haulers and workers in recycling facilities who might be accidentally stuck by them. All "needlestick" injuries demand expensive testing, cause long-term emotional stress and increase the risk of exposure to infectious diseases such as Hepatitis B and HIV from contaminated needles.



To reduce such health risks, the state adopted rules in 1994 about how to package, treat and dispose of sharps, including household sharps. Sharps must be packaged safely and treated either by incineration at a licensed medical waste incinerator or by methods which render the sharps non-infectious and both broken and unable to be reused. Sharps must be treated before they are disposed of in a landfill. Other infectious waste generated at home may be bagged and put out with the regular trash.

Four steps to safe packaging

Follow these four steps for packaging your used, or discarded unused sharps:

1. **Clip the needle points with needle clippers, or recap or re-sheath discarded sharps to help prevent "needle sticks."** Recapping needles is discouraged in hospitals and other health care facilities because medical workers might stick themselves with contaminated needles, but individuals who administer their own medications are not at risk from their own needles.
2. **Place the sharps in rigid puncture-resistant containers with secure lids or caps.** Acceptable containers include commercially-available sharps containers or heavy plastic detergent or bleach bottles with screw caps. Unacceptable containers include coffee cans (their lids are too easily punctured), plastic milk jugs, plastic bags, pop cans or soda bottles. Note: **DO NOT** add bleach to the container. Bleach may not completely disinfect needles, and it could spill and injure you or waste handlers.

3. **Visibly label the sharps container** with the words "bio-hazard," "infectious waste" or "sharps," or with the bio-hazard emblem. It's also a good idea to label detergent bottles with the words "Do not recycle" so that they are not accidentally included with recyclables.
4. **When the container is full, sealed and labeled, store it out of reach of children and dispose of it properly.** Do not put the container out with the trash or with recyclables. Instead, take it to a registered "sharps collection station" or make other arrangements if such stations aren't available.



Disposal options

Ask your local doctor or clinic, diabetic support group, pharmacy, hospital, public health department, solid waste or streets department or environmental services department about local options. Some of them may be registered sharps collection stations. You may also call your local DNR office (ask for the waste management specialist) or the American Diabetes Association (1-888-342-2383) for locations of registered sharps collection stations. Registered sharps collection stations may only charge fees to recover costs, such as costs for the container, transportation and treatment. Some offer the service for free.

If there are no local sharps collection programs, you may take sharps directly to a licensed infectious waste treatment facility or contract with a licensed infectious waste hauler to transport them for you. (People transporting more than 50 pounds per month must get a license from the DNR). Ask your doctor where she or he sends sharps, or look in the yellow pages under "waste disposal" or "medical waste."

Another option provided by some disposal companies is a mail-in sharps disposal program. The company provides containers and packaging which meet U.S. Postal regulations.

Write your local disposal options here:

Acknowledgments

The Wisconsin Department of Natural Resources gratefully acknowledges the Minnesota Pollution Control Agency for permission to use information from their "Disposal of Household Sharps" brochure and the Washington State Department of Ecology for permission to use graphics from their "Get the Point" brochure.

DISCLAIMER: This fact sheet is not intended as a substitute for the regulations and statutes that apply. Rather, it is a brief summary of the topic. Please consult Wisconsin's regulations and statutes for more information. PUBL-WA804-00...October 9, 2000

Guidelines for reusing syringes continued

Ask your doctor or nurse “Is there any reason why I should not reuse my insulin syringes?”

If you decide to reuse your syringes, follow these American Diabetes Association (ADA) guidelines:

- Store the used syringe at room temperature in a clean container, perhaps a hard plastic pencil case or toothbrush holder.
- Carefully recap the needle; if the needle touches anything except your skin at the injection site or the top of the insulin vial, throw the syringe away.
- Do not clean the needle with alcohol between uses; this wipes off the silicone coating that allows the needle to enter your skin smoothly.
- Do not reuse a needle if bent or dull.
- Move the plunger up and down after each use; this helps to prevent the needle from clogging.
- If you use one type of insulin in the morning and another type at another time in the day, use different syringes; this will avoid mixing insulin, since a small amount of insulin remains in the syringe after the injection; you may want to have two clean storage containers well marked; this way you can store each syringe in a different container.
- Never use anyone else’s used syringe; never let anyone else use your used syringe.

Preparing for injection and choosing injection site

Items to consider before injecting insulin

- Accurate dose measurement
- Selection of an injection site
- Timing of dose and time meals are eaten

Accurate measurement of insulin drawn up

- It is critical to get the right amount of insulin.
- Air bubbles in the syringe take up space and contain no insulin and lead to incorrect dose.
- Injecting an air bubble will not harm you; you will simply receive less insulin than recommended.

Tricks to removing air bubbles

- Avoid shaking the insulin. If you need to mix the insulin, roll it back and forth in your hands.
- Tapping against the side of the syringe can move the bubble to the top near the needle; this way it can be gently pushed out and an accurate amount of insulin can be drawn up.
- While drawing up the insulin, always keep the tip of the needle in the insulin; this will prevent you from drawing up air.
- If you are not mixing 2 types of insulin, you may push the insulin back into the vial and redraw slowly to remove bubbles.

Insulin injection sites

Insulin can be injected in various parts of the body as shown on the body map. (see page O-18). Abdominal sites are the preferred area for giving insulin. Insulin is absorbed more rapidly and consistently when injected into the abdomen. Sites in the upper arms are slightly slower, followed by the thighs and then the buttocks.

Strenuous exercise of the muscles at an injection site can make the insulin absorb faster and make it enter the blood quicker.

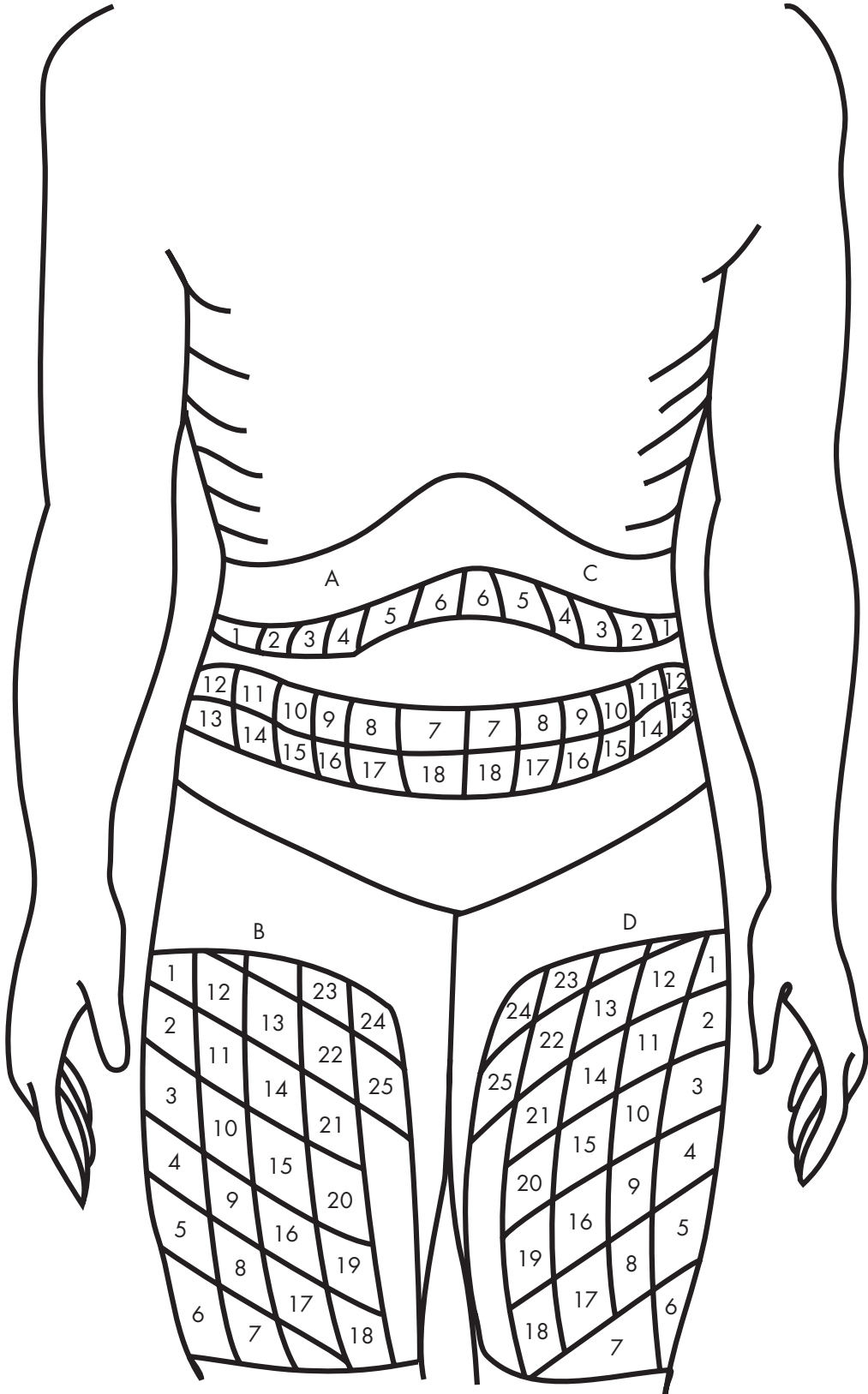
Site rotation is important. Site rotation means changing the injection sites within an area of the body following a regular pattern. For example, when using your abdomen you start on your left outer abdominal area and move injection sites to the center. When you reach the center, you return to the left outer edge and begin a new row about one inch lower and move to the center. Rotating sites will keep the skin, fat, and muscles healthy in the injection areas.

Injection tips

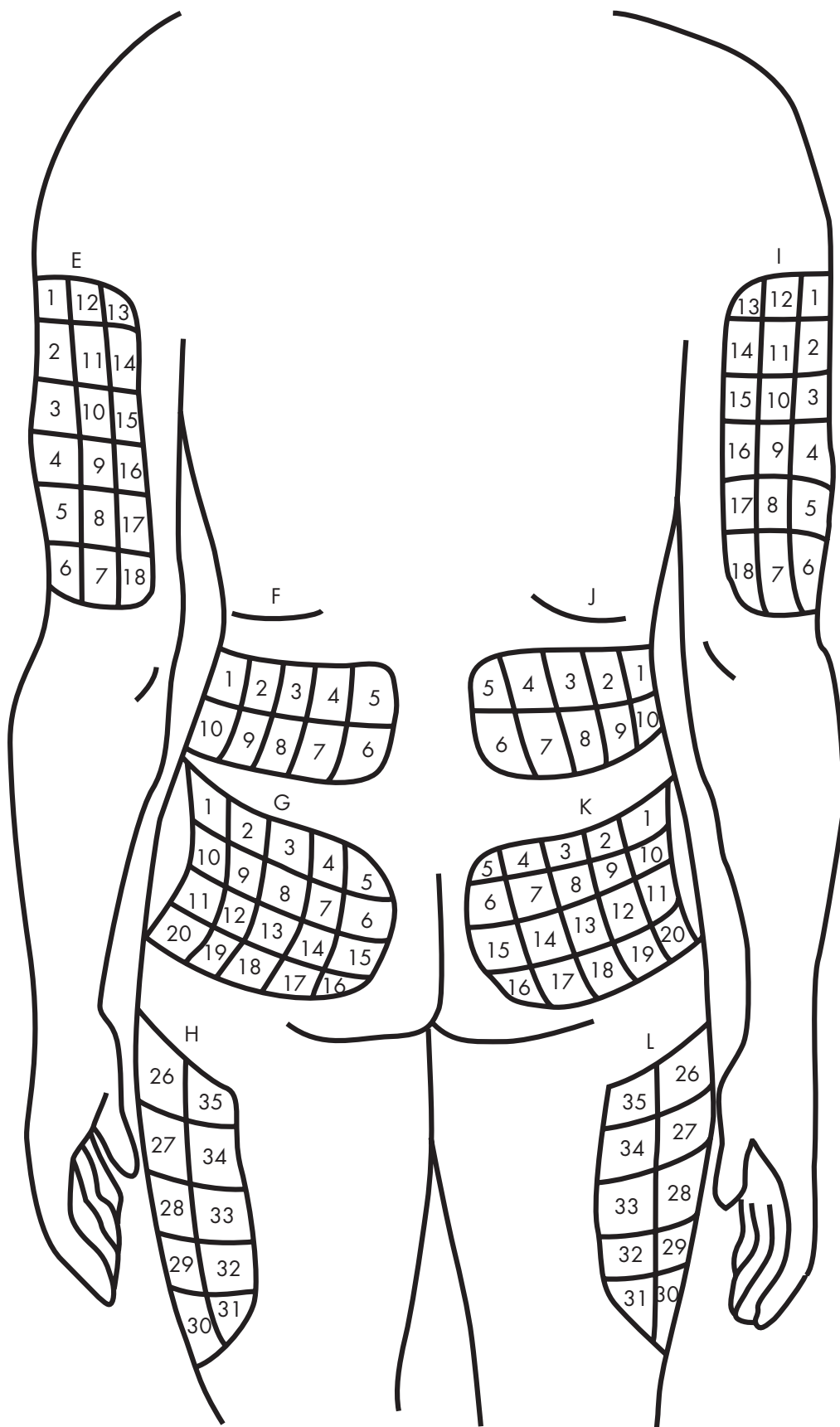
- Space your sites 1 inch apart (the size of a quarter).
- Inject into the skin only if it is free of stretch marks, scars, moles, or sores.
- Inject insulin anywhere there is fat on the abdomen, except for a 2 inch space around the navel (belly button).
- Rotate sites within one area of your body, until all sites in that area are used. Rotating sites within one area of your body will help to prevent fat hypertrophy.
- Fat hypertrophy is a thickening of the tissue at the injection site. This can slow insulin absorption. The skin looks “lumpy” when hypertrophy develops.
- Lipoatrophy can also occur with insulin injections. The fatty layer under the skin disappears and “dents” appear at injection sites.

Selection of an injection site

Front



Back



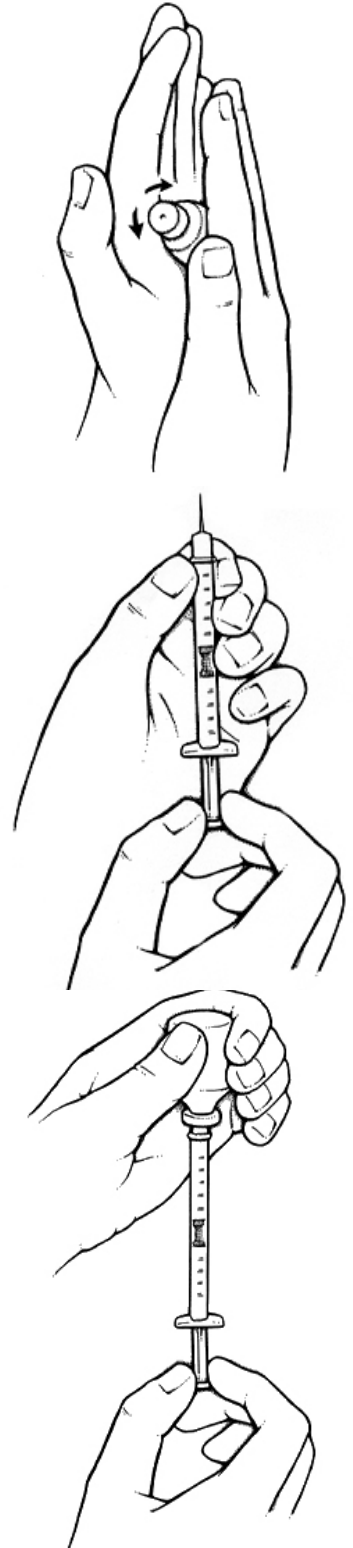
How to give insulin injections with insulin pen

1. Gather your supplies. You need an insulin pen, alcohol swab, pen needle and sharps container. Place it on a clean workspace on a table or countertop.
2. Wash your hands with soap and warm water.
3. Wipe the tip of the pen where the needle attaches with alcohol swab.
4. Take the pen needle and remove the protective pull tab and screw it onto the pen until tight.
5. Remove the plastic outer cap.
6. Remove the inner needle cap.
7. Find the dose window on pen and turn the dosage knob to 2 units.
8. Perform an “air shot”. Hold the pen with the needle pointing up. Press the dose button until insulin drops appear. Repeat this “air shot” procedure until at least one drop of insulin is seen.
9. Dial in the number of units of insulin you take.
10. Wrap your fingers around the pen with your thumb on the dose button.
11. With the other hand, gently pinch up the skin around the area where you plan to give the shot.
12. Insert the needle straight into the skin; press the dose button all the way until the dose window reads 0, count to 10 then pull the needle straight out.
13. If you bleed when the needle comes out, gently apply an alcohol swab until bleeding stops. Do not rub the area.
14. Carefully replace the plastic, outer cover over the needle and unscrew the needle from the pen.
15. Throw away the pen needle into your sharps container. Recap your insulin pen.

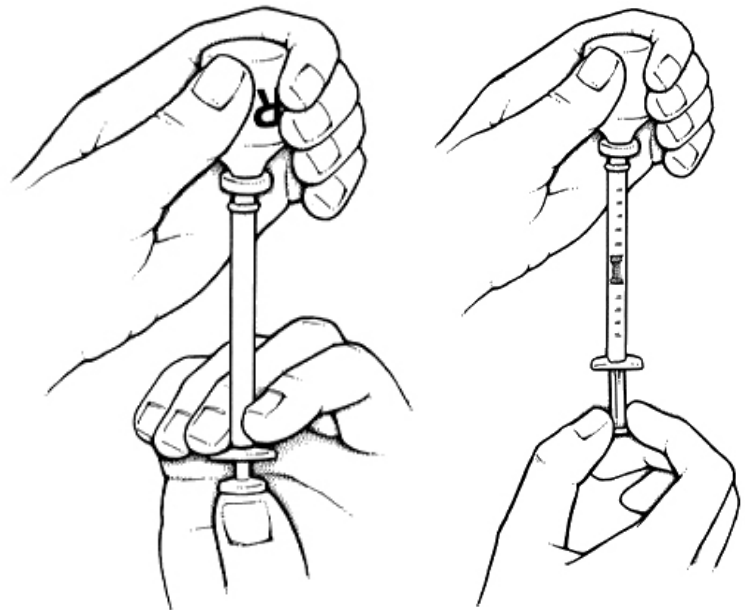
How to give single and mixed dose insulin injections

Single dose insulin

1. Gather your supplies. You need a syringe, alcohol swab, insulin vial, and sharps container. Place it on a clean workspace on a table or countertop.
2. Wash your hands with soap and warm water.
3. Prepare the insulin. If you use cloudy insulin; roll the vial of insulin between the palms of your hands to mix the insulin well. Do not shake the vial. This can leave air bubbles that can get into the syringe.
4. Wipe the rubber top of the insulin vial with the alcohol swab. Do not touch the rubber top after it has been wiped clean.
5. Take the needle cap off the syringe.
6. Hold the syringe with needle pointing toward the ceiling. Keep syringe at eye level so you can easily see the markings on the barrel.
7. You must put air into the insulin vial before you can get the insulin out of the vial. First, pull the syringe plunger down until the top of the black tip crosses the mark of the dose of insulin you are to take. This draws air into the syringe. This will be _____ units of air.
8. Now turn the syringe needle down. Put the needle through the rubber stopper of the insulin vial. Push down all the way on the plunger, and hold the plunger in. This puts air into the vial.
9. Turn the vial and syringe upside down, so the vial is on the top and the syringe is on the bottom. Leave the needle in the vial with the plunger pushed all the way in.
10. Make sure the tip of the needle is in the insulin. Pull down slowly on the plunger. This brings insulin into the syringe.
11. Pull down slowly on the plunger until the end of the plunger is even with the number of units of insulin you take. The right amount of insulin should now be in your syringe.



12. Look in the syringe for air bubbles. If you see air bubbles, push the insulin back into the vial. Then pull the plunger back to the exact line of your insulin dose. If bubbles are still in the syringe, repeat the process until they are gone or try lightly tapping the syringe with your fingertip, pen, or pencil.



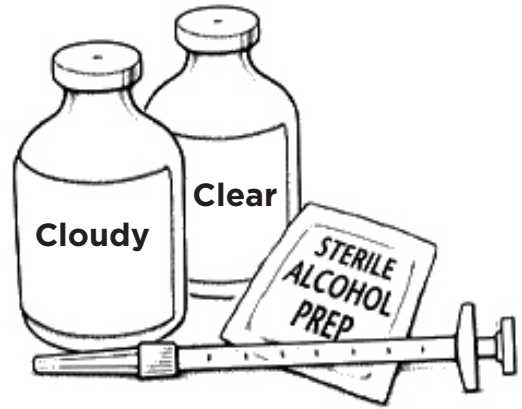
13. When all the bubbles are out and you have the right dose, remove the needle from the vial. Check to be sure that you have the right dose. You will know that it is right if the top of the plunger crosses the right mark on the syringe and there are no air bubbles. Carefully put the syringe down so the needle does not touch anything.

14. Now you are ready to give yourself your injection. Take a deep breath and let it out slowly to help you relax.

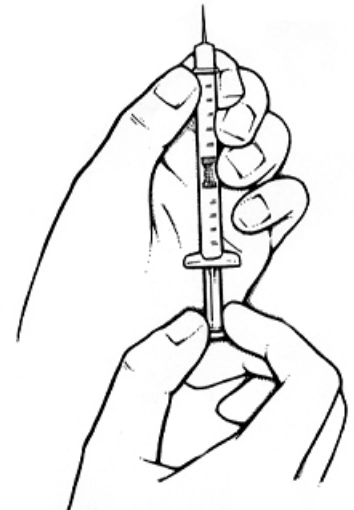
Mixed dose insulin

Some people need two different kinds of insulin to control their blood glucose. The following steps will allow you to safely draw up 2 different types of insulin into one syringe and avoid having to take extra injections.

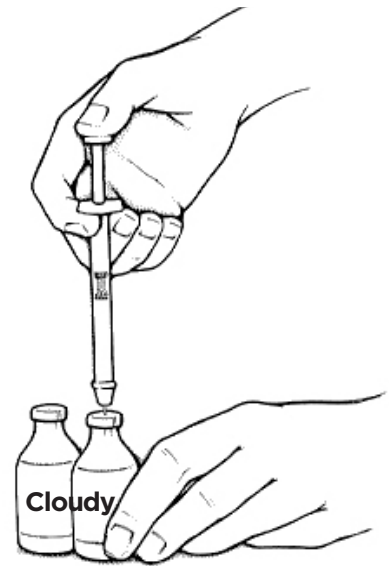
_____ Units cloudy insulin
_____ Units clear insulin
_____ Total dose



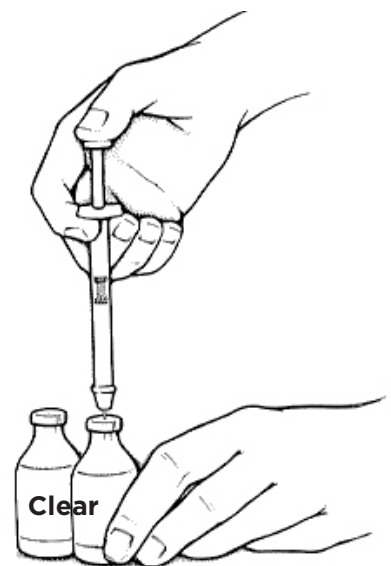
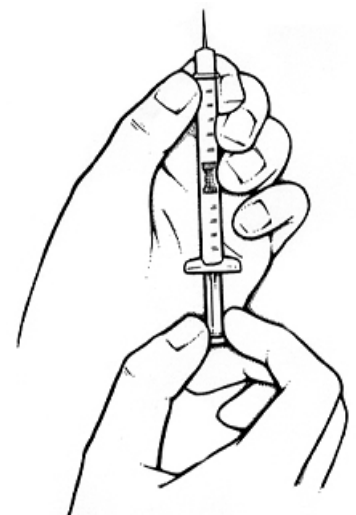
1. Gather your supplies. You need a syringe, alcohol swab, insulin vial, and sharps container. Place it on a clean workspace on a table or countertop.
2. Wash your hands with soap and warm water.
3. Prepare the insulin. Roll the vial of cloudy insulin between the palms of your hands. Do not shake the vial. Wipe the rubber top of both insulin vials with the alcohol wipe.
4. Wipe the rubber top of the insulin vial with the alcohol swab. Do not touch the rubber top after it's been wiped clean.
5. Take the needle cap off the syringe.
6. Hold the syringe with the needle pointed towards the ceiling. Keep syringe at eye level, so you can easily see the markings on the barrel.
7. You must put air into the insulin vial. Pull the syringe plunger down until the top of the black tip crosses the mark of the dose of **cloudy** insulin you are to take. This will be _____ units of air.



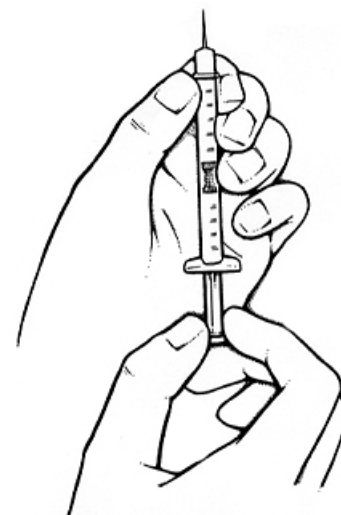
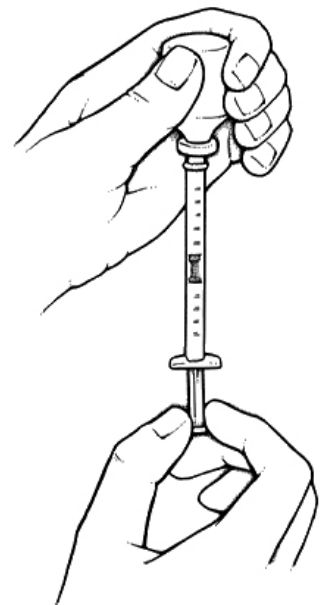
- Put the needle through the rubber stopper of the vial of **cloudy** insulin. Push air into the vial. **DO NOT** draw up any insulin. Remove the needle and syringe.



- Hold the syringe with the needle pointing towards the ceiling. You now must put air into the vial of clear insulin.
- Pull the syringe plunger down until the tip of the black top crosses the mark of the dose of **clear** insulin to be taken. This will be _____ units of air drawn into the syringe.
- There is no need to roll or shake the vial of clear insulin. Turn the syringe needle down. Put the needle through the rubber stopper of the vial of **clear** insulin. Push air into the vial. **DO NOT** pull the syringe out of the vial. Hold the plunger all the way in.
- Turn the vial and syringe upside down so the vial is on top and the syringe is on the bottom. Leave the syringe in the vial with the plunger pushed all the way in.
- Make sure the tip of the needle is in the insulin. Pull your dose of **clear** insulin into the syringe by slowly pulling down the plunger. Carefully measure your dose of **clear** insulin into the syringe. This will be _____ units of **clear** insulin.

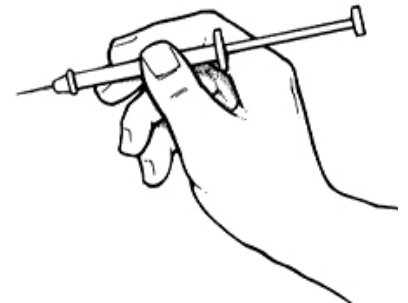
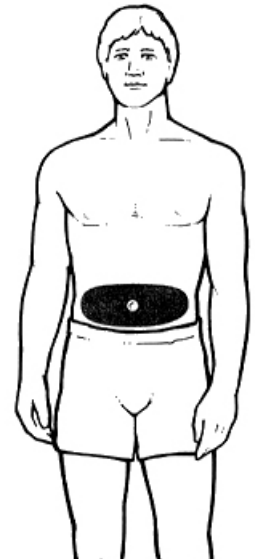


14. Check for air bubbles in your syringe. If you have air bubbles or have drawn up too much insulin, push the insulin back into the vial. Slowly pull the plunger back to the line of your **clear** insulin dose. If there are still bubbles in the syringe, repeat the process.
15. When your syringe is free of air bubbles and you have the right dose of insulin pull the vial straight up and off the needle.
16. Push the needle through the rubber top of the cloudy insulin vial.
17. Turn the vial and syringe upside down. Be very careful not to push the plunger in. Pull the plunger back slowly to draw up the **cloudy** insulin. Pull the plunger back until the tip of the black tip crosses the mark of your **total** insulin dose. Clear _____ + cloudy = _____ total.
18. Pull the vial off the needle. Check syringe for correct dose and for air bubbles. If there are air bubbles or you have a wrong dose, squirt the insulin out of the syringe. **Do not** inject the insulin mix back into the insulin vial.
19. When the dose is correct and there are no air bubbles, you are ready to inject your insulin.



Giving the injection

1. Insulin may be injected in many areas. However, your upper abdomen is preferred. Insulin is absorbed more evenly from this site. Your abdomen also has fewer nerves than other places, and a pad of fat underneath. Pick a spot at least 1 inch from the place you gave your last shot and at least 1 inch around the navel (belly button). (See page O-22).
2. If desired, clean the spot with alcohol. Let dry. If skin is clean, alcohol is not necessary.
3. Remove the top from the needle. Hold the syringe in one hand as you would hold a pencil.
4. With your other hand pinch up a couple of inches of skin.
5. Stick the needle straight into the pinched skin. Put the needle all the way in through the skin with one smooth motion.
6. Relax the pinch, and slowly push the plunger all the way down. Be sure the insulin is in, then remove the needle.
7. Lightly press down on the site. Do not rub the spot. Do not worry if a drop of blood appears where the needle was.
8. Record the insulin dose you just gave yourself in your diabetes log.
9. When you are ready to discard your used needles and syringes, put them into a sharps container or other container as approved by your local garbage disposal laws. Label and discard according to local law.



It may be hard to give yourself a shot the first time, but with practice it will become much easier.