

# **Chapter 12**

## **Parenteral Medications**

# Learning Objectives

After reviewing this chapter, you should be able to

1. identify various types of syringes used for parenteral administration.
2. read parenteral solution labels and identify dosage strengths.
3. read and measure dosages on a syringe.
4. calculate dosages of parenteral medications already in solution.
5. identify the appropriate syringe to administer the dosage based on the dosage calculation.

# Background: Parenteral Medications

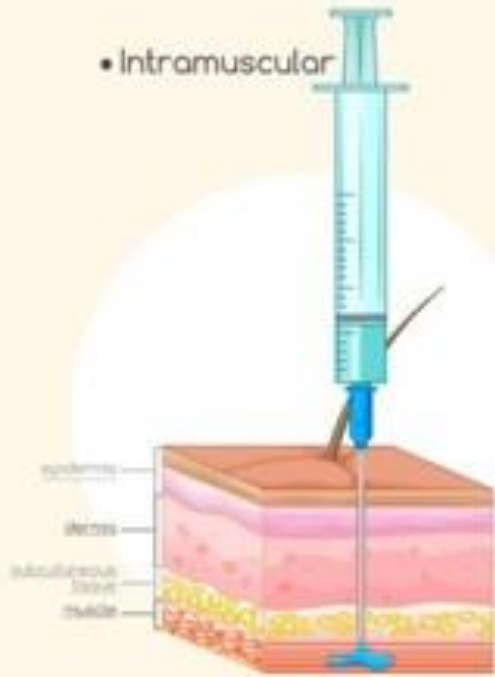
- Refers to any route other than GI system
- Commonly refers to meds given by injection with needle and syringe (IM, Subcut, ID, IV)
- Medication takes effect faster because more rapidly absorbed than oral meds
- Sterile solutions, generally nonirritating
- Preferred route if client is vomiting or unconscious and no gastric route is available

# **Types of Injections**

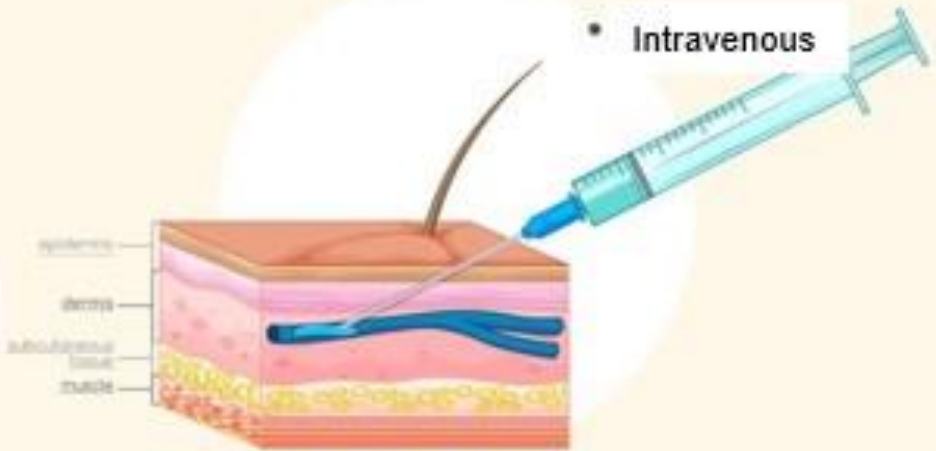
# Background: Parenteral Medications (Cont.)

- **IM**— Intramuscular injection given into a muscle
- **Subcut**—Subcutaneous Injection into the subcutaneous tissue
- **IV**—Intravenous Injection given directly into the vein
- **ID**—Intradermal Injection administered just under the skin is mainly used for diagnostic purposes.

• Intramuscular



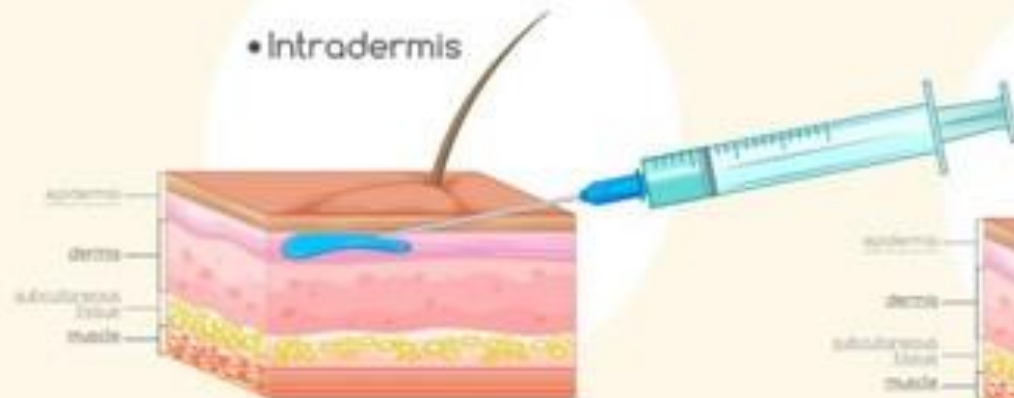
• Intravenous



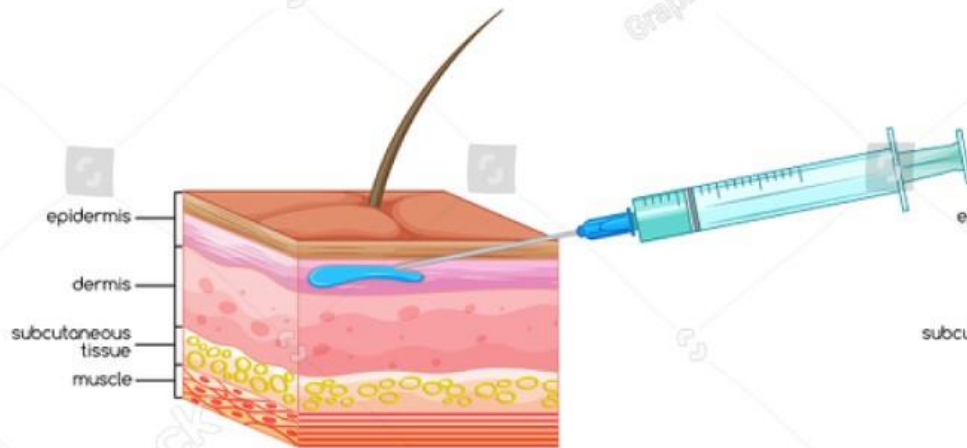
• Subcutaneous



• Intradermis



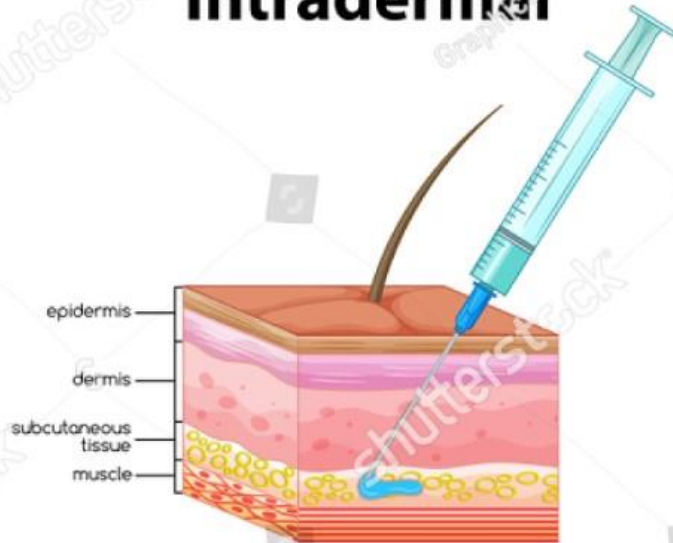
# Types of Injections



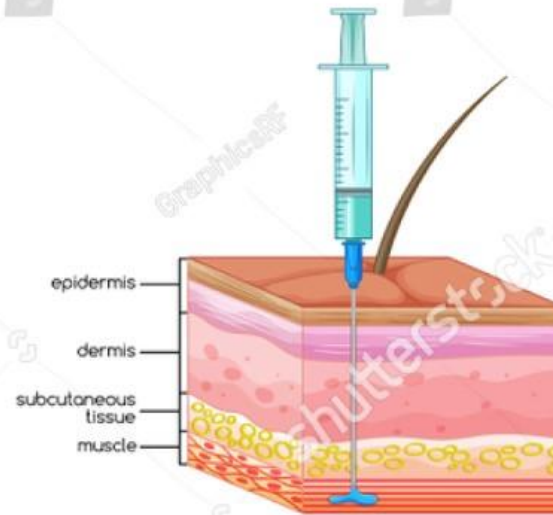
**Intradermal**



**Intravenous**



**Subcutaneous**



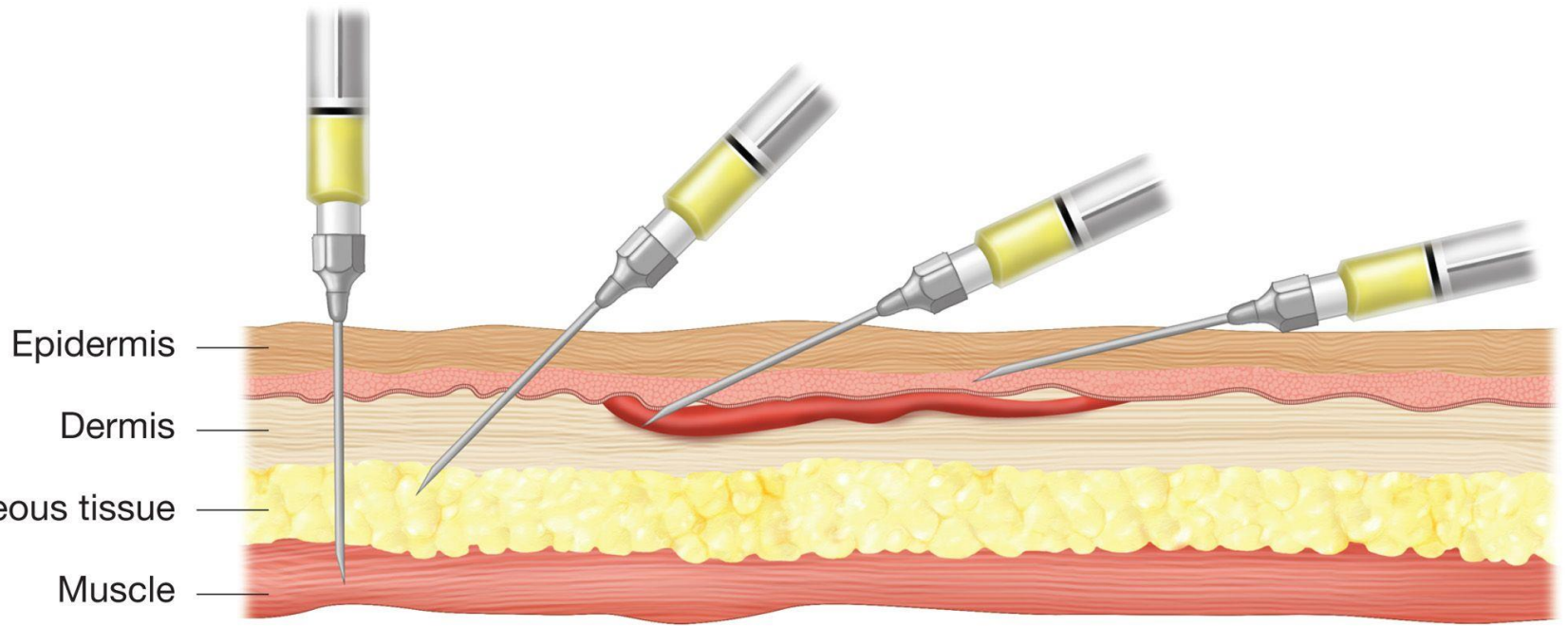
**Intramuscular**

Intramuscular

Subcutaneous

Intravenous

Intradermal



Subcutaneous tissue

Muscle



Intramuscular



Subcutaneous

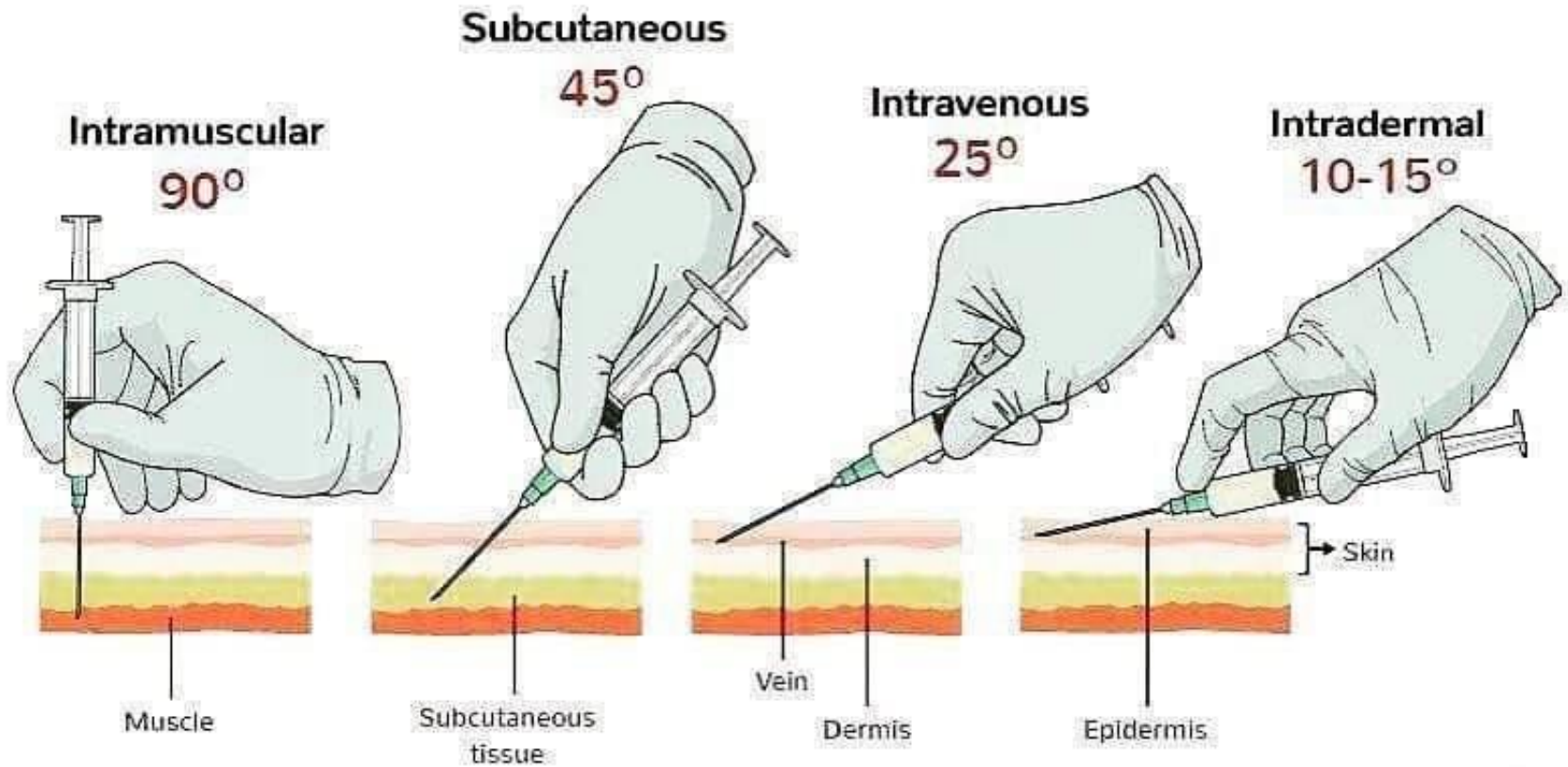


Intravenous



Intradermal

# Injection technique



# DANGEROUS MISPERCEPTIONS

Here are some examples of dangerous misperceptions about safe injection practices.



## Myth

Changing the needle makes a syringe safe for reuse.



Syringes can be reused as long as an injection is administered through IV tubing.



If you don't see blood in the IV tubing or syringe, it means that those supplies are safe for reuse.



It's okay to use leftover medicine from use single-dose or single-use vials for more than one patient.



## Truth

Once they are used, both the needle and syringe are contaminated and must be discarded. A new sterile needle and a new sterile syringe should be used for each injection and each entry into a medication vial.

Syringes and needles should never be reused. The IV tubing, syringe, and other components represent a single, interconnected unit. Distance from the patient, gravity, or infusion pressure do not ensure that small amounts of blood won't contaminate the syringe once it has been connected to the unit.

Germ such as hepatitis C virus and staph or MRSA are invisible to the naked eye, but can easily infect patients even when present in microscopic quantities. Do not reuse syringes, needles, or IV tubing.

Single-dose or single-use vials should not be used for more than one patient regardless of how much medicine is remaining.

**SAFETY ALERT!** 

Always discard excess medication  
from a cartridge or prefilled syringe  
**PRIOR** to administration.

# Injection Safety

An injection goes into the body tissue. If the needle or syringe used is not sterile, has been re-used or is contaminated with infected blood or body fluid, it can spread disease from one person to another.

Globally, unsafe injection practices are responsible for

**30%**

of new Hepatitis B cases,

**41%**

of new Hepatitis C cases and

**9%**

of new HIV cases.



## What makes an injection unsafe?



- 1 Overuse of injections, especially when alternate oral medication is available and recommended
- 2 Re-use of syringes, needles and/or other injection equipment
- 3 Contaminated workspace and hands
- 4 Unsafe disposal mechanisms



A safe injection is one that does not harm the recipient, does not expose the provider to any avoidable risks and does not result in waste that is dangerous for the community.



GET THE  
POINT

# MAKE YOUR INJECTION A SAFE INJECTION

## DID YOU KNOW?

An **unsafe injection** could **put you at risk** of getting a life-threatening infection such as:

30%



HEPATITIS B

3%



HEPATITIS C

0.3%



HIV

*Estimated risk of getting these infections from a contaminated syringe or needle.*

# Hepatitis Viruses



## *Things to Know*

**Hepatitis A, B, and C are all viruses that affect the liver**

	<b>A</b>	<b>B</b>	<b>C</b>
<b>Fatal</b>	Rare	Potentially	Potentially
<b>Spreads By</b>	Food/Water Contact	Body Fluids	Blood
<b>Chronic Infection</b>	No	Can Cause	Can Cause
<b>Vaccine</b>	Yes	Yes	No
<b>Treatable</b>	Yes	Yes	Yes

# HEPATITIS

**AE** Hepatitis with a vowel comes from the bowel.

Transmission: Fecal, Oral



Vaccine-A  
Yes



Vaccine-E  
No

**SS:** (All Types)  
RUQ Discomfort  
GI-N/V  
Anorexia  
Weight Loss  
Fever  
Chills  
Jaundice  
Dark Urine  
History of potential exposure

**C** Hepatitis C  
(HCV)  
Circulation

Transmission: Blood, Semen



Vaccine-C  
No

**B** Hepatitis B  
Body fluids

Transmission: Blood,  
Semen,  
Saliva



Vaccine-B  
Yes

**TX:** (All Types)  
Rest  
Activity as tolerated  
Nutrition  
Hydration

**DX:** Presence of  
specific antibody /  
antigen in serum

**D** Hepatitis D  
Super infection  
with HBV

Transmission: Blood



Vaccine-D  
No

## Safe injection practices

- Correct disposal in appropriate container
- Avoid re-sheathing needle
- Avoid removing needle
- Discard syringes as single unit
- Avoid over-filling sharps container



# Sharps Disposal



**Sharps disposal container**



↑ FULL ↓  
↑ DO NOT FILL ABOVE THIS LEVEL ↑  
BIOHAZARD INFECTIOUS WASTE  
PELIGRO WARNING  
5.4 qt 5.1 L  
SHARPS  
To avoid accidental sticks, never touch sharps or waste.  
When removing container, shake properly. Repeat and  
handle with care. Do not attempt to repair or reuse.  
Dispose of in accordance with local regulations.  
Container is puncture resistant. See manufacturer's product  
Red 5.4 Quart - Resin No. 143154  
#237143154  
Manufactured by Plasti-Products, Inc., Omaha, NE 68144



**Large  
14 qt.**



**Medium  
8 qt.**



**Small  
4 qt.**



**Tray Size  
1 qt.**





## KEEP YOUR COMMUNITY SAFE

**DO NOT**  
throw loose  
sharps in trash



**DO NOT**  
put sharps  
in recycling



**DO NOT**  
flush sharps  
down toilet

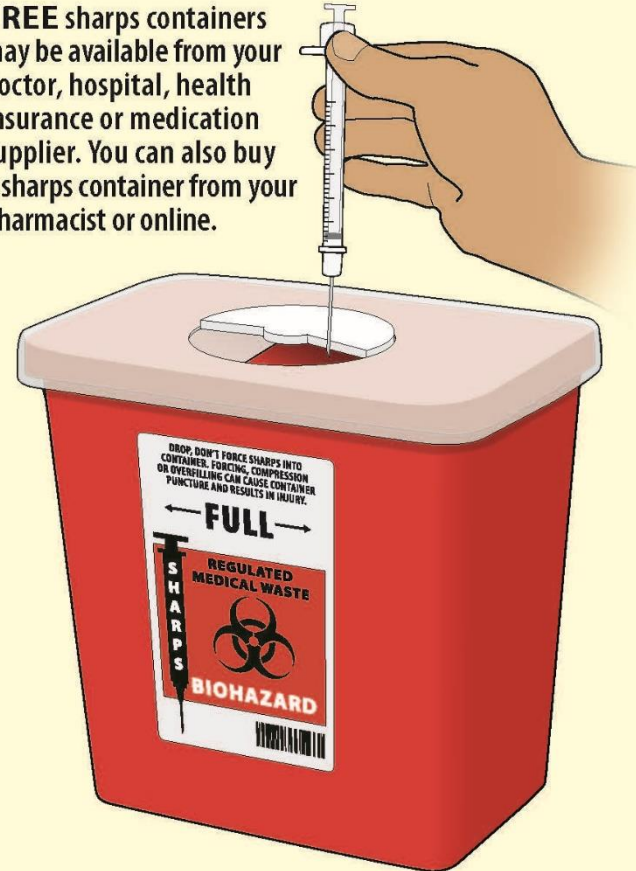


**KEEP OUT**  
of reach  
of children

## ALWAYS USE A SHARPS CONTAINER

Used sharps are hazardous waste. When not discarded properly they can cut and infect others. Protect your community by always discarding your used sharps in a sharps disposal container.

**FREE** sharps containers may be available from your doctor, hospital, health insurance or medication supplier. You can also buy a sharps container from your pharmacist or online.



For information about rules and laws in your community, contact the Coalition for Safe Community Needle Disposal at 800.643.1643. For more information on sharps visit [fda.gov/safesharpsdisposal](http://fda.gov/safesharpsdisposal).



PLACE SHARP HORIZONTALLY  
LIFT TO ASSURE DISPOSAL

**FULL**

WARNING - DO NOT FILL ABOVE THIS LINE

**SHARPS CONTAINER**

CAUTION: PUNCHING OR OVERFILLING SHARPS INTO COLLECTOR MAY CAUSE SERIOUS INJURY. This container is puncture-resistant, but not puncture proof. To prevent injury, always use the collector correctly before you fill. Carry or dispose of it CLOSE COVER AND SECURE LATCH LEVEL IS REACHED.

**BIOHAZARD WARNING**

VOLUME: 4.6L  
Item No.: 14.6A  
AMP7101

**Biohazard** 

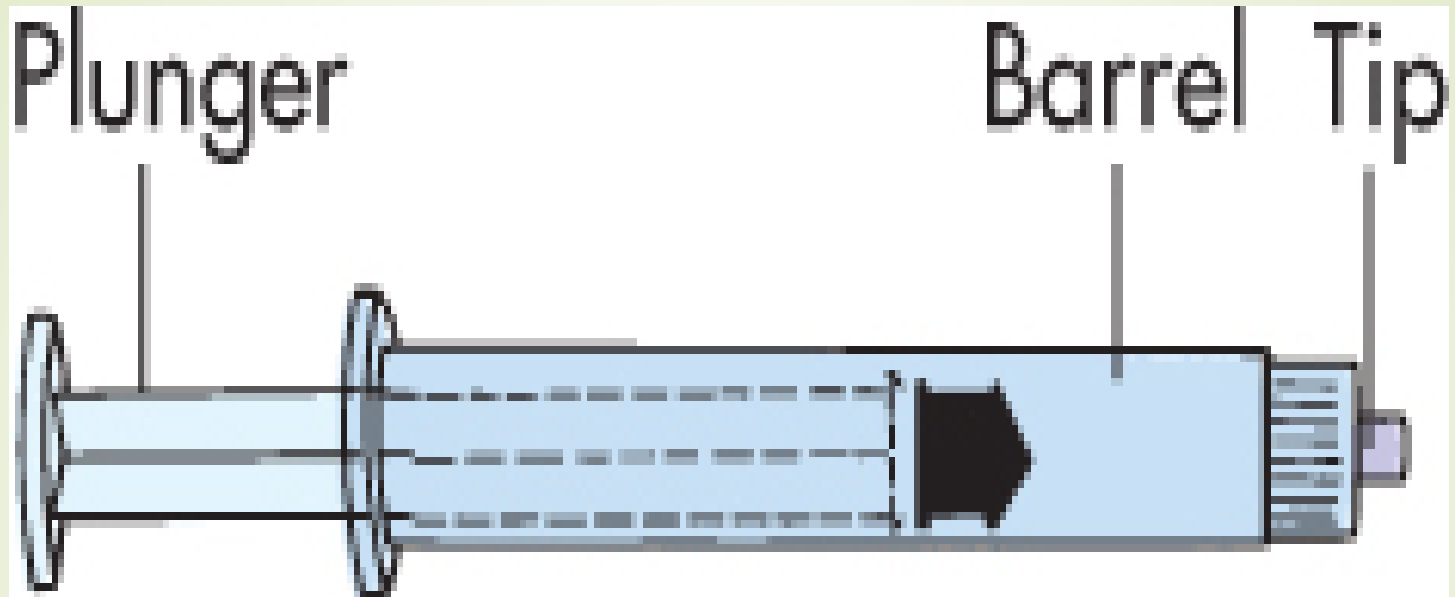
One-time use only  
Lot # 0202021138  
©2014 100  
Woodsell, WA 98098  
Made in China

# Syringes

# Syringes

- Various sizes
- Components
  - Barrel—outer calibrated portion to hold medicine
  - Plunger—fits into the barrel to withdraw and inject medicine
  - Tip—end of syringe upon which needle or blunt tip device is placed or into which it is prebuilt; may be slip tip or Luer-Lok
- **Disposable—one use only**





Parts of a syringe.

# Old-School Tools





72  
27/11/00



**HAUSSMANN & DUNN CO.**  
MAKERS OF  
**SURBICAL INSTRUMENTS**  
107 S. CLARK ST. CHICAGO.



EL  
me 17<sup>th</sup> 1890

No XL  
pill  
a day  
three

Responsible for any loss.  
ROOM. TIME.

Cofay

Washington

43912  
19-90

Adams

348  
311  
311





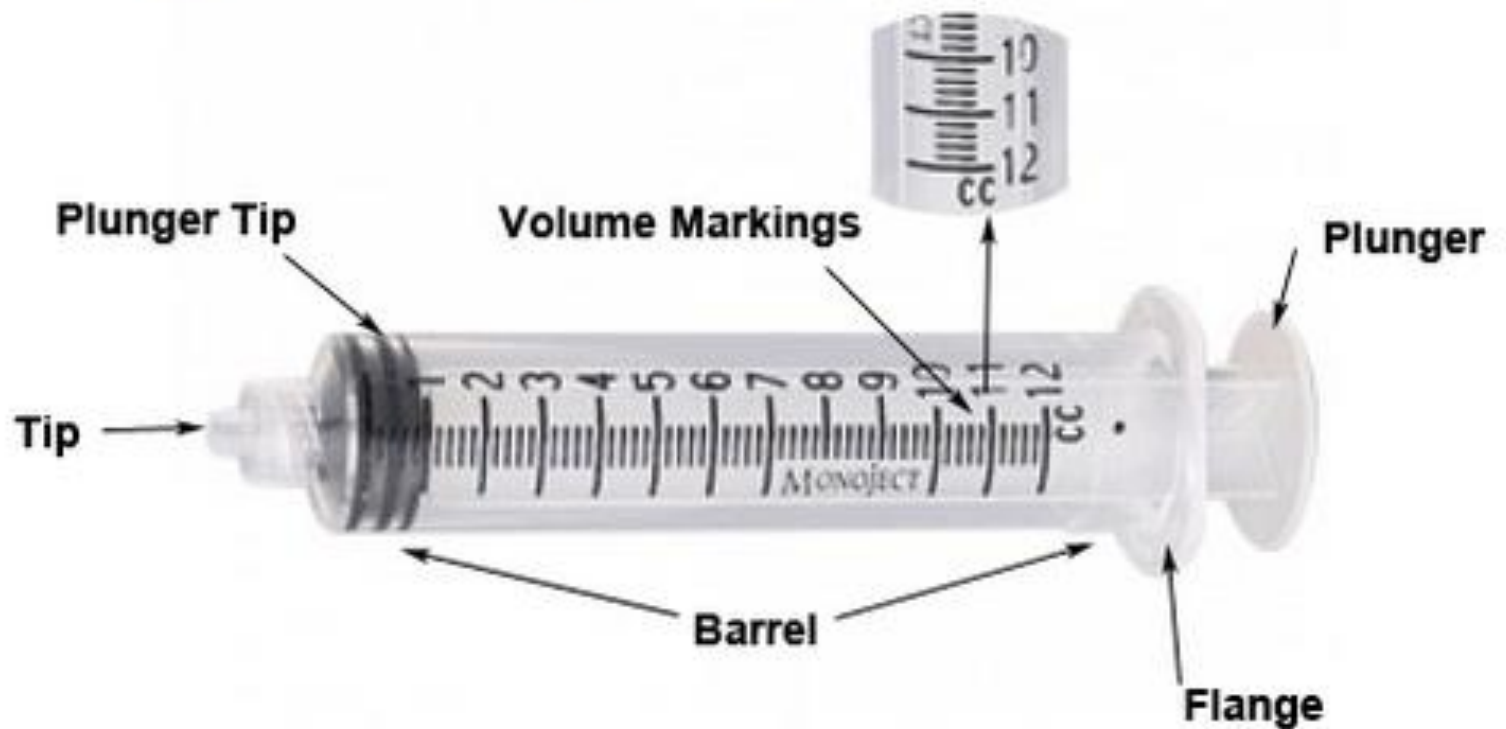


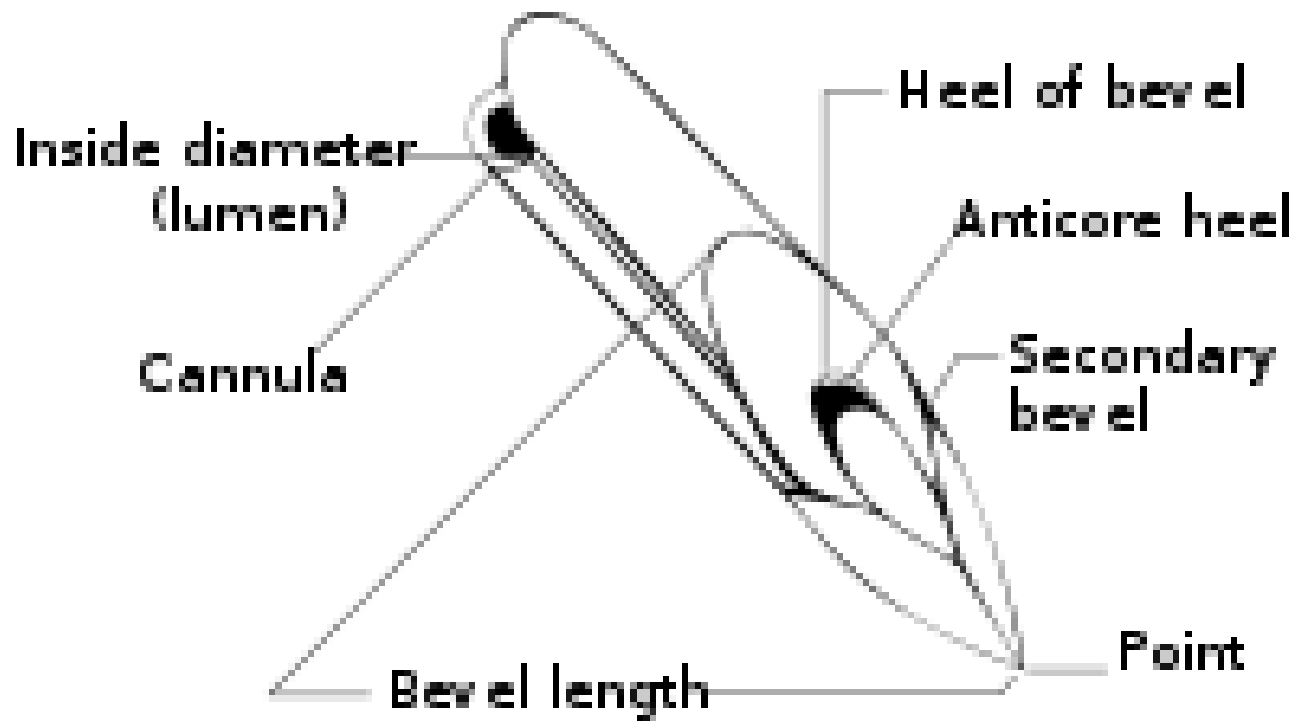


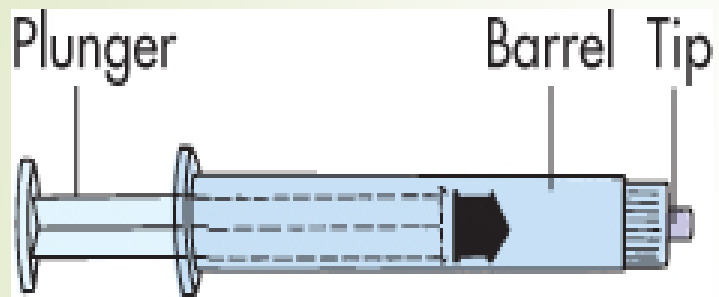




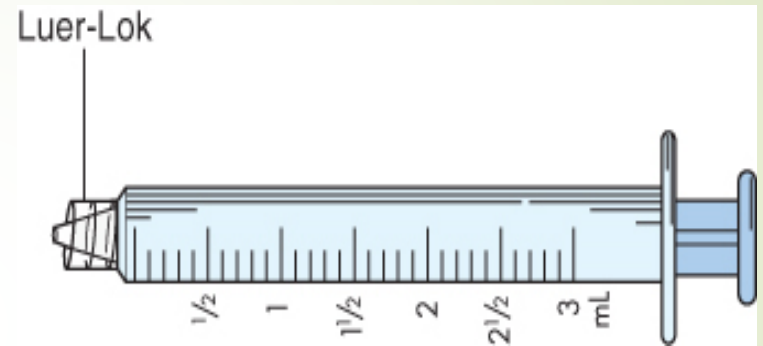
# Anatomy of a Syringe







Parts of a syringe.



3-mL Luer-Lok syringe. (



**Luer Slip**

**Luer Lock**



**Leur Lock**



**Leur Lock**

# Intramuscular Injection Guidelines for Needle Length and Gauge Selection\*

<b>INTRAMUSCULAR (IM)**</b>		Location of Injection	Needle Length	Needle Gauge	Needle Angle
<b>Pediatric</b>	<b>Infants &lt; 18 months</b>	<ul style="list-style-type: none"> <li>Vastus lateralis muscle (&lt;math&gt;\leq 0.5\text{ mL}&lt;/math&gt; vol.)</li> </ul>	7/8" - 1"	25 - 27 G	90°
	Children (>18 months and walking to 18 years)	<ul style="list-style-type: none"> <li>Deltoid muscle</li> <li>Ventrogluteal site</li> <li>Dorsogluteal site—not recommended for &lt;math&gt;&lt; 3&lt;/math&gt; years</li> <li>Vastus lateralis muscle</li> </ul>	7/8" - 1 1/4"	22 - 25 G	90°
<b>Adult</b>	> 18 years	<ul style="list-style-type: none"> <li>Deltoid muscle, Ventrogluteal site—may be best site for cachectic adults</li> <li>Dorsogluteal site—avoid in obese adults</li> <li>Vastus lateralis muscle</li> </ul>	1" - 1 1/2" (up to 3" for large adults)	19 - 25 G	90°




\* Adapted from Fundamentals of Nursing: Human Health and Function, R. Craven, C. Hirnle, 4th ed. Lippincott Williams & Wilkins 2003

\*\* Prior to administering an IM injection, refer to your procedure manual to determine the injection site utilizing body landmarks.



ISO Hub for Standards for safety-engineered needles

**Bigger the number the smaller the needle**

SITE	INFANT	TODDLER	CHILD	ADULT
<b>Vastus Lateralis</b>	Needle : 5/8 inch Volume: 0.5 ml	Needle: 5/8 - 1 inch Volume: 0.5 - 1 ml	Needle: 1 inch Volume: 1-2 ml	Needle: 1-3 inches Volume: 1-5 ml
<b>Ventrogluteal</b>	Needle : 5/8 inch Volume: 0.5 ml	Needle: 5/8 - 1 inch Volume: 1 ml	Needle: 1 inch Volume: 1-2 ml	Needle: 1-3 inches Volume: 1-5 ml
<b>Deltoid</b>	 Not recommended	Needle: 5/8 - 1 inch Volume: 0.5 ml	Needle: 5/8 - 1 inch Volume: 0.5 - 1 ml	Needle: 1-3 inches Volume: 0.5 - 2 ml
<b>Dorsogluteal</b>	 Not recommended	 Not recommended	Needle: 0.5 - 1.5 inches Volume: 1.5 - 2 ml	Needle: 1-3 inches Volume: 1-5 ml

Areas to avoid in infants and toddlers regardless of the size of the needle

# Syringes (Cont.)

**SAFETY ALERT!**

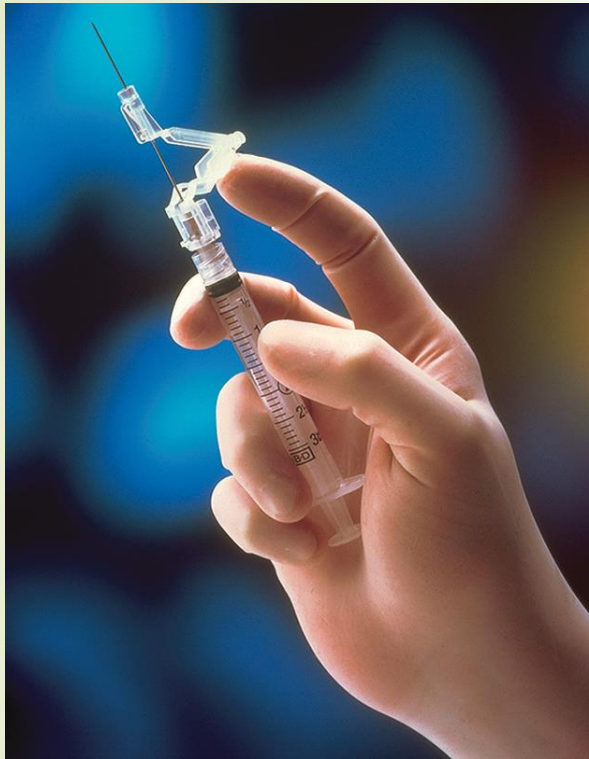


Needle-stick prevention is critical

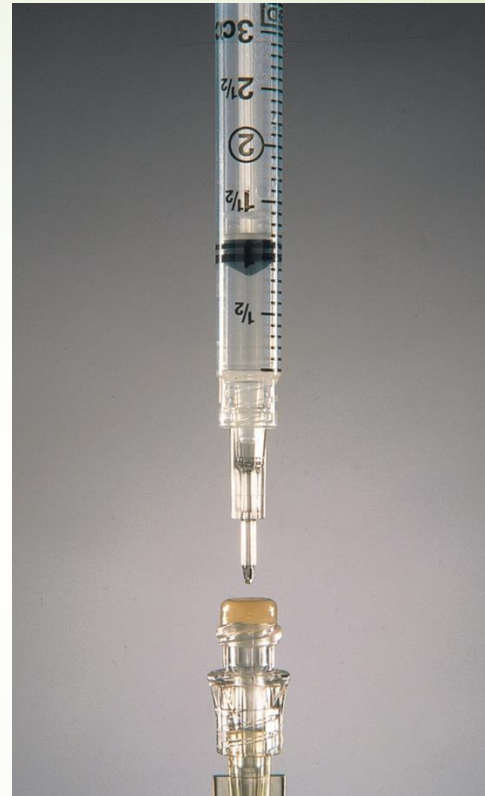
- **NEVER** recap used needles.
- Specialized needles with safety guards
- Needleless systems
- Dispose of in puncture resistant containers



**Figure 18-7** Needle with plastic guard to prevent needle sticks. A, Position of guard before injection. B, After injection the guard locks in place, covering the needle. (From Perry AG, Potter PA, Elkin MK, Ostendorf WR: *Nursing interventions and clinical skills*, ed 6, St Louis, 2016, Mosby.)



**Figure 18-8** BD SafetyGlide™ needle.  
(Courtesy and © Becton, Dickinson and Company, Franklin Lakes, NJ).



**Figure 18-9** Needleless syringe system.  
(Courtesy and © Becton, Dickinson and Company, Franklin Lakes, NJ).



## Prior to activation



## After activation

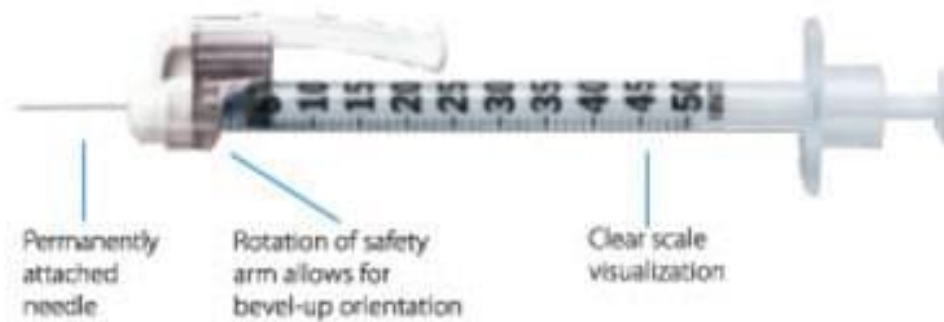
Stainless steel latch securely shields needle tip after activation.





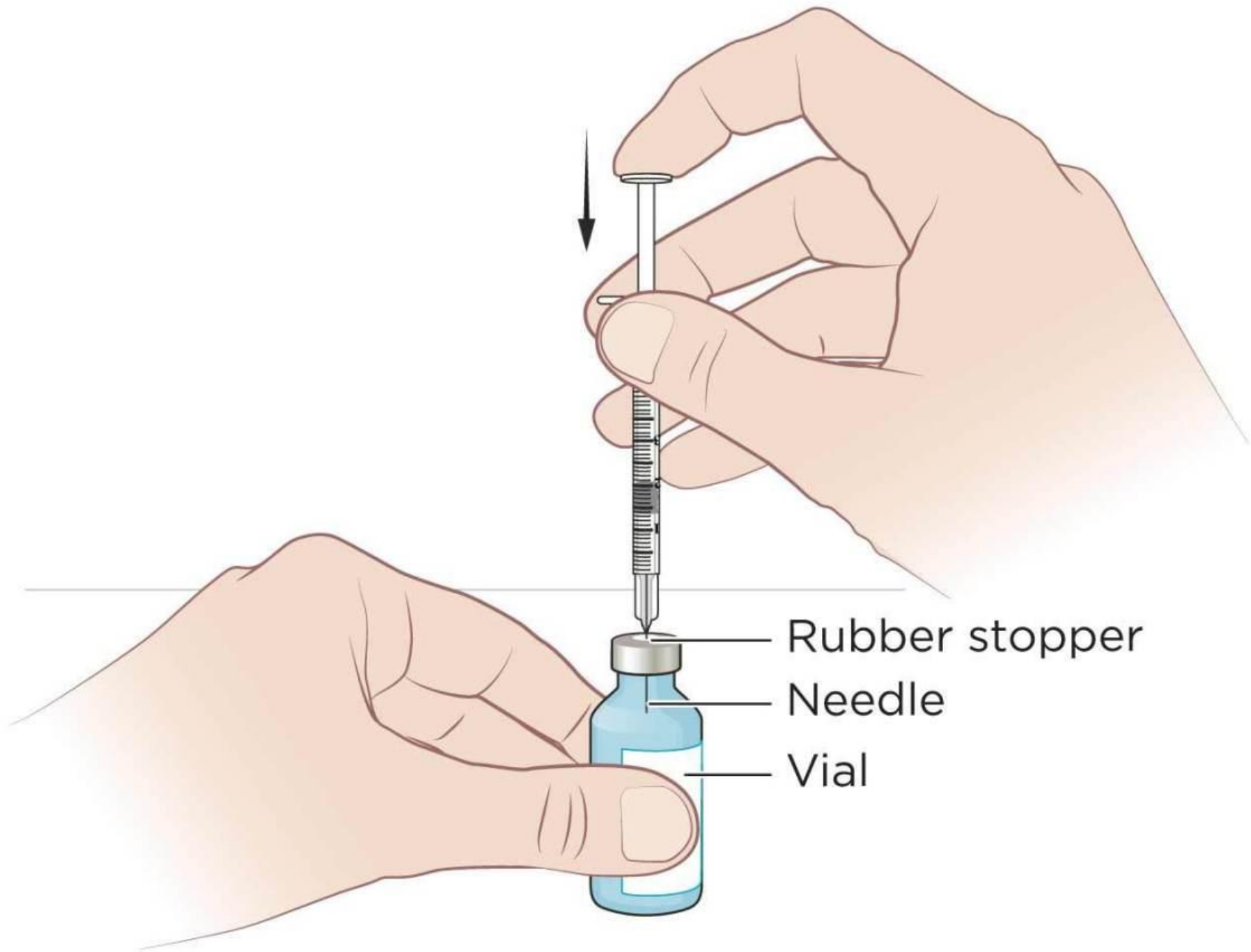


## Prior to activation



## After activation

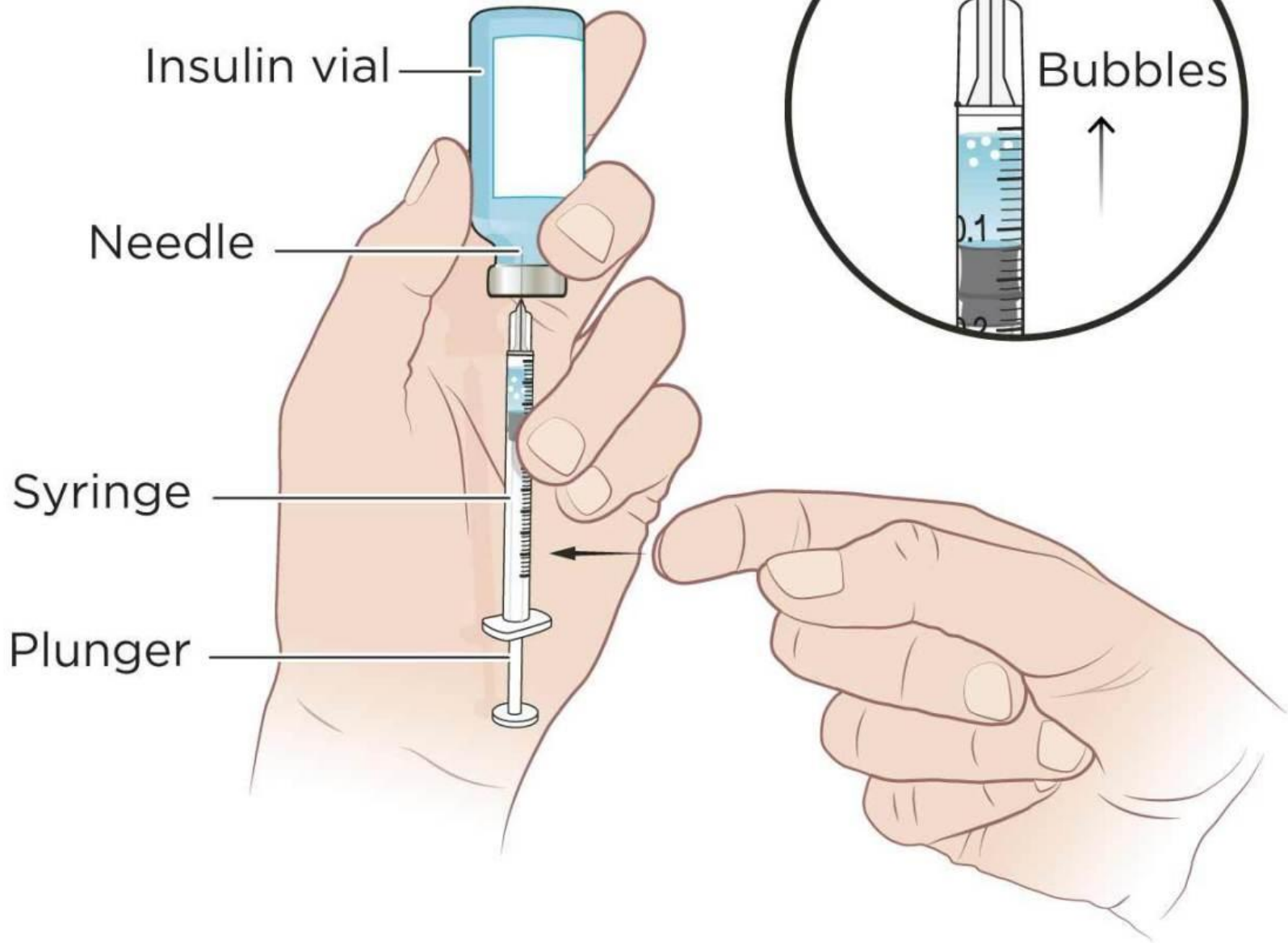




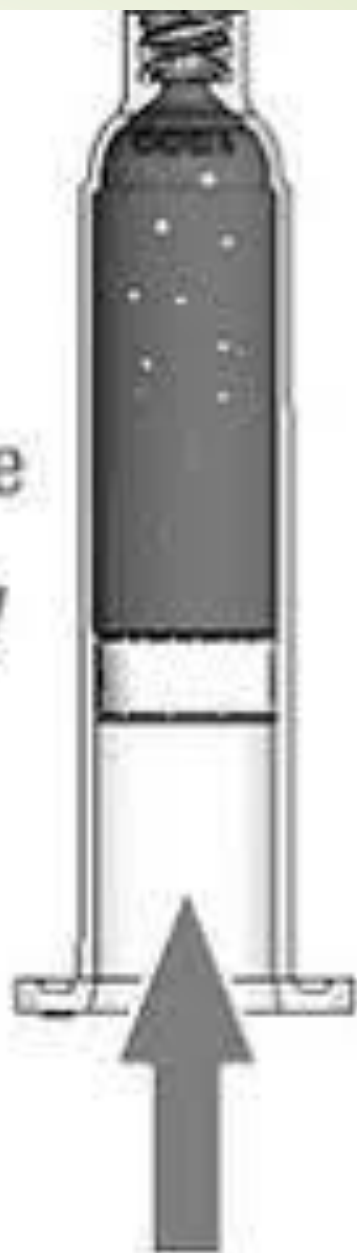
Rubber stopper

Needle

Vial



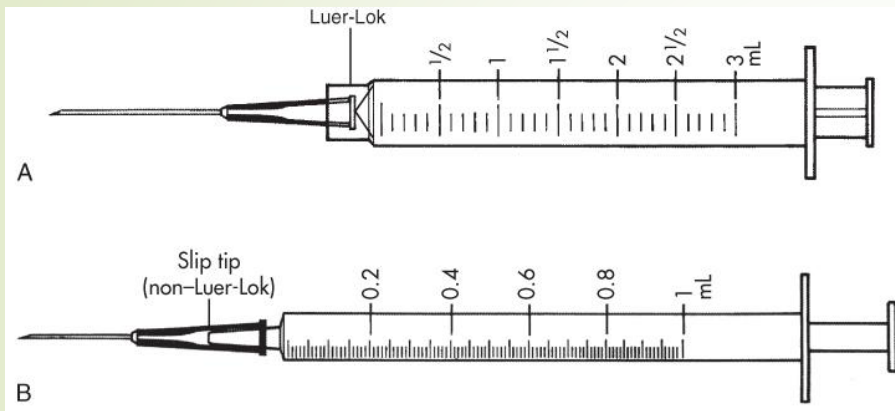
1. Tap syringe
2. Let air bubbles rise
3. Push piston slowly



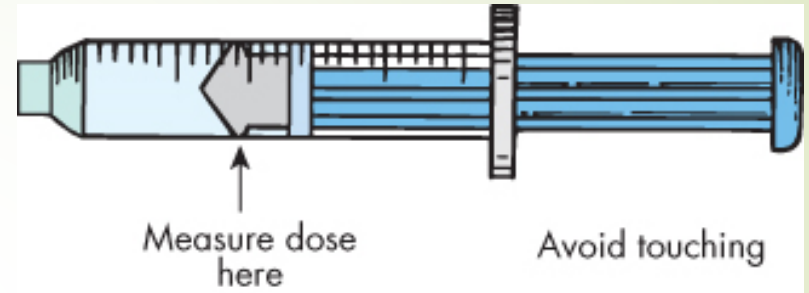


# Types of Syringes—Hypodermic

- Syringe with a needle
- Sizes 0.5 mL to 60 mL
- Calibrated in hundredths, tenths, and whole mL
- Term “cc” or cubic centimeter—incorrect
- Express dose in metrics—use decimals for partial dose
- Do NOT read dose at pointed tip of rubber on plunger; read where rubber touching solution also touches inside barrel.
- Misreading the calibrations could lead to a medication error.



**Figure 18-10** 3-mL and 1-mL syringes.



**Figure 18-11** Reading measured amount of medication in a syringe. (From Potter PA, Perry AG, Stockert P, Hall A: *Fundamentals of nursing*, ed 9, St Louis, 2016, Mosby.)

# Syringes—Hypodermic (Cont.)

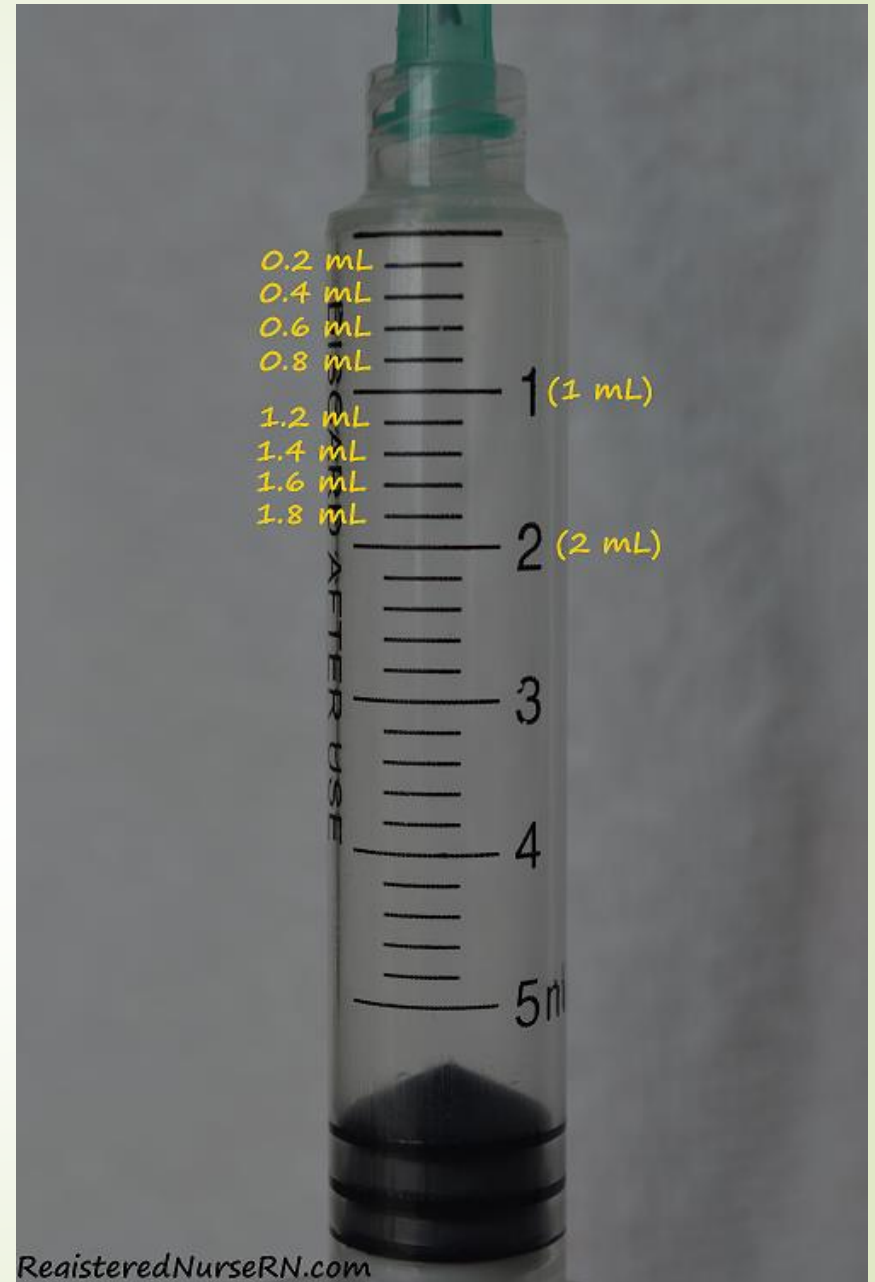
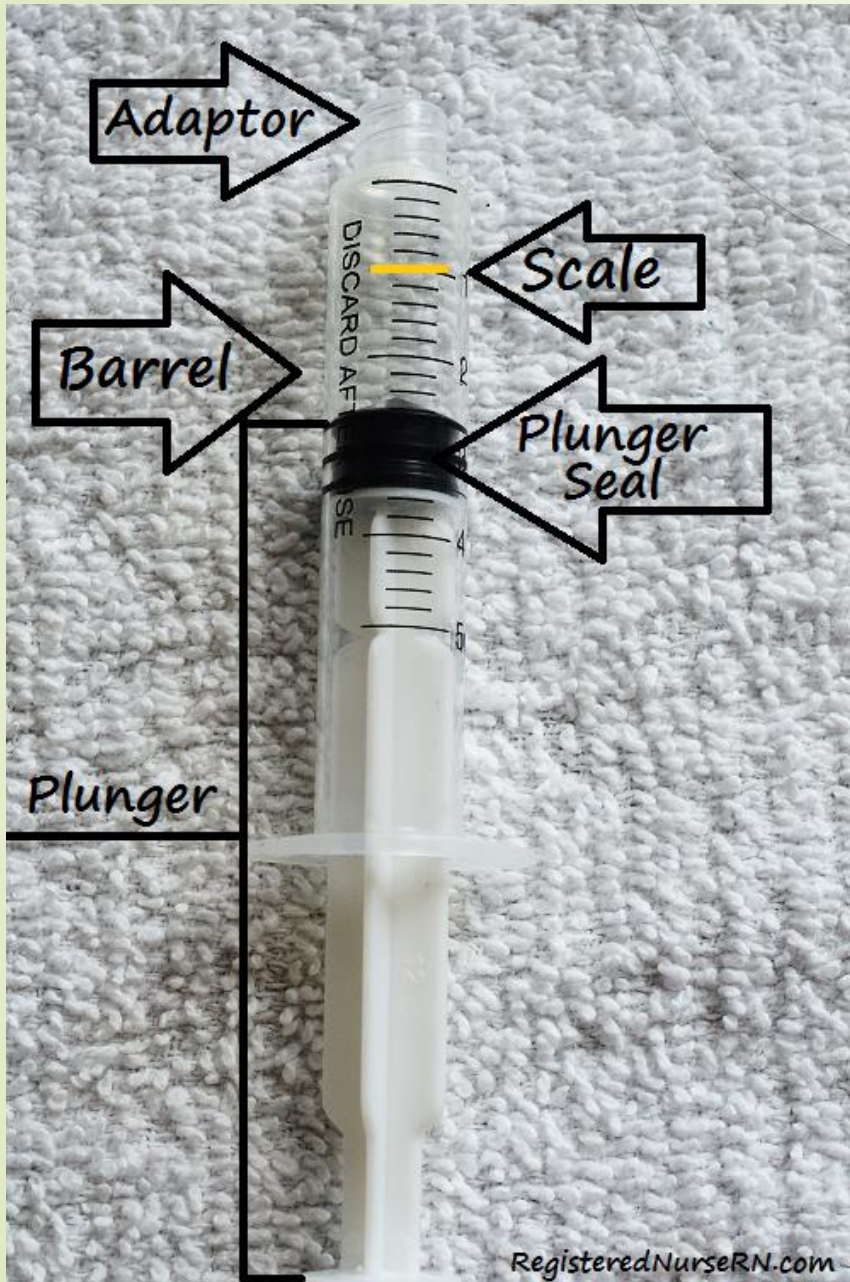
- ▶ 3-mL syringe is used for small doses greater than 1 mL.
- ▶ 5-, 6-, 10-, and 12-mL syringes are used to give WHOLE mL increments.
- ▶ Larger syringes have larger calibrations.

HOW TO

READ A

SYRINGE

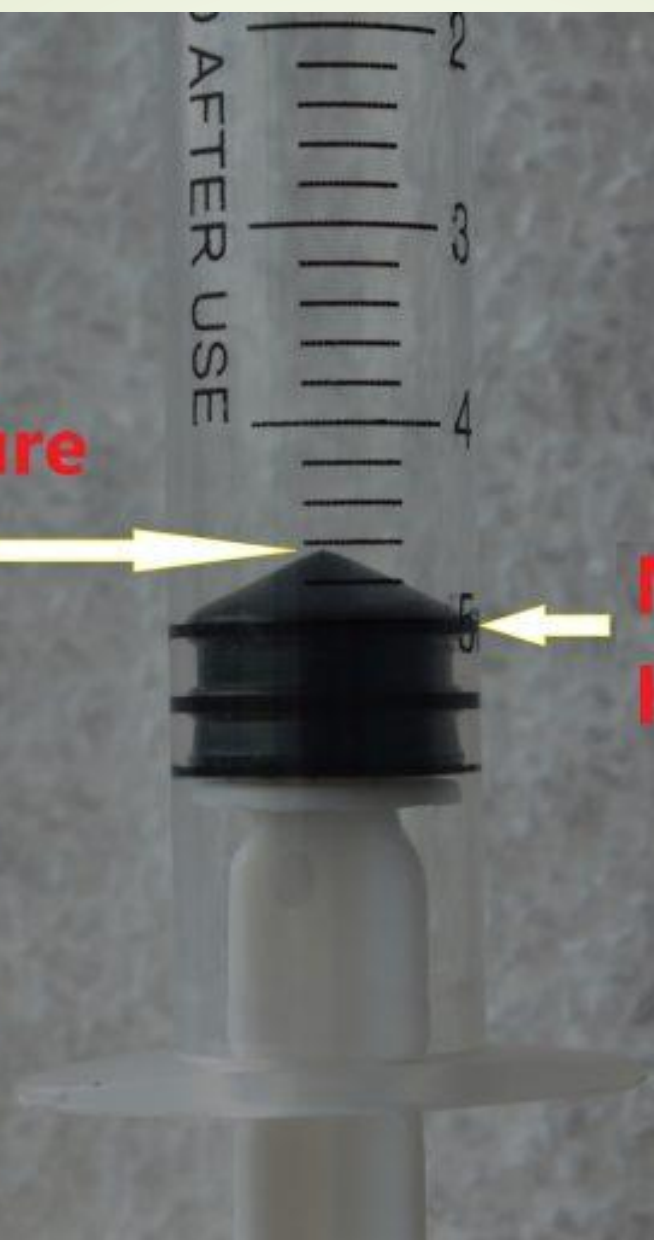




**Don't  
Measure  
Here**

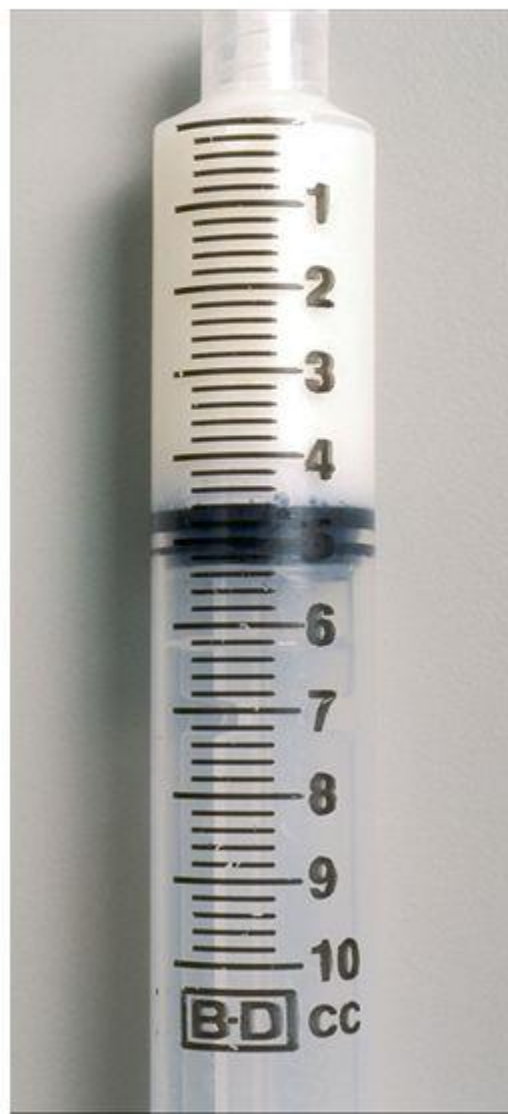


**Measure  
Here**



# Reading the Amount of Medication 10 mL Syringe

- The image at the right shows a 10 mL syringe containing 4.6 mL of medication
  - Each large marking represents 1 mL
  - Each small marking represents 0.2 mL



0.25ml



0.5ml



1ml



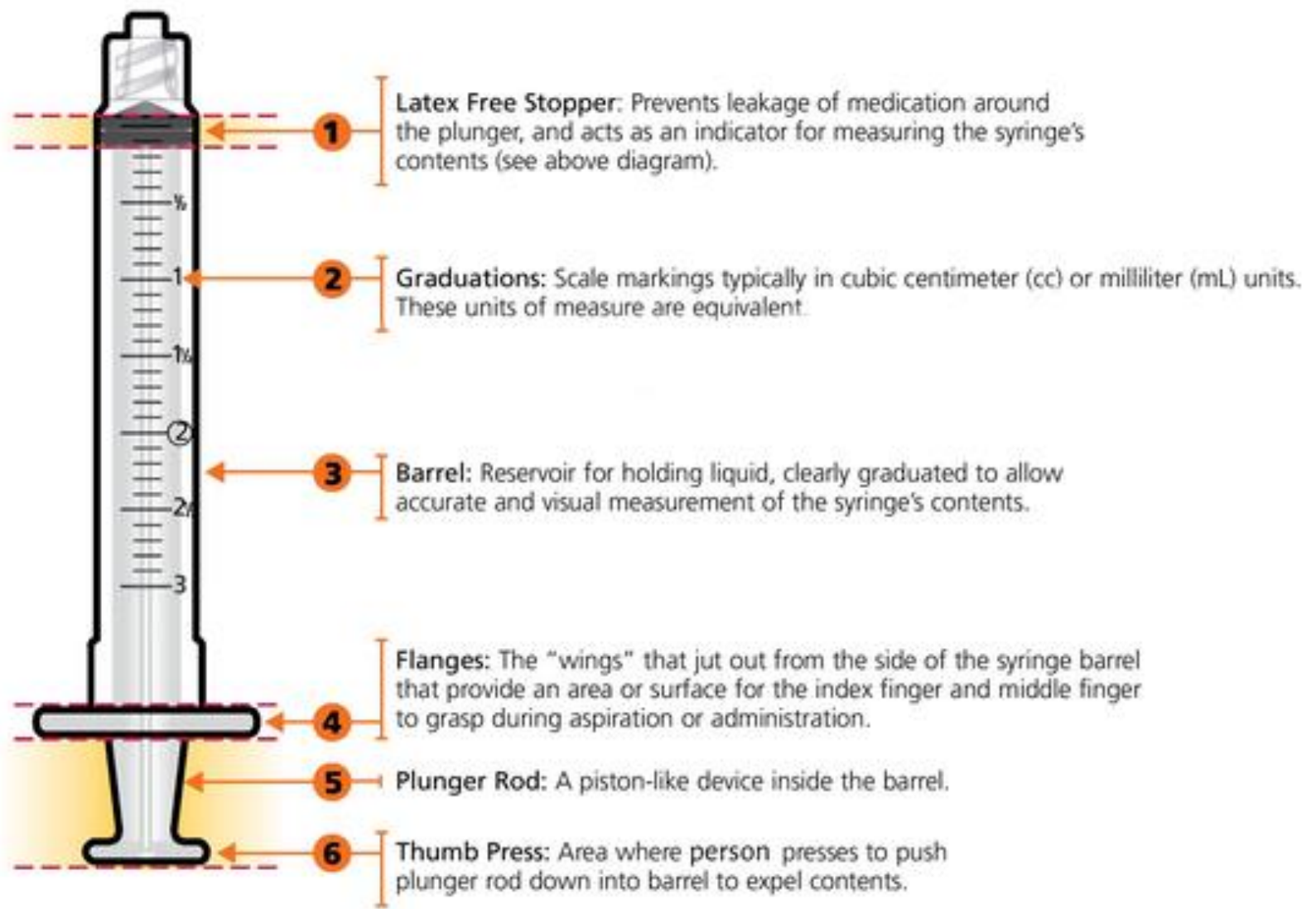
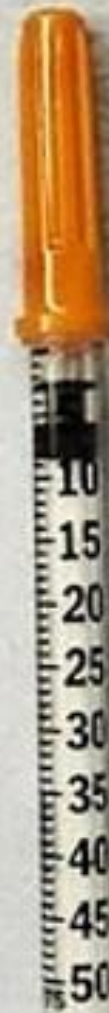


Image 2

1 cc/ml  
syringe

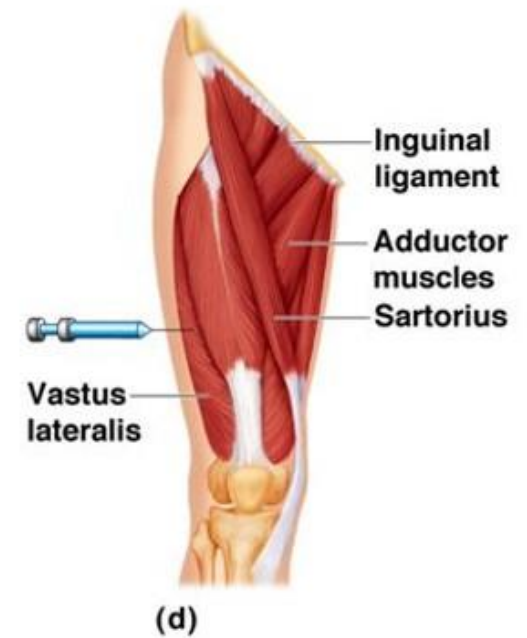
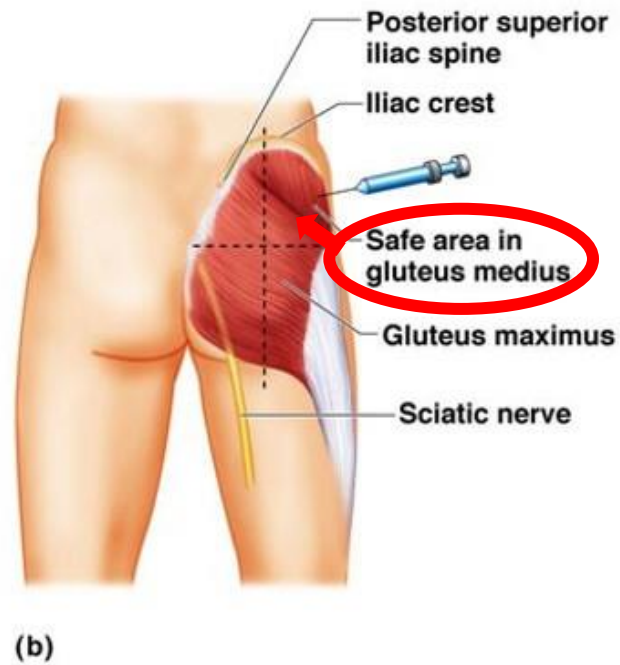
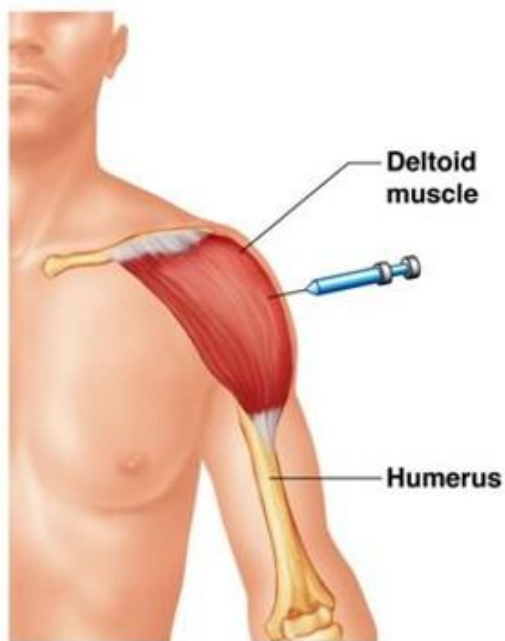


1/2 cc/ml  
syringe



**NOTE: 'cc' and 'ml' are interchangeable and are the same units of measure.**

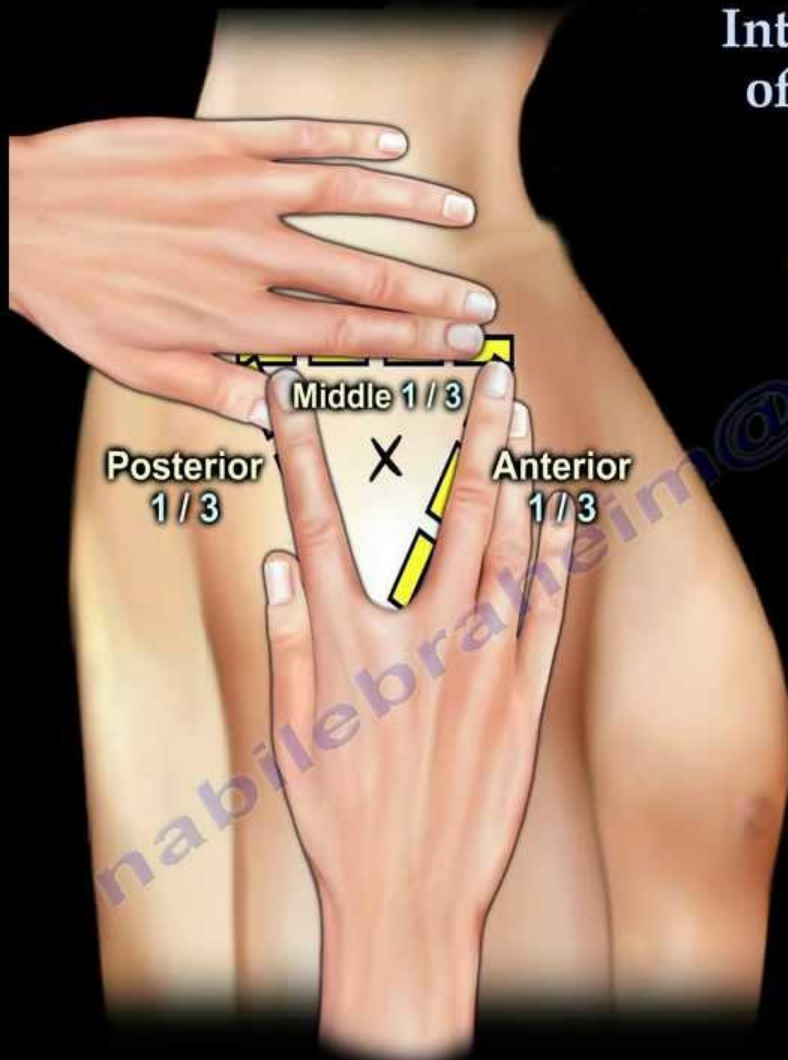
# Intramuscular Injection Sites



## Intramuscular Injection of the Deltoid Muscle

The injection site for  
this method is located  
in the middle third of  
the triangle.


It is sometimes easiest  
to make the triangle  
with the fingers as  
shown here.

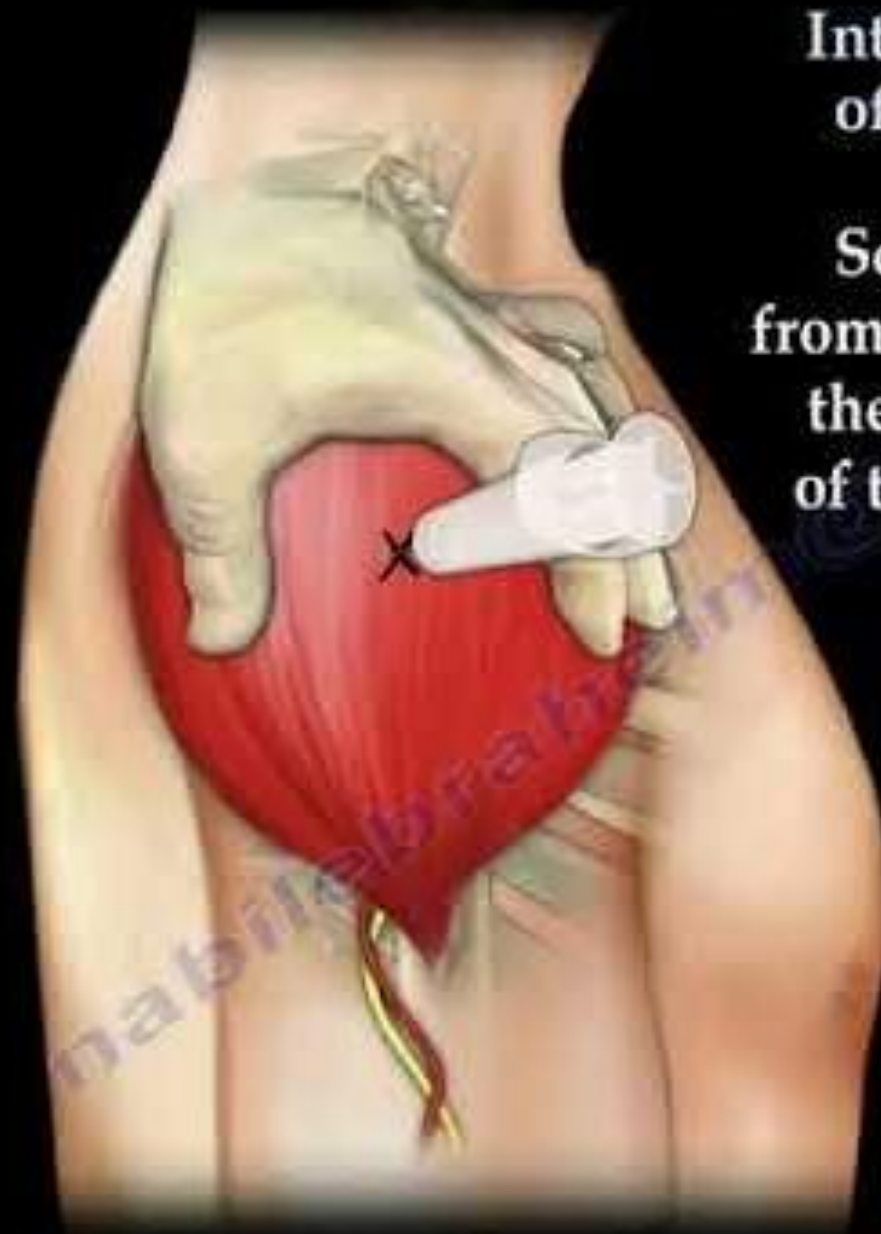


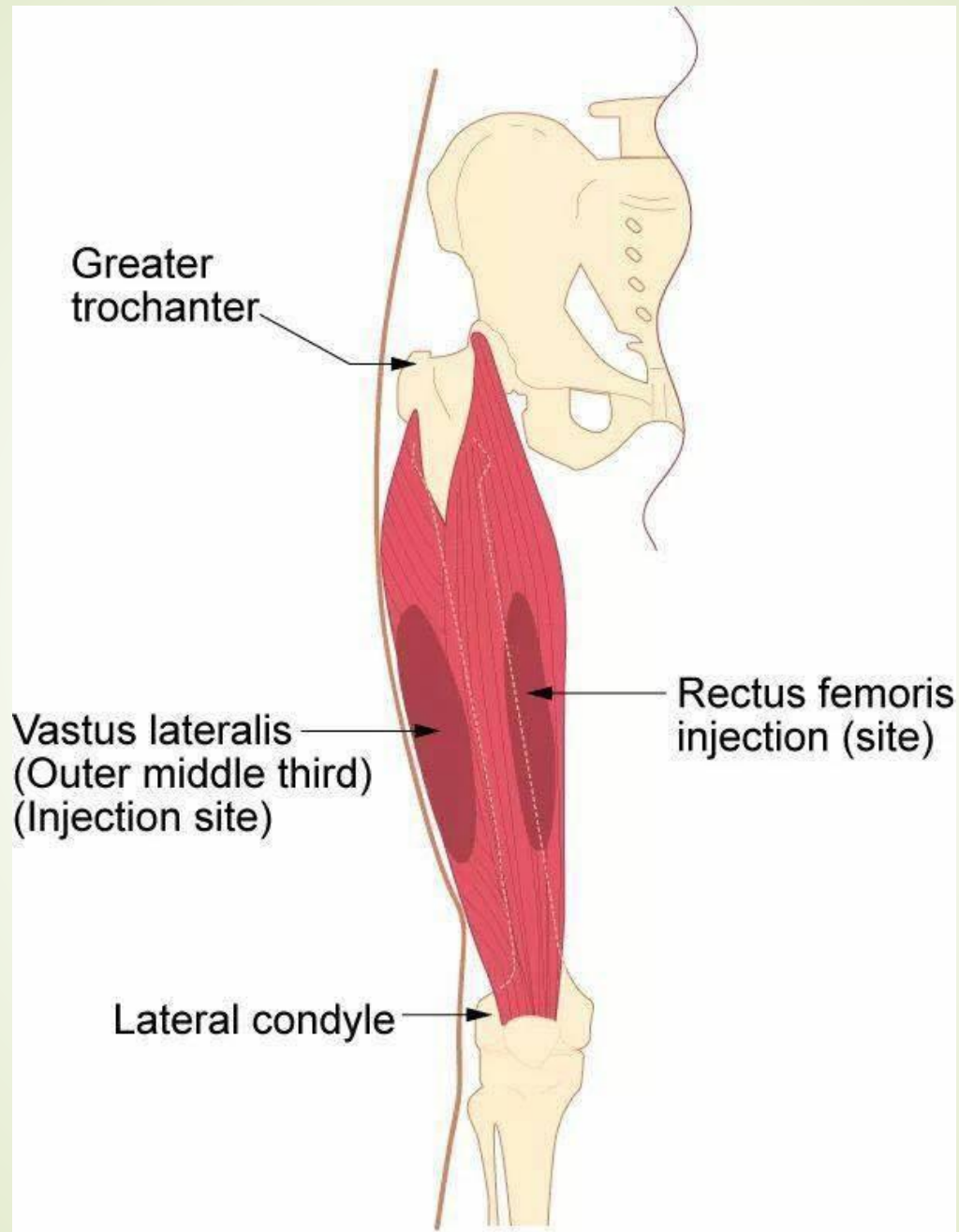
## Intramuscular Injection of the Deltoid Muscle

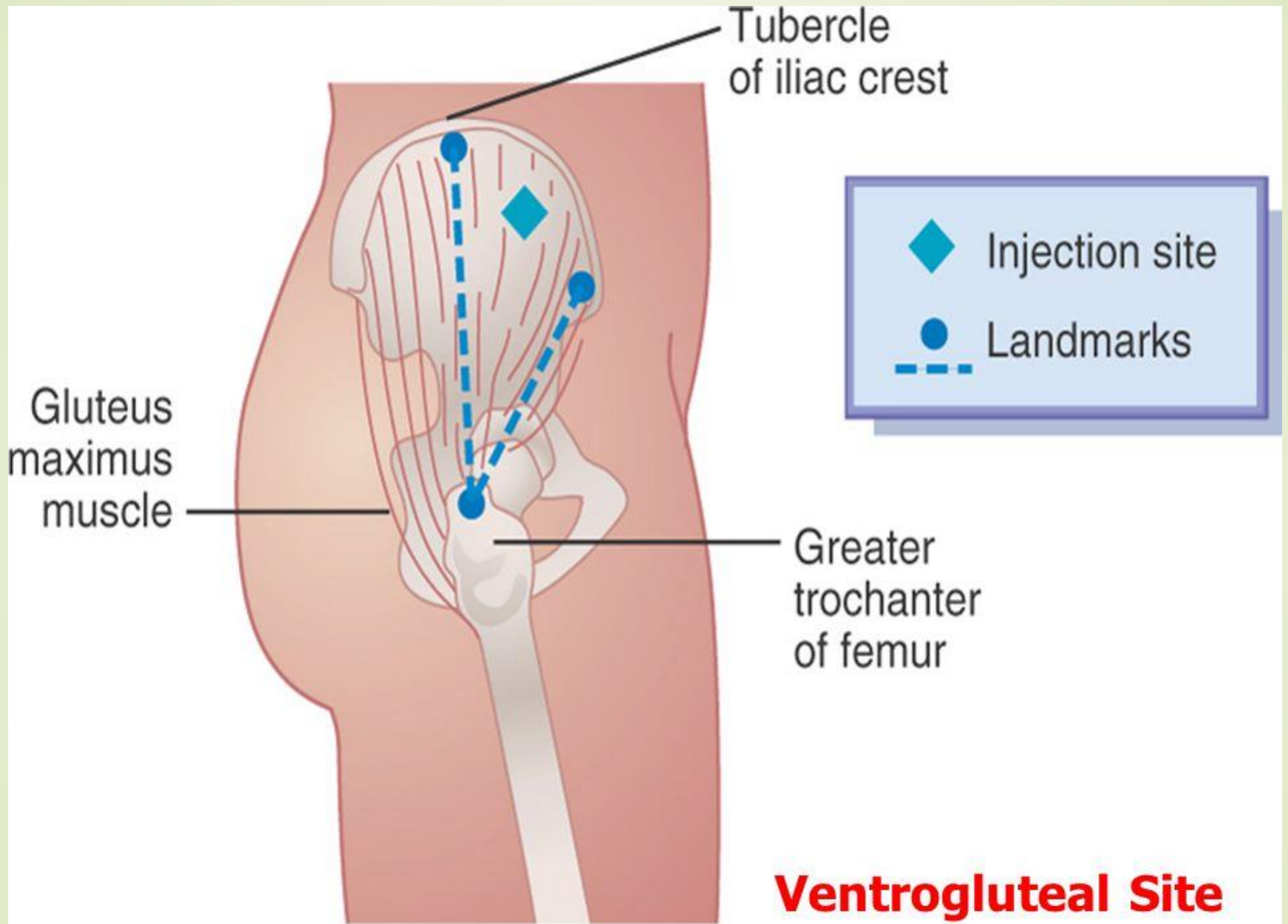
Squeezing the muscle  
from front to back increases  
the thickness and depth  
of the muscle and avoids  
nerve injuries.

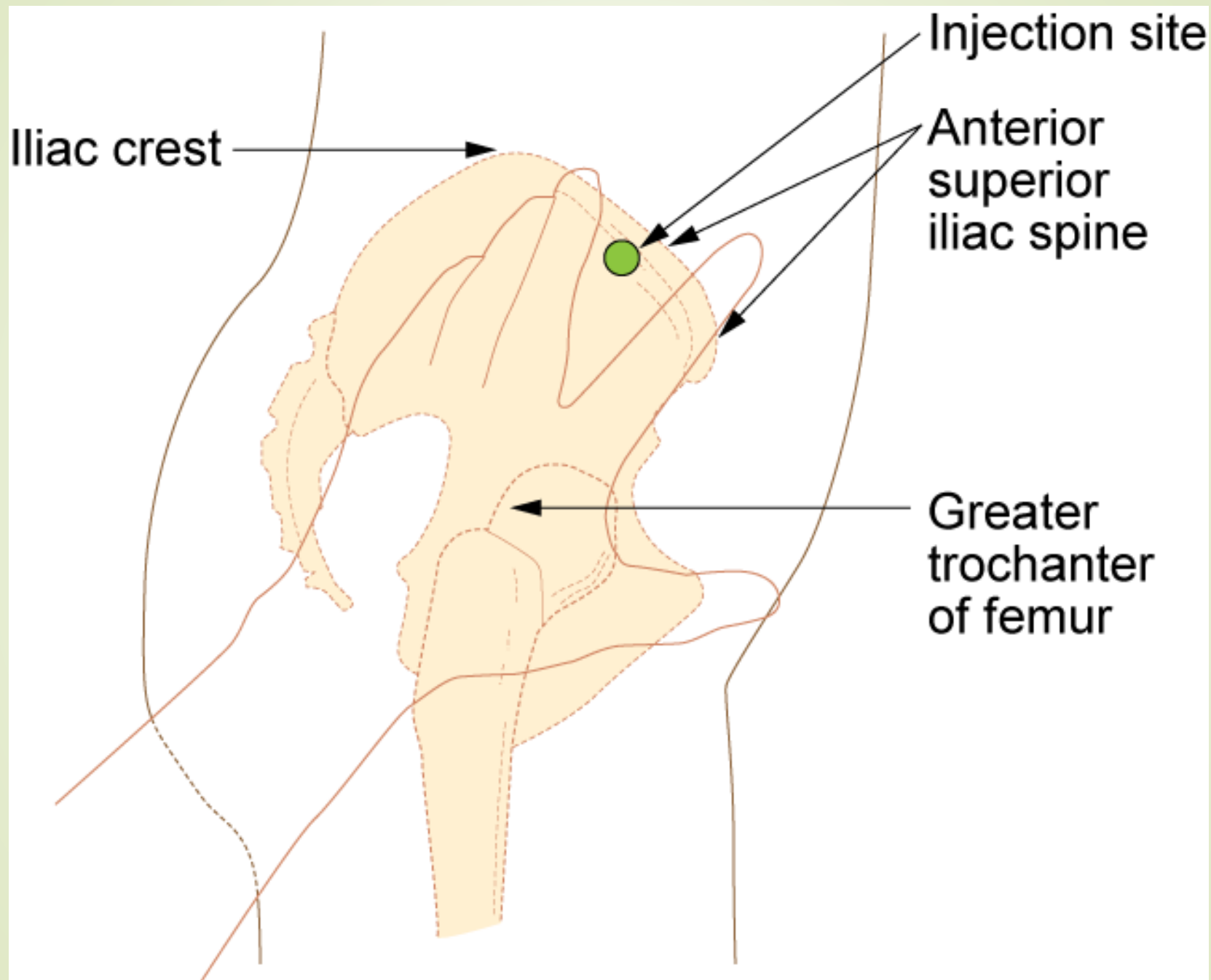
Make sure you do  
not advance the  
needle deep to  
touch the bone.

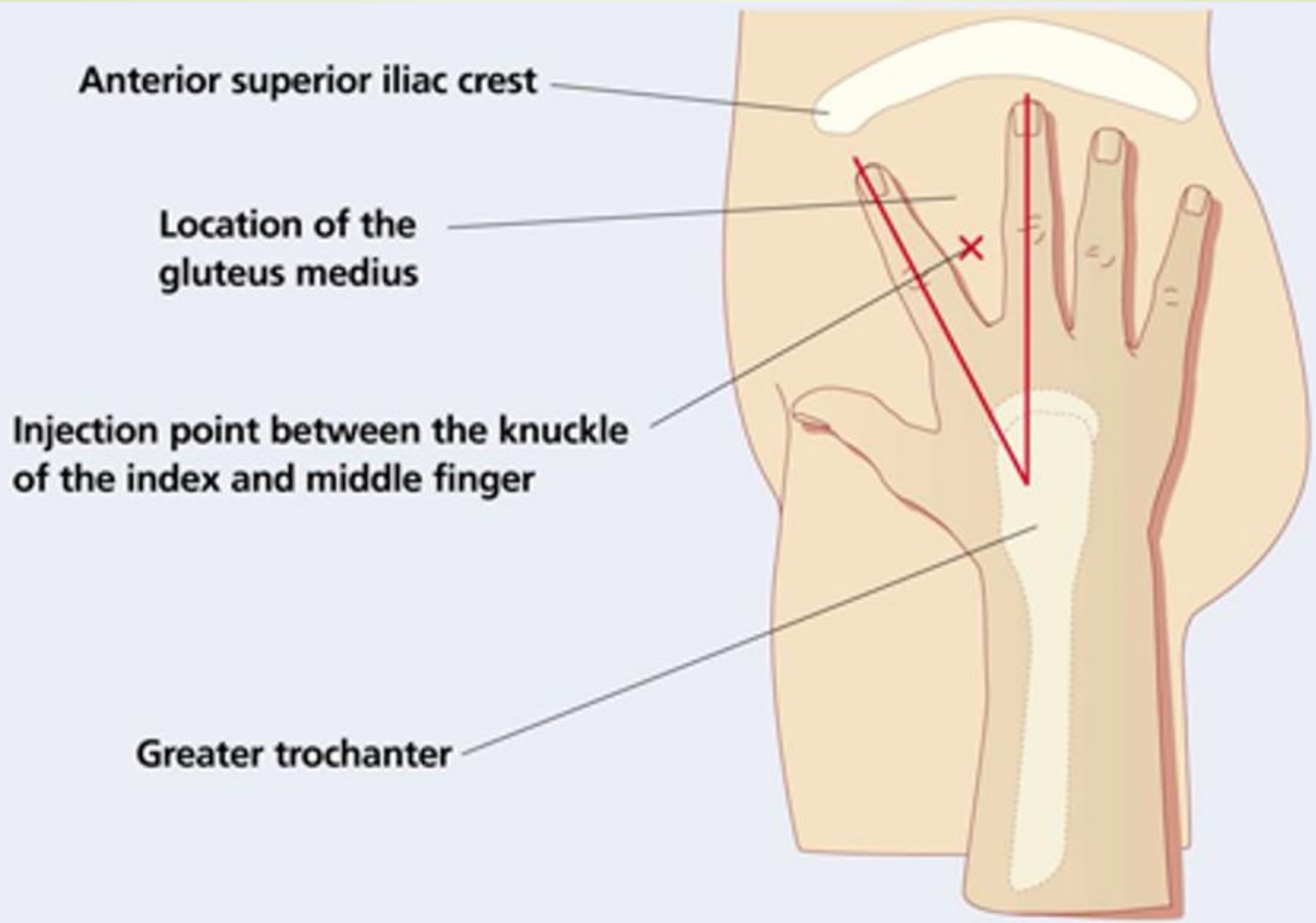
  
Aspirate before  
you inject.



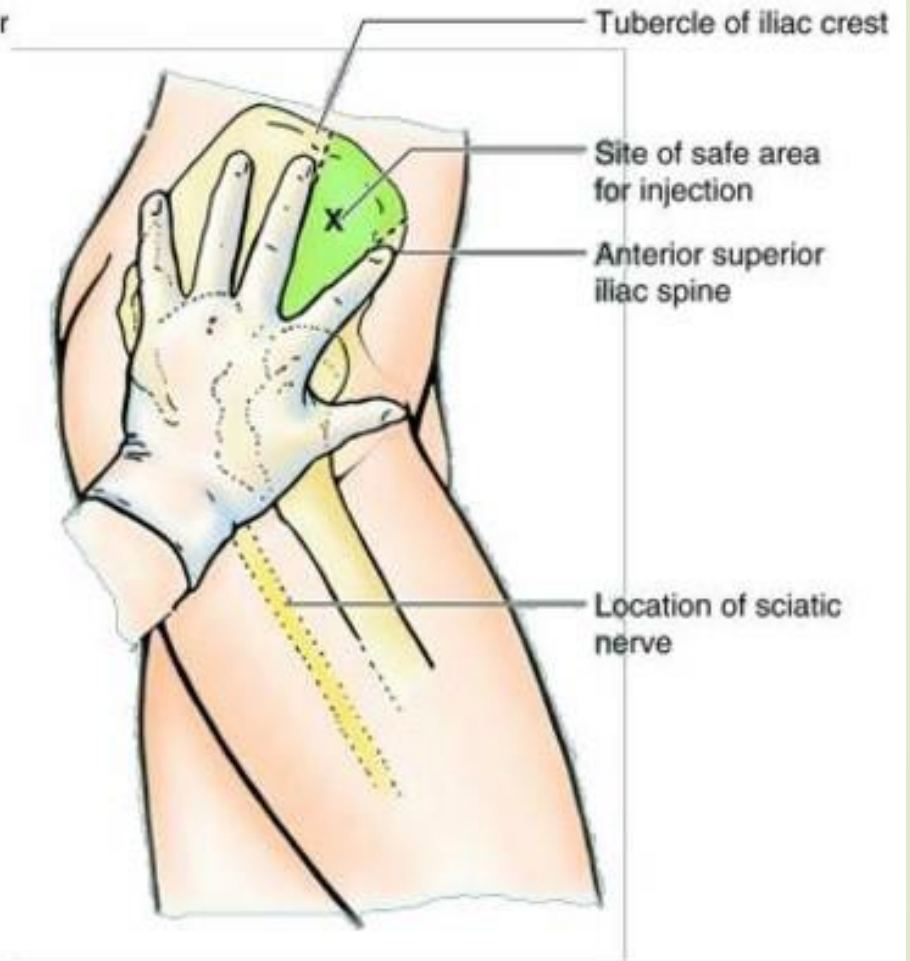
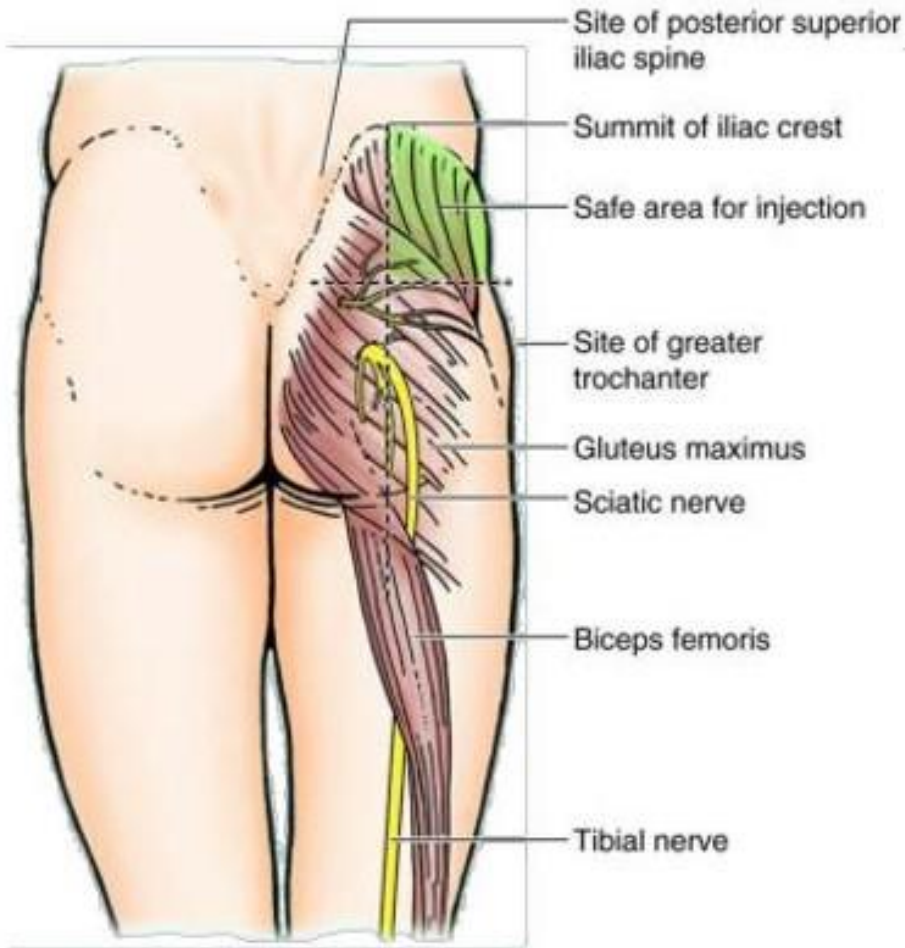


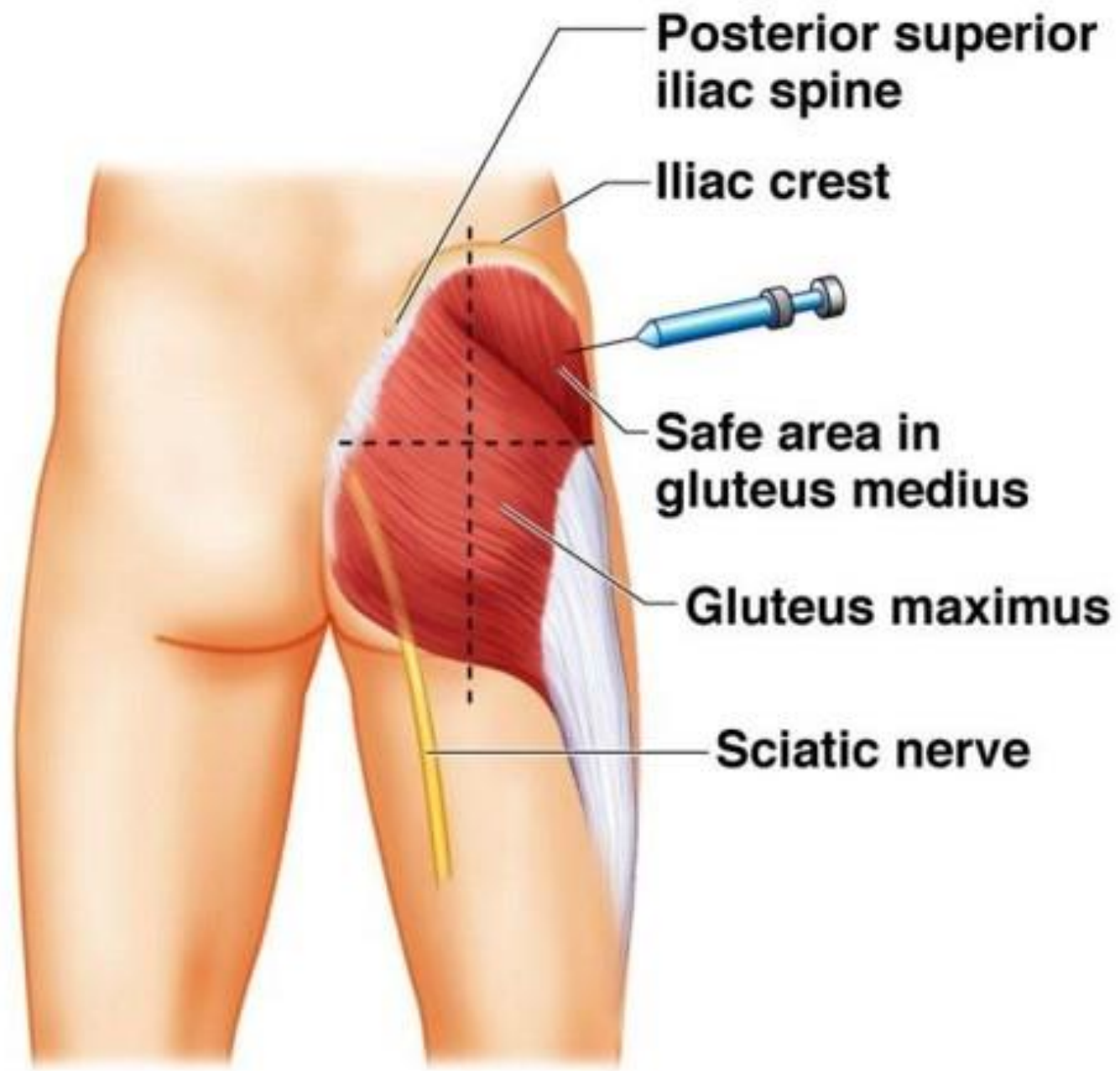






## Gluteal Intramuscular Injection





**Posterior superior  
iliac spine**

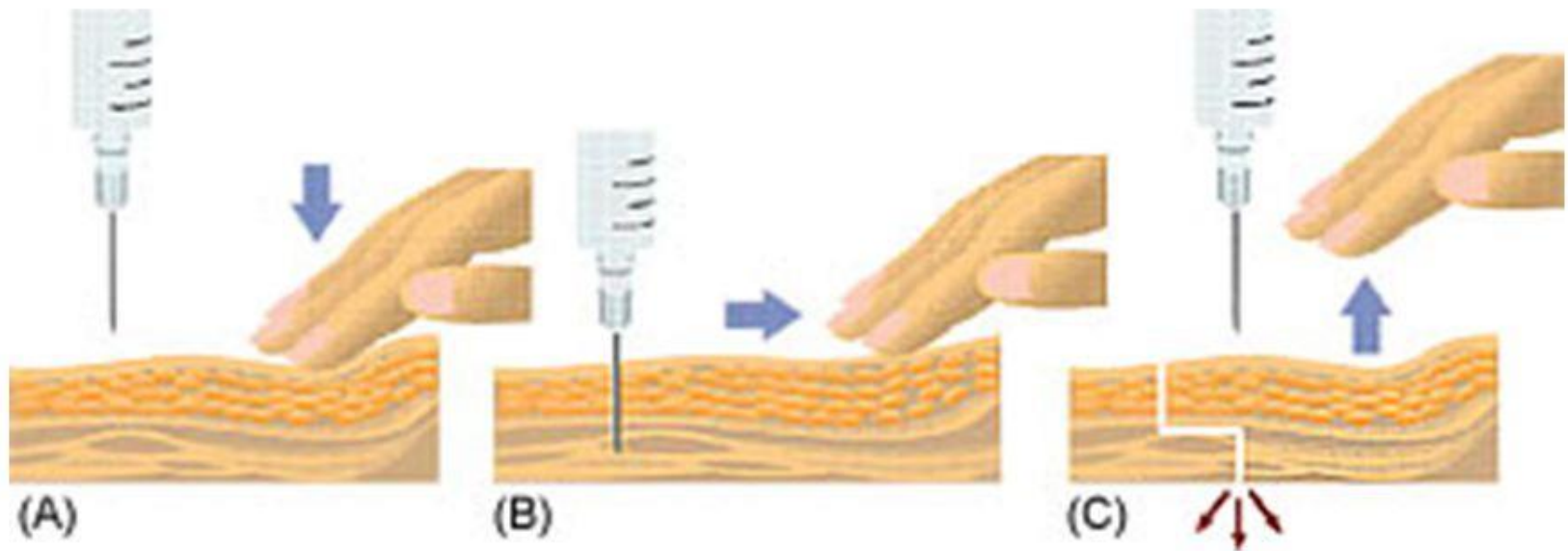
**Iliac crest**

**Safe area in  
gluteus medius**

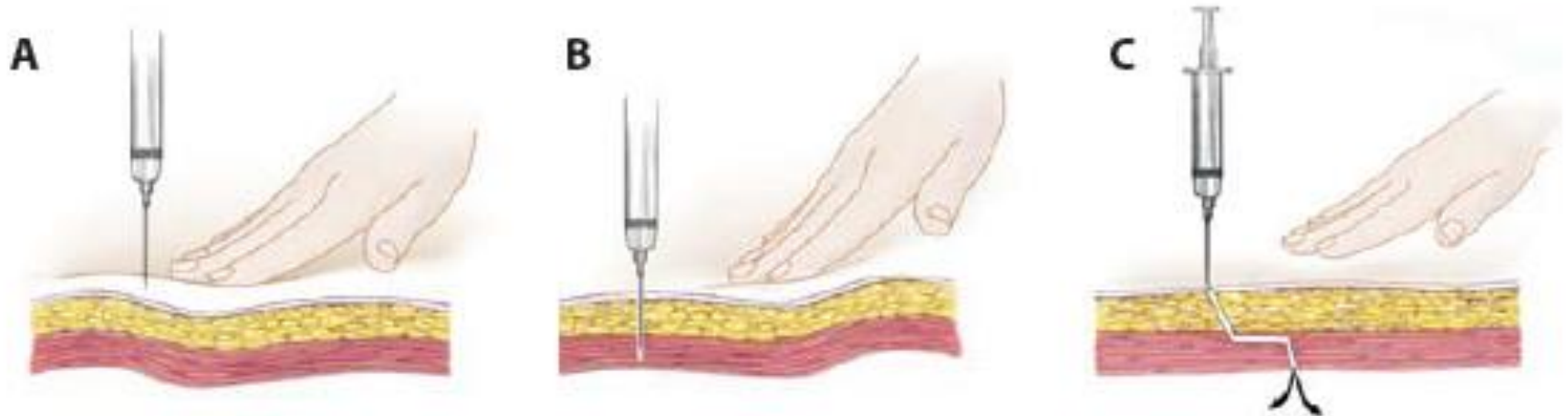
**Gluteus maximus**

**Sciatic nerve**

# Z Track technique



### Z-track injection technique



**FIGURE 2.** Z-track injection technique prevents leakage into subcutaneous tissue and decreases the chance of local irritation. (A) Pull or push the skin 2 to 3 cm away from the injection site with the nondominant hand. (B) Pierce the skin at 90° and depress the plunger slowly. If resistance occurs, pause then resume depressing the plunger. (C) Withdraw the needle, then release the skin.

# Syringes—Tuberculin

- Narrow—capacity of 1 mL
- Calibrated 0.1 to 0.01 (tenths to hundredths)
- Provide accurate measurement
  - Heparin, PPD, skin testing, and pediatric dosing



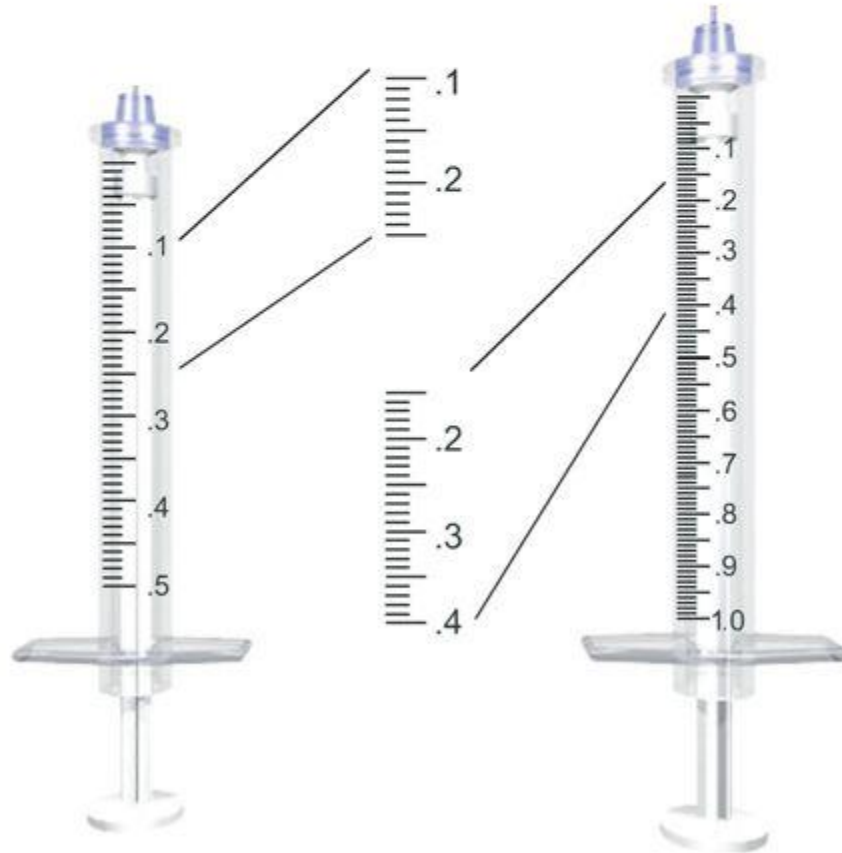
## SAFETY ALERT!

Understanding the calibration marks on a syringe is critical to accurately measuring a medication dosage. If not measured accurately, an incorrect dosage can be administered, resulting in client harm.

# Tuberculin Syringes (cont.)

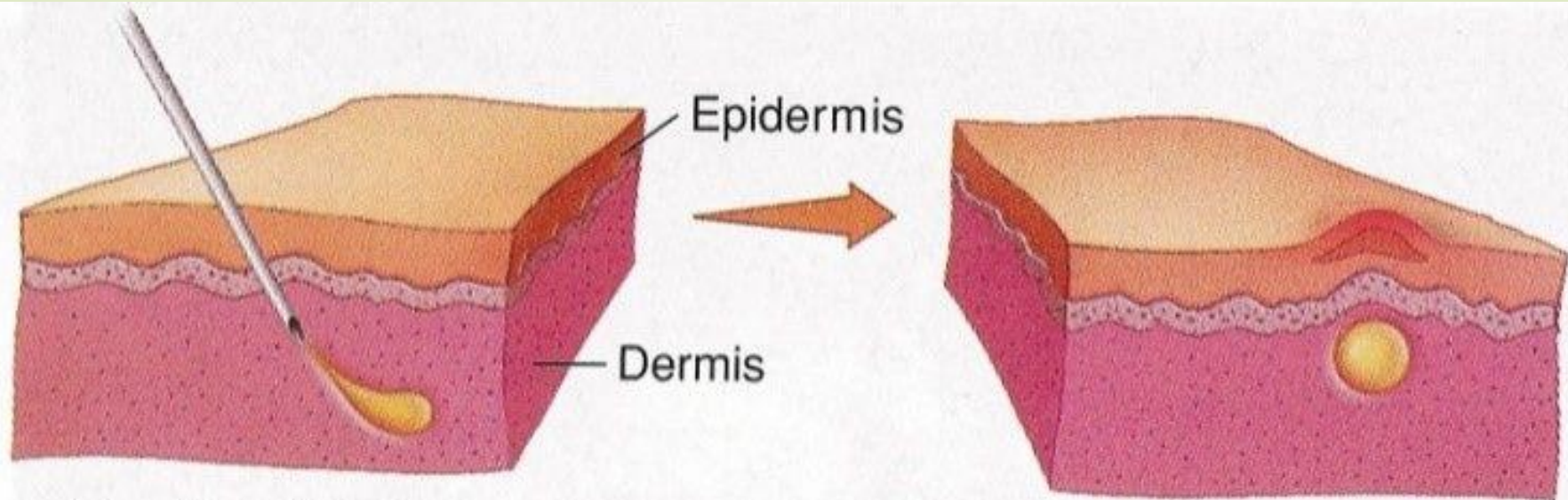
Comparison of tuberculin syringes:

0.5 mL  
syringe



1 mL  
syringe

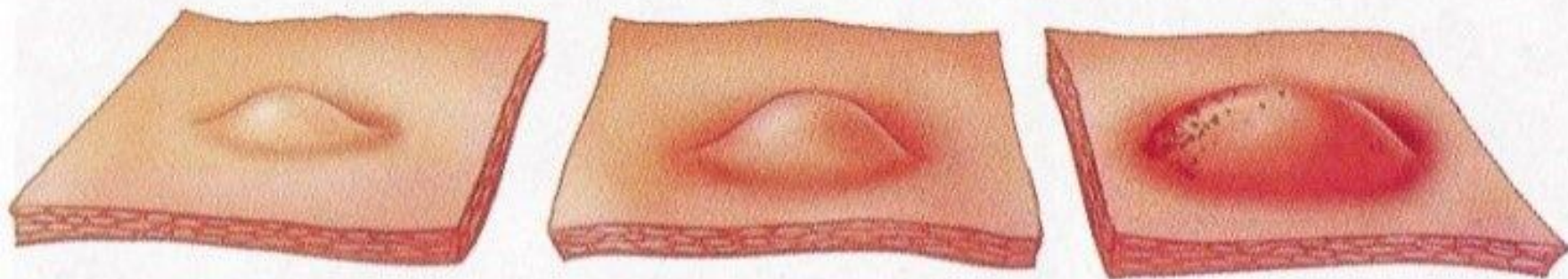




Injection of PPD

Small bleb develops

(a)





5–9 mm  
Positive if person  
is in category 1

10–14 mm  
Positive if person  
is in category 2

$\geq 15$  mm  
Positive if person  
is in category 3

(b)

# Syringes—Insulin

- Use for **INSULIN ONLY**—do not give insulin with any other syringe
- Measured in units 
- Syringe calibrated to match insulin doses
- U-100 syringes for U-100 insulin
- NEVER think in terms of mL when giving insulin; think in units 
- Two size types
  - Lo-dose
  - standard

# Syringes—Insulin (Cont.)

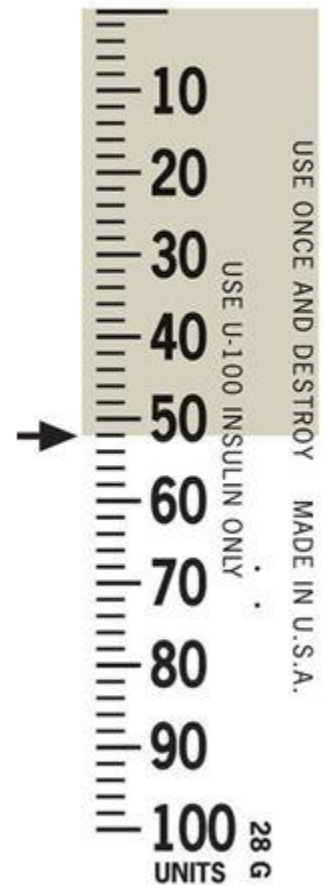
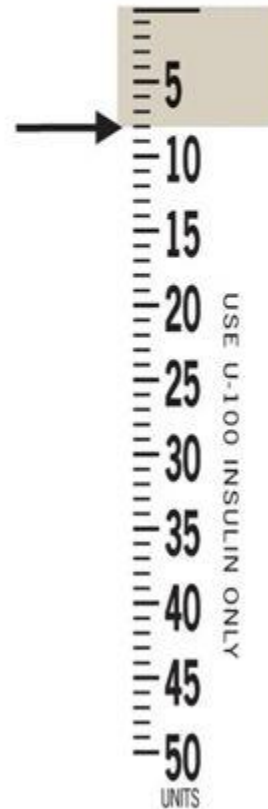
- ▶ Lo-dose insulin syringes
  - ▶ Have 30- or 50-unit capacities
  - ▶ Have enlarged scales for easy reading
- ▶ Standard insulin syringe
  - ▶ Capacity of 100 units of insulin
  - ▶ 2-unit increments

**SAFETY ALERT!** 

Insulin is a high-alert medication. Always check insulin dosages with another nurse before administration.

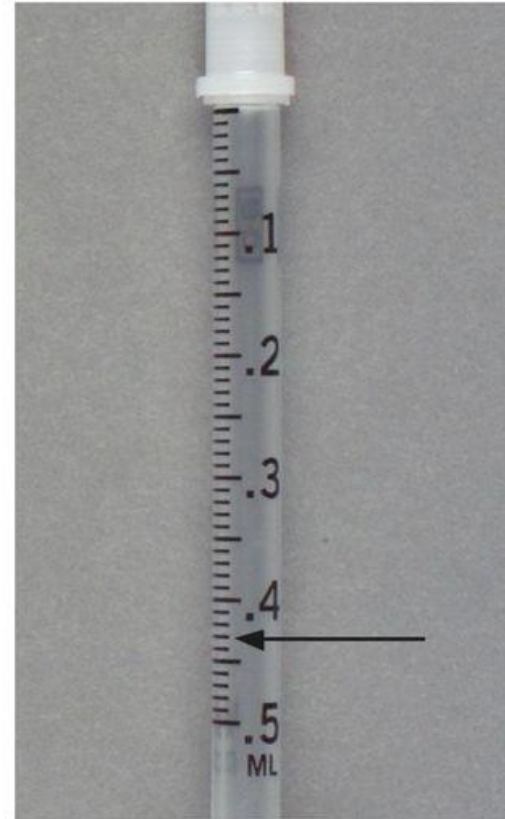
# Insulin Syringes

- At the right are images of 2 different types of Insulin syringes
  - NOTE: Both of these syringes are for U-100 Insulin; this means that you must U-100 Insulin for the unit measurement to be correct
- The difference is the capacity of the syringe
  - If you need to give more than 50 units then select the syringe that could hold more than 50 units
  - If you need to give 50 units or less then select the 50 unit syringe



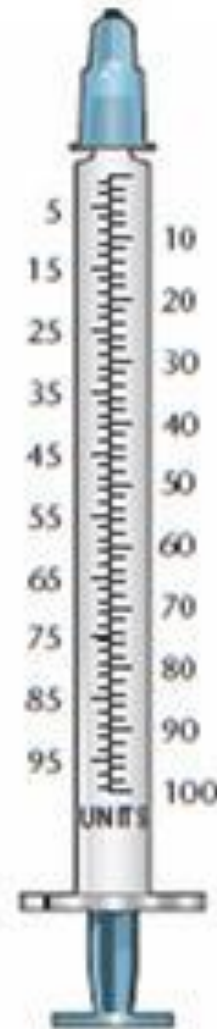
# 0.5 mL Tuberculosis (TB) Syringe

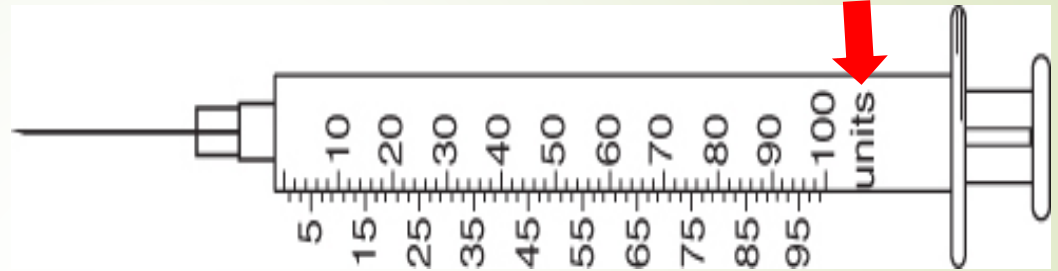
- At the right is an image of a 0.5 mL syringe
- Each of the markings represents 0.01
- The arrow is pointing at the 0.43 mL marking



# Insulin Syringes

- Marked in units
  - Measures units of insulin *not* volume of solution
    - 100 unit capacity
    - 50 unit capacity
    - 30 unit capacity
- Calibrated in 1- or 2-unit increments





**Figure 18-13** 1-mL capacity insulin syringe (100 units) with dual scale odd and even calibrations. (Courtesy and © Becton, Dickinson and Company, Franklin Lakes, NJ).

**Figure 18-12** Insulin syringes. A, 1-mL size (100 units). B, Lo-Dose (50 units). C, Lo-Dose (30 units). (From Macklin D, Chernecky L, Infortuna H: *Math for clinical practice*, ed. 2, St. Louis, 2010, Mosby.)

# Insulin

## Cost of Insulin Pens:

- Norway: \$0
- Scotland: \$0
- Thailand: \$5
- Australia: \$28
- Mexico: \$35
- Taiwan: \$40
- Greece: \$51
  - Italy: \$61
- Canada: \$70
- Germany: \$73
- **United States: \$700**

© 2013  
8.13.13

Facebook.com/BizarroComics

Dist. by King Features

Your money or your life.

PHARMAC

BIZARROCOMICS.COM

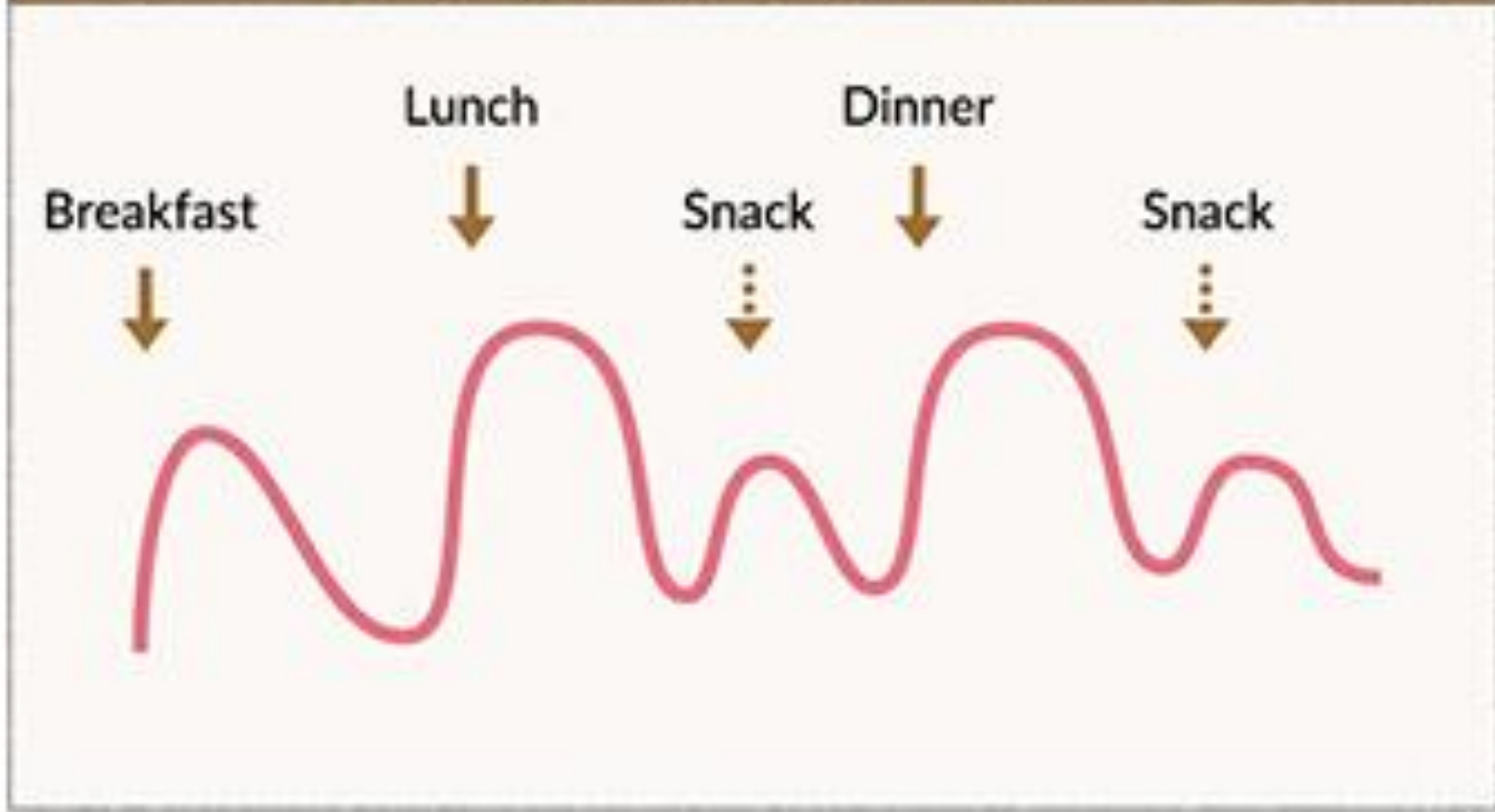


# Why is insulin so expensive?

1. Only three companies control 90% of the insulin market
2. Synthetic insulin is patented
3. No generic insulin exists
4. Greed

# Blood sugar levels during a typical day

Blood sugar



Morning

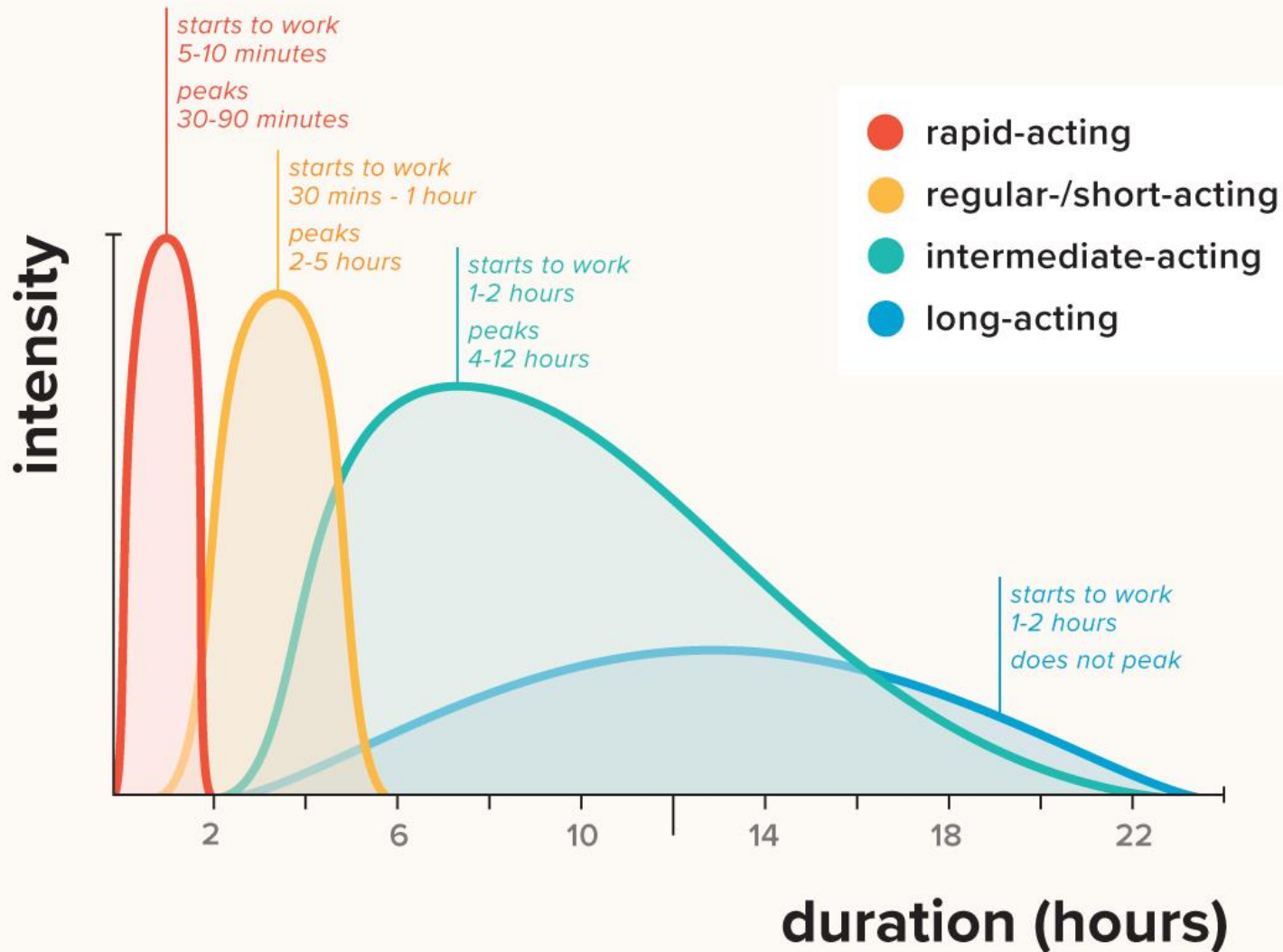
Noon

Evening

# Insulin

- Rapid- or short-acting has a short onset and peak of action
- Mixed is a combination of short-acting and long-acting
- Intermediate acting generally has an onset of about 30 minutes and a 6-12 hour effect
- Long-acting has a long duration
- Never mix long acting glargine (Lantus) with any other insulins
- Only regular insulin can be administered by IV

# types of insulin



## Main types of insulin preparations

Type	Onset	Peak	Duration	Comments
Rapid-acting insulin analogue	5-15 min	30-60 min	2-5 hr	Can be injected at the start of a meal
Short-acting (soluble/regular insulin)	30 min	1-3 hr	4-8 hr	Usually injected 15-30 minutes before a meal. Clear solution
Intermediate or long-acting insulin (isophane or zinc insulin)	1-2 hr (NPH, Lente) 2-3 hr (Ultralente)	4-8 hr 4-8 hr	8-12 hr (NPH) 8-24 hr (Ultralente)	Used to control glucose levels between meals. May be combined with short-acting insulin
Long-acting insulin analogue	30-60 min	No peak	16-24 hr	Usually taken once daily

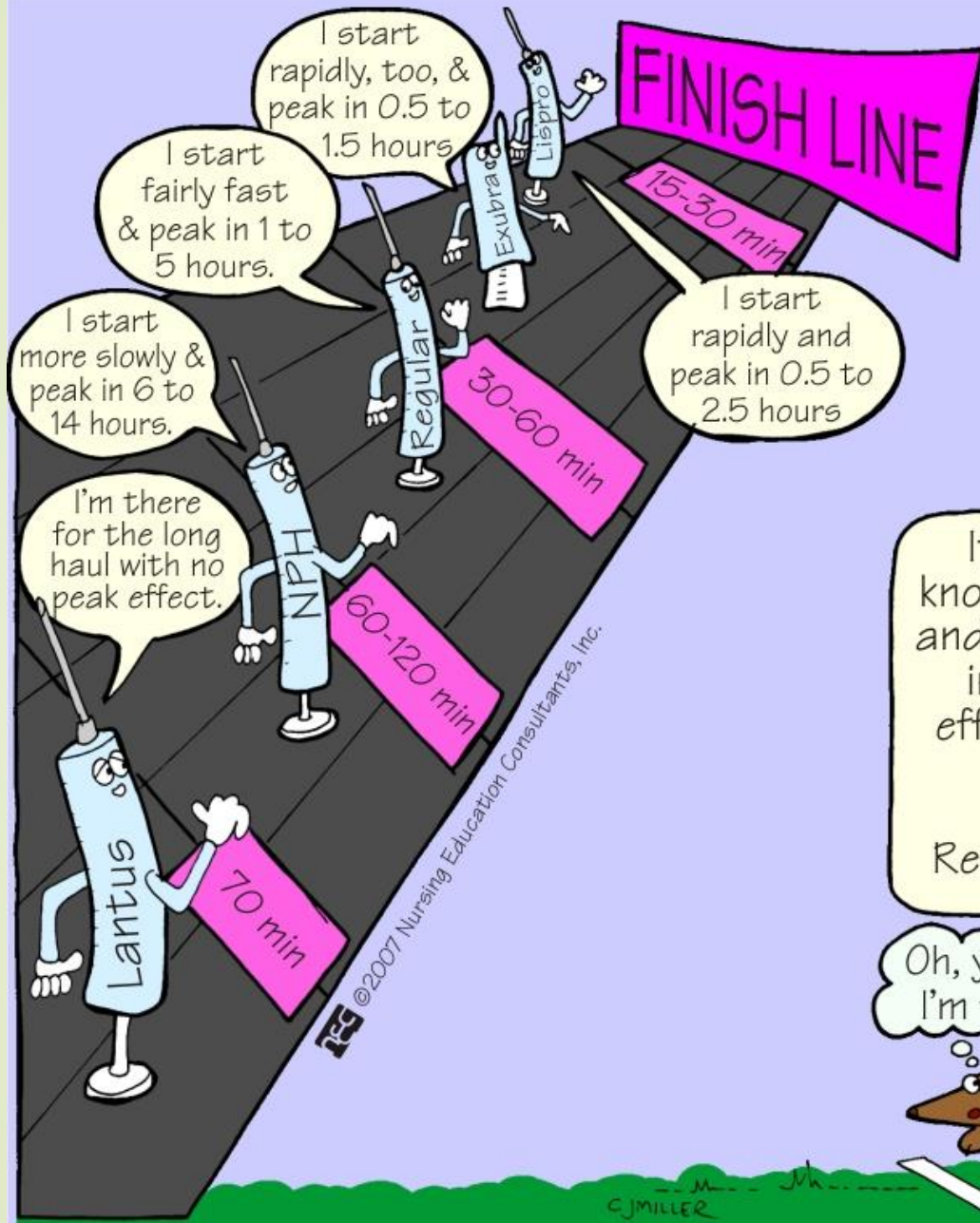
RAPID	Humalog or Lispro	< 15 min	60-90 min	3-5 hrs	<ul style="list-style-type: none"> <li>Inject 10-15 min before mealtime</li> <li>Typically used in conjunction with longer-acting insulin.</li> </ul>
	Novolog or Aspart	< 15 min	60-120 min	3-5 hrs	
	Apidra or Glulisine	< 15 min	60-90 min	1-2.5 hrs	
SHORT	Regular (R) Humulin, Actrapid or Novolin	30-60 min	2-5 hrs	6-8 hrs	<ul style="list-style-type: none"> <li>Inject at least 20-30 minutes before mealtime</li> </ul>
	Velosulin	30-60 min	2-3 hrs	2-3 hrs	
INTERMEDIATE	NPH (N)	1-2 hrs	4-12 hrs	18-24 hrs	<ul style="list-style-type: none"> <li>Commonly used twice daily</li> <li>Often combined with rapid- or short-acting insulin</li> </ul>
	Lente (L)	1-2.5 hrs	3-10 hrs	18-24 hrs	
LONG	Ultralente (U)	30 min- 3 hrs	10-20 hrs	20-36 hrs	<ul style="list-style-type: none"> <li>Covers insulin needs for 24 hrs</li> <li>If needed, often combined with rapid- or short-acting insulin</li> </ul>
	Lantus or Glargine	1-1.5 hrs	No Peak	20-24 hrs	
	Levemir or Detemir	1-2 hrs	6-8 hrs	Up to 24 hrs	
PRE-MIXED	Humulin 70/30	30 min	2-4 hrs	14-24 hrs	<ul style="list-style-type: none"> <li>Combination of intermediate- and short-acting insulin</li> <li>Commonly used twice daily before mealtime</li> </ul>
	Novolin 70/30	30 min	2-12 hrs	Up to 24 hrs	
	Novolog 70/30	10-20 min	1-4 hrs	Up to 24 hrs	
	Humulin 50/50	30 min	2-5 hrs	18-24 hrs	
	Humalog 75/25	15 min	30 min-2.5 hrs	16-20 hrs	

## Sliding Scale Insulin Protocol

---

<b>Blood Glucose Level, mg/dL</b>	<b>Human Insulin, IU<sup>a</sup></b>	<b>Additional Action Requested</b>
0-80	0	1 Ampule of D50, call physician
81-100	0	No action
101-150	0	No action
151-200	2	No action
201-250	4	No action
251-300	6	No action
301-350	8	No action
351-400	10	No action
>401	12	Call physician

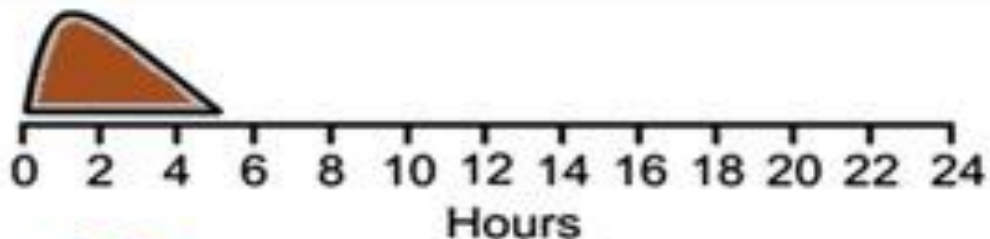
# INSULIN: Types, Onset, & Peaks



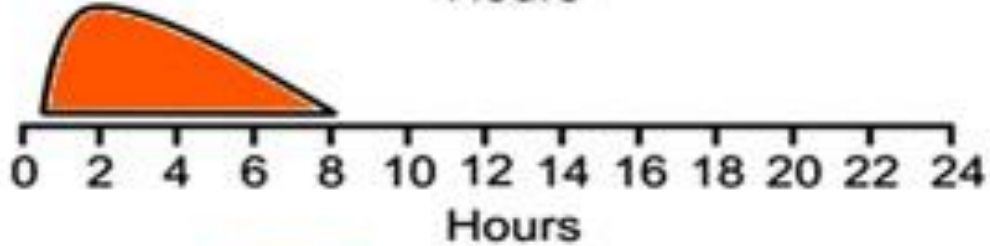
It's important to know the onset, peak, and duration of these insulins for safe, effective treatment of diabetes... Okay, Buddy... Ready, set... GO!!

Oh, yeah... I'm fast!

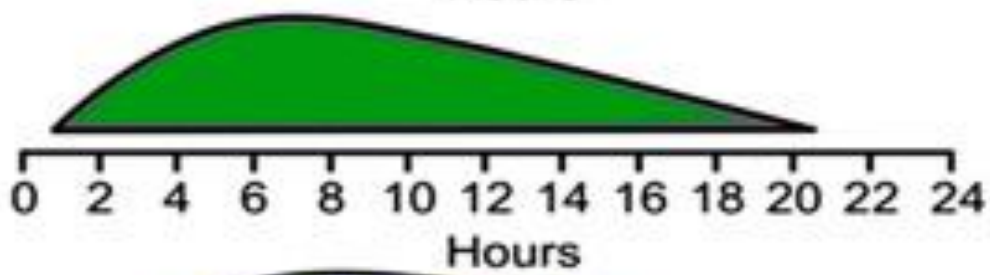




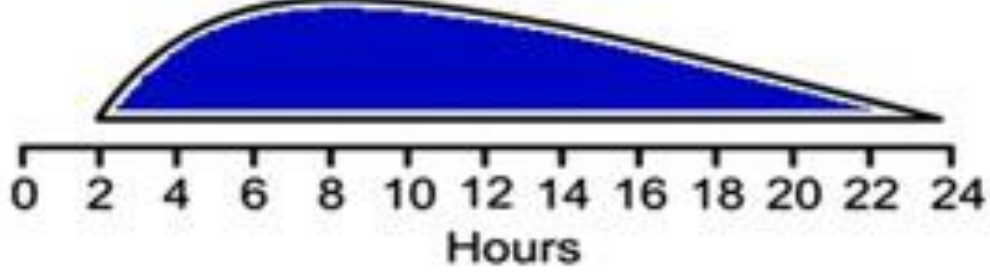
Rapid-acting analog  
(insulin aspart, insulin lispro)



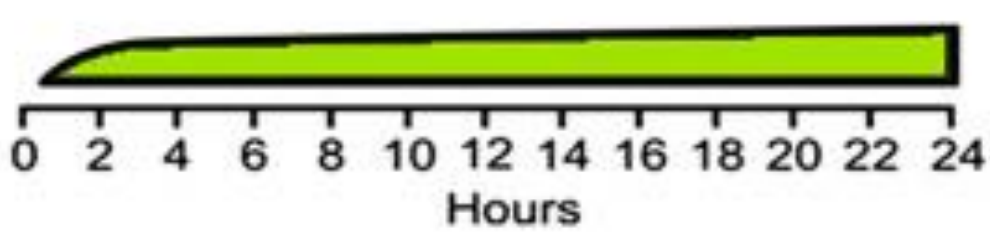
Short-acting  
(regular/soluble)



Intermediate-acting  
(isophane)

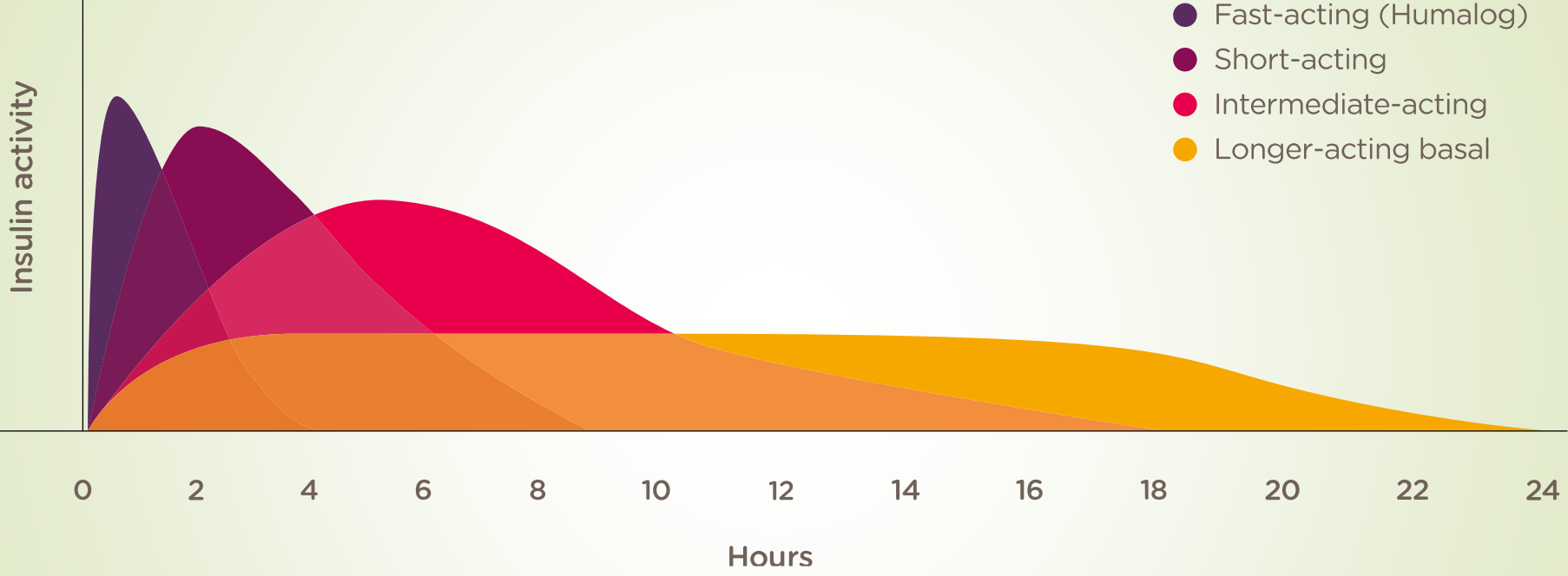


Long-acting  
(lente)



Prolonged action analog  
(insulin glargine)

# Types of Insulin



The doctor is prescribing an insulin that takes effect in less than half the time of regular (short acting) insulin. The nurse knows that the patient has been prescribed which type of insulin:

1. Humulin R, Novolin R
2. Lispro (Humalog), aspart (Novolog)
3. Humulin N, Novolin N
4. Humulin 70/30, Novolin 70/30

The doctor is prescribing an insulin that takes effect in less than half the time of regular (short acting) insulin. The nurse knows that the patient has been prescribed which type of insulin:

1. Humulin R, Novolin R
- 2. Lispro (Humalog), aspart (Novolog)**
3. Humulin N, Novolin N
4. Humulin 70/30, Novolin 70/30

# Insulin Administration

- Preparation of insulin
- Administering two insulins
- Procedure for insulin injection

# INSULIN STORAGE

Quick pointers on storing and handling your insulin.



Write the date on the vial on the day you open it.



Keep the insulin in a cool area away from sunlight

Note: Do not store your open vials in the fridge. You can store your unused vials in the fridge, but do not freeze.



Avoid shaking the insulin vial excessively.



Discard the insulin if expired (30 days after opening), contaminated, or there are insoluble sediments.

# Medication Errors





Novolog

70% intermediate

30% very fast  
acting


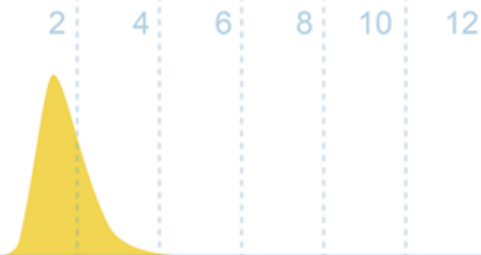

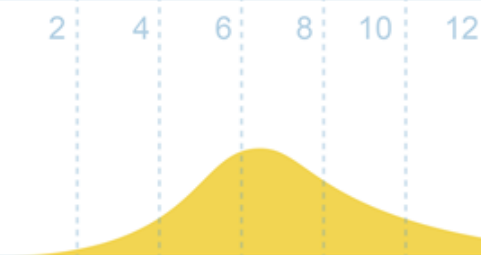




Novolin

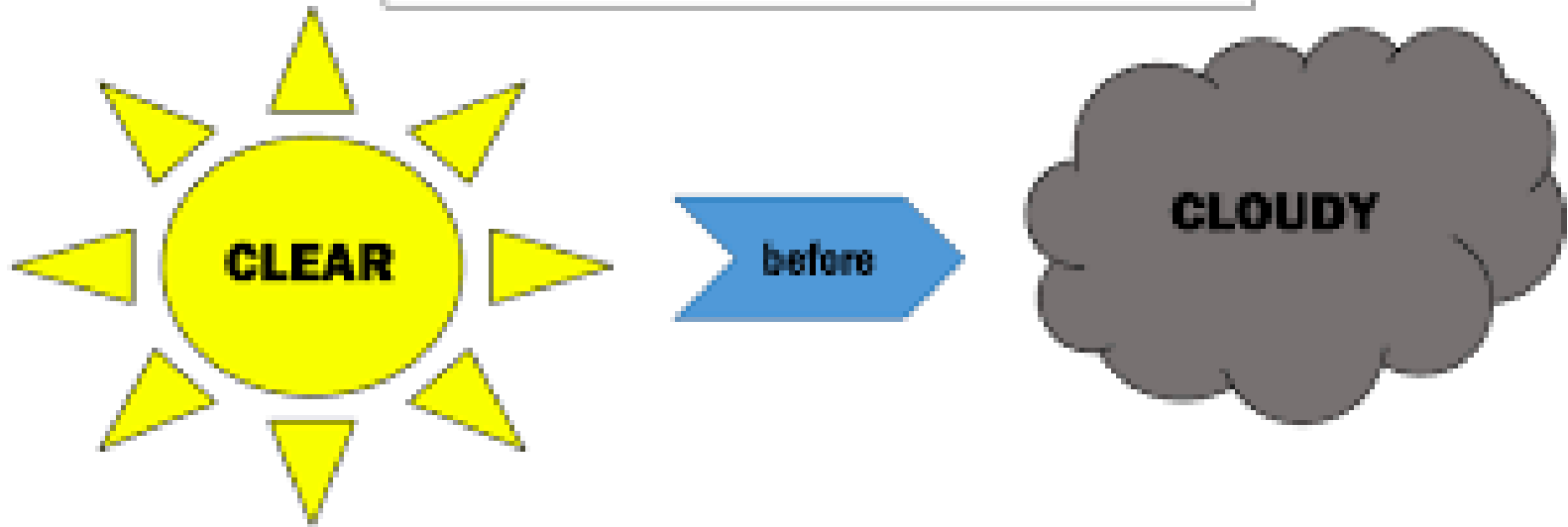
70%

intermediate

30% fast acting

Type of Insulin	Appearance	Action times after injection (in hours)
<b>Rapid-acting</b> <ul style="list-style-type: none"> <li>▪ Lispro (Humalog)</li> <li>▪ Glulisine (Apidra)</li> <li>▪ Aspart (NovoRapid)</li> </ul>	Clear 	 <p> <b>Onset:</b> 10 to 15 mins  <b>Peak:</b> 1 to 2 hours  <b>Duration:</b> 3 to 5 hours         </p>
<b>Intermediate-acting</b> <ul style="list-style-type: none"> <li>▪ NPH (Humulin-N, Novolin-NPH)</li> </ul>	Cloudy 	 <p> <b>Onset:</b> 1 to 3 hours  <b>Peak:</b> 5 to 8 hours  <b>Duration:</b> up to 18 hours         </p>
<b>Slow or long-acting</b> <ul style="list-style-type: none"> <li>▪ Glargine (Lantus)</li> <li>▪ Detemir (Levemir)</li> </ul>	Clear 	 <p> <b>Onset:</b> 90 mins  <b>Peak:</b> None  <b>Duration:</b> up to 24 hours         </p>

# MIXING INSULIN



Never mix long acting glargine (Lantus) with any other insulin

# MIXING INSULIN:

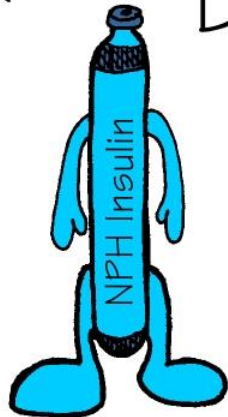
Draw Up The Clear...

(Clear and  
Fast-Acting)



Before The Cloudy...

(Cloudy and  
Long-Acting)



C.J. MILLER

To Prevent Contaminating  
A Short-Acting Insulin "Reg"  
With A Long-Acting Insulin "NPH"

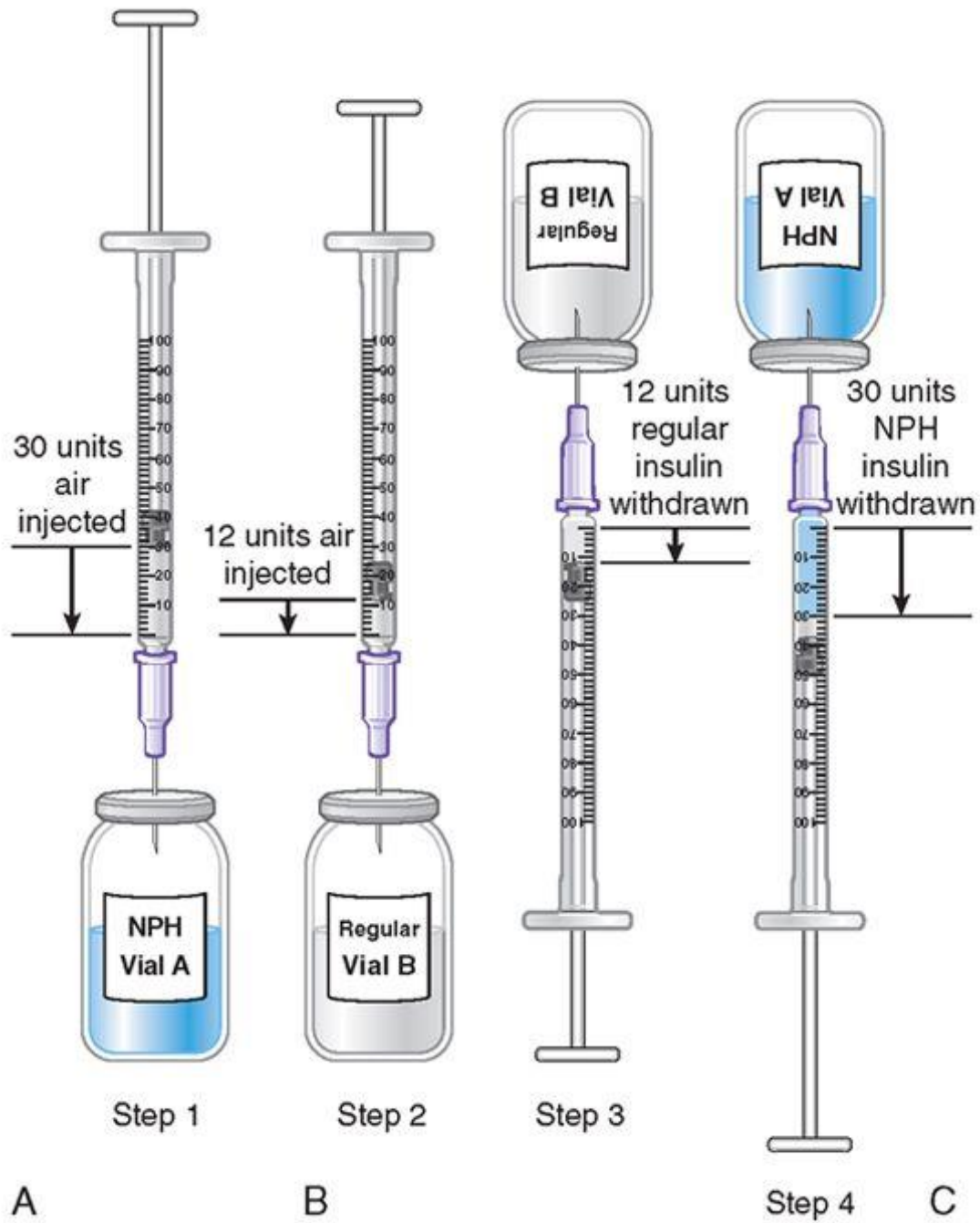


**Cloudy**



**Clear**





A

B

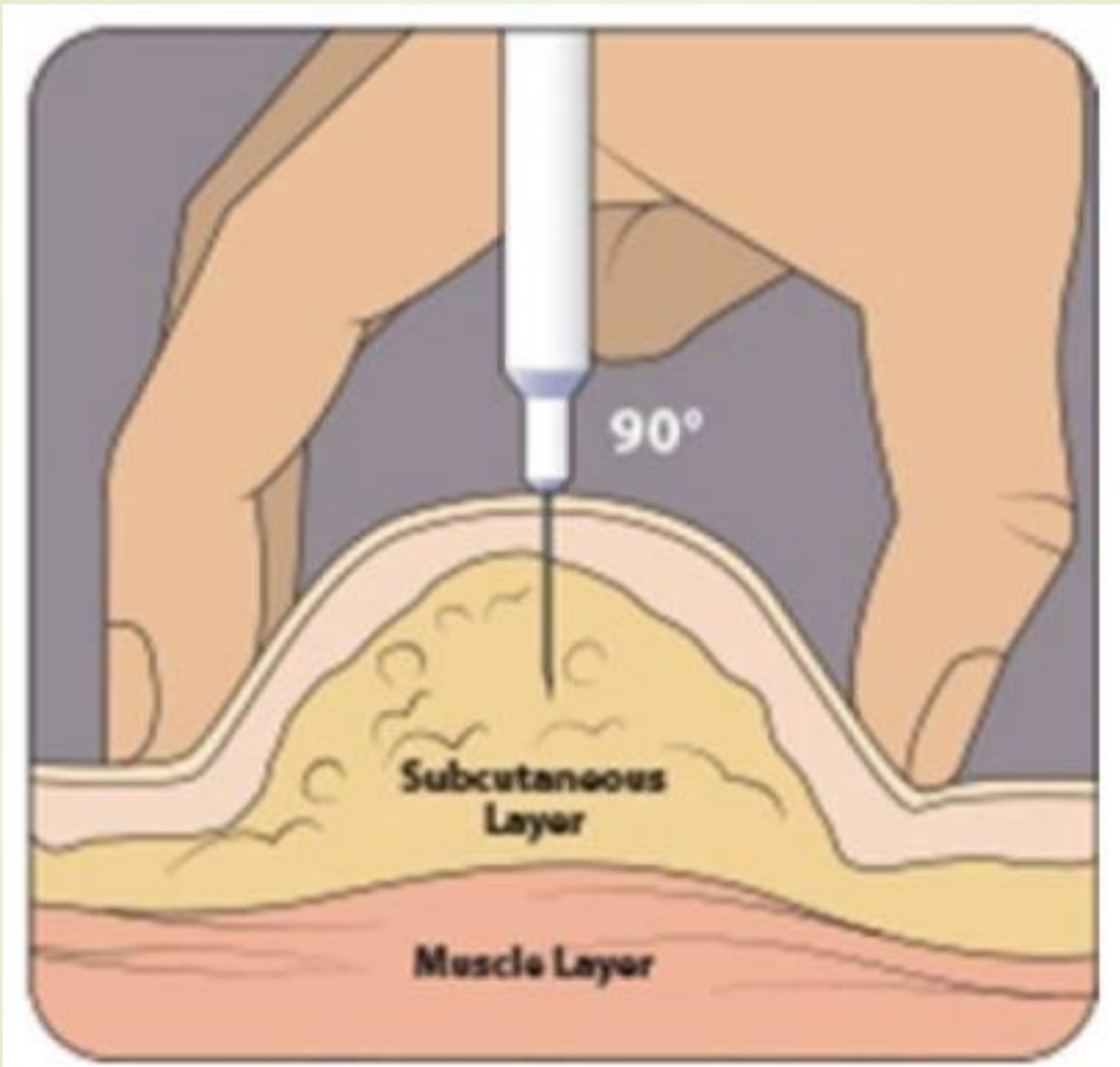
C











# Subcutaneous injection

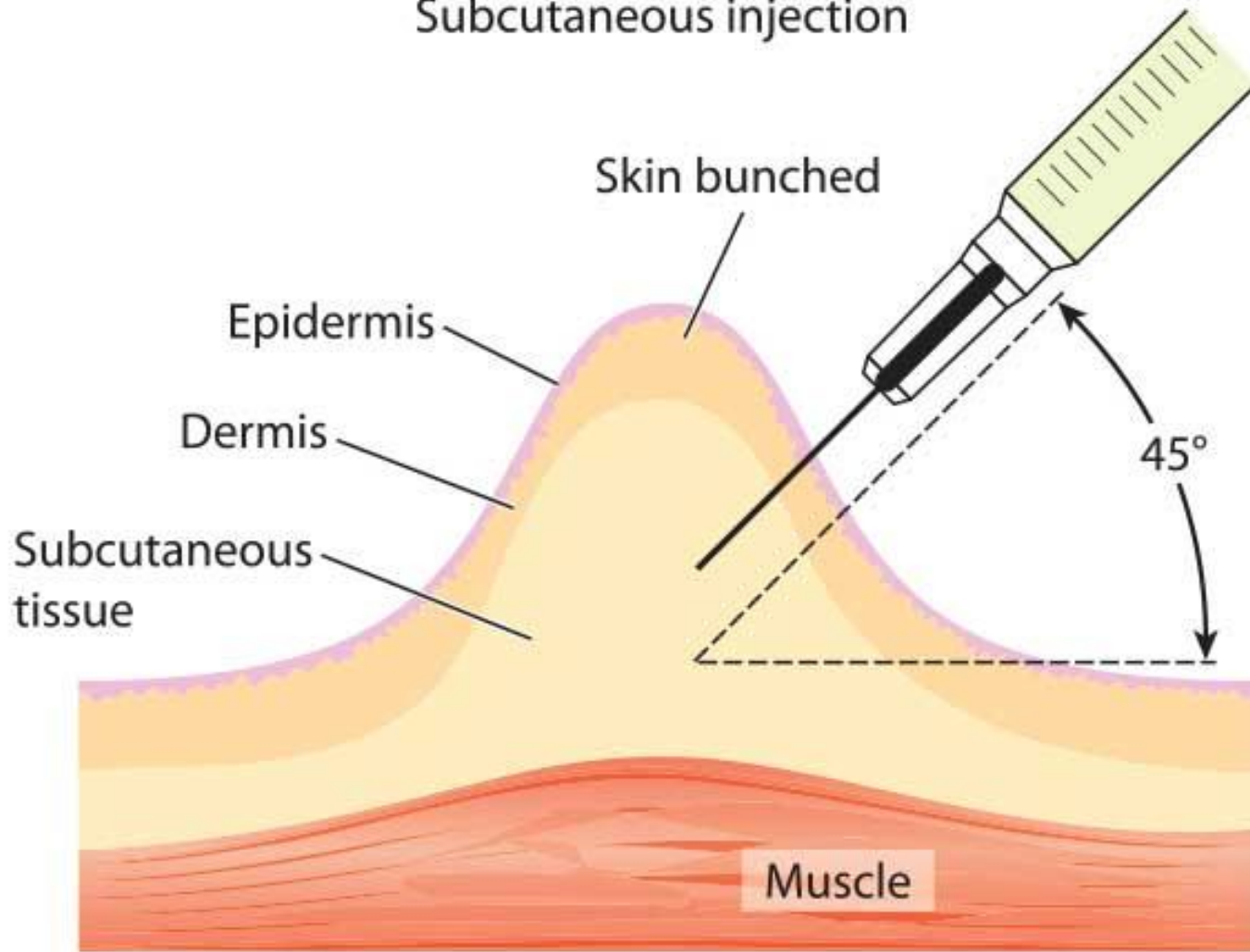
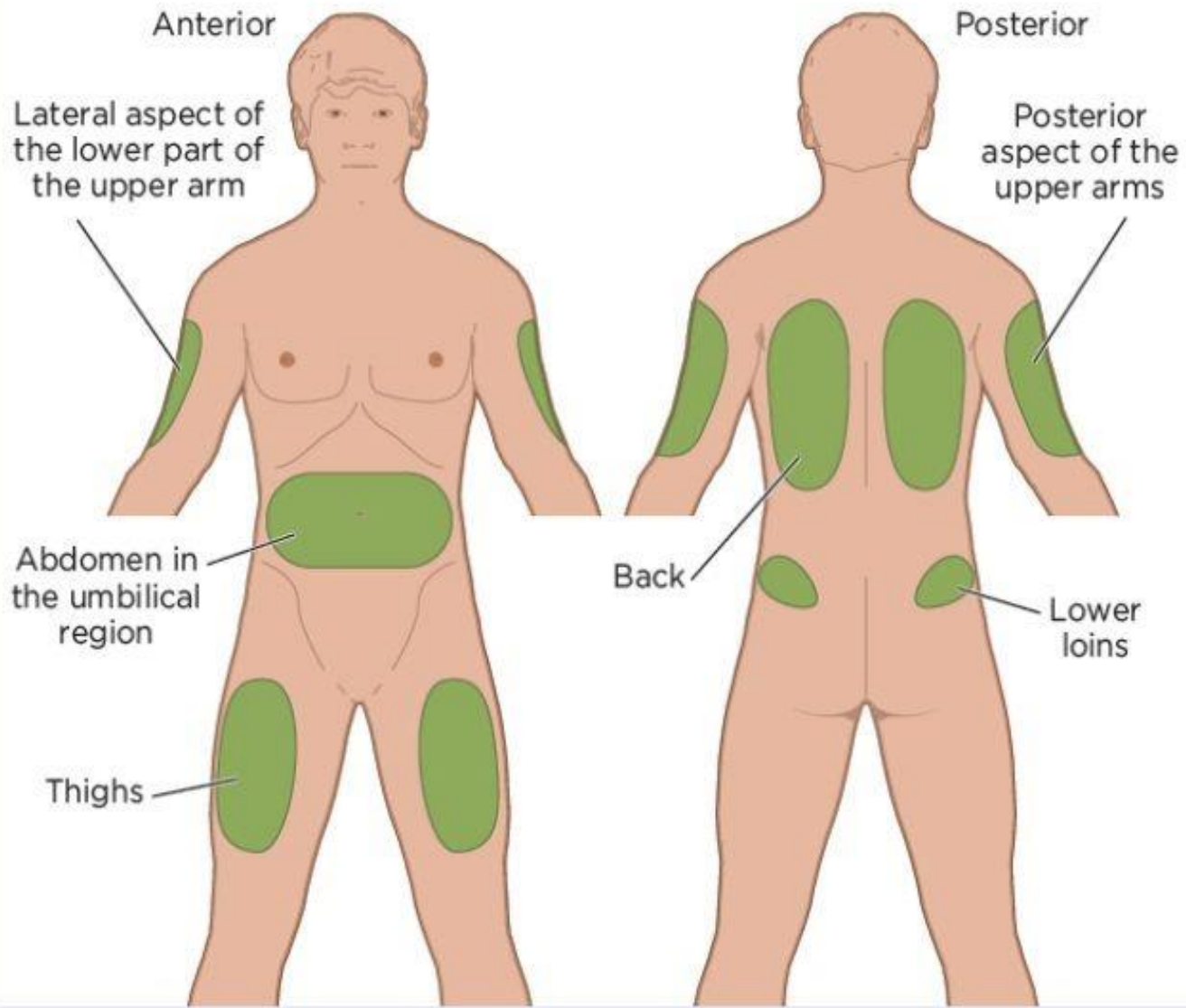
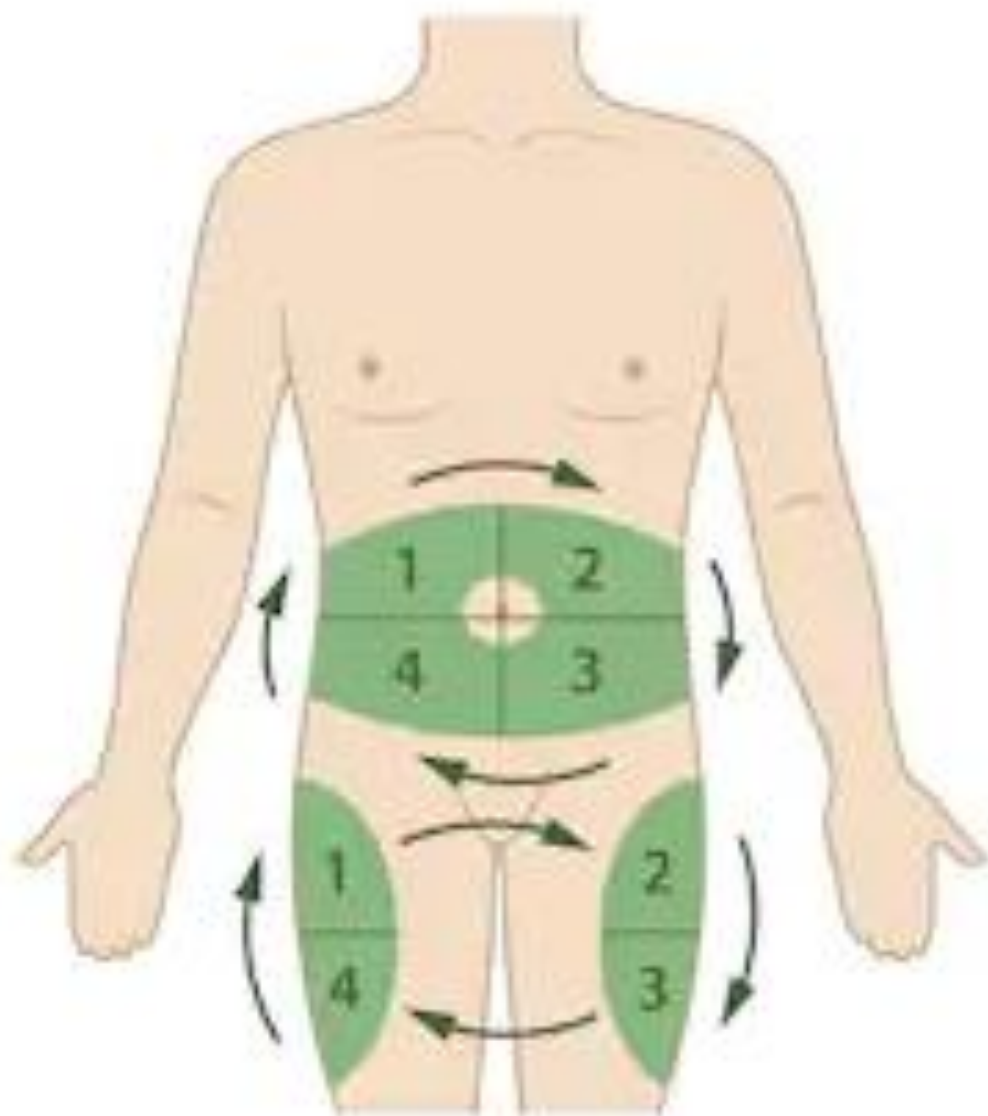




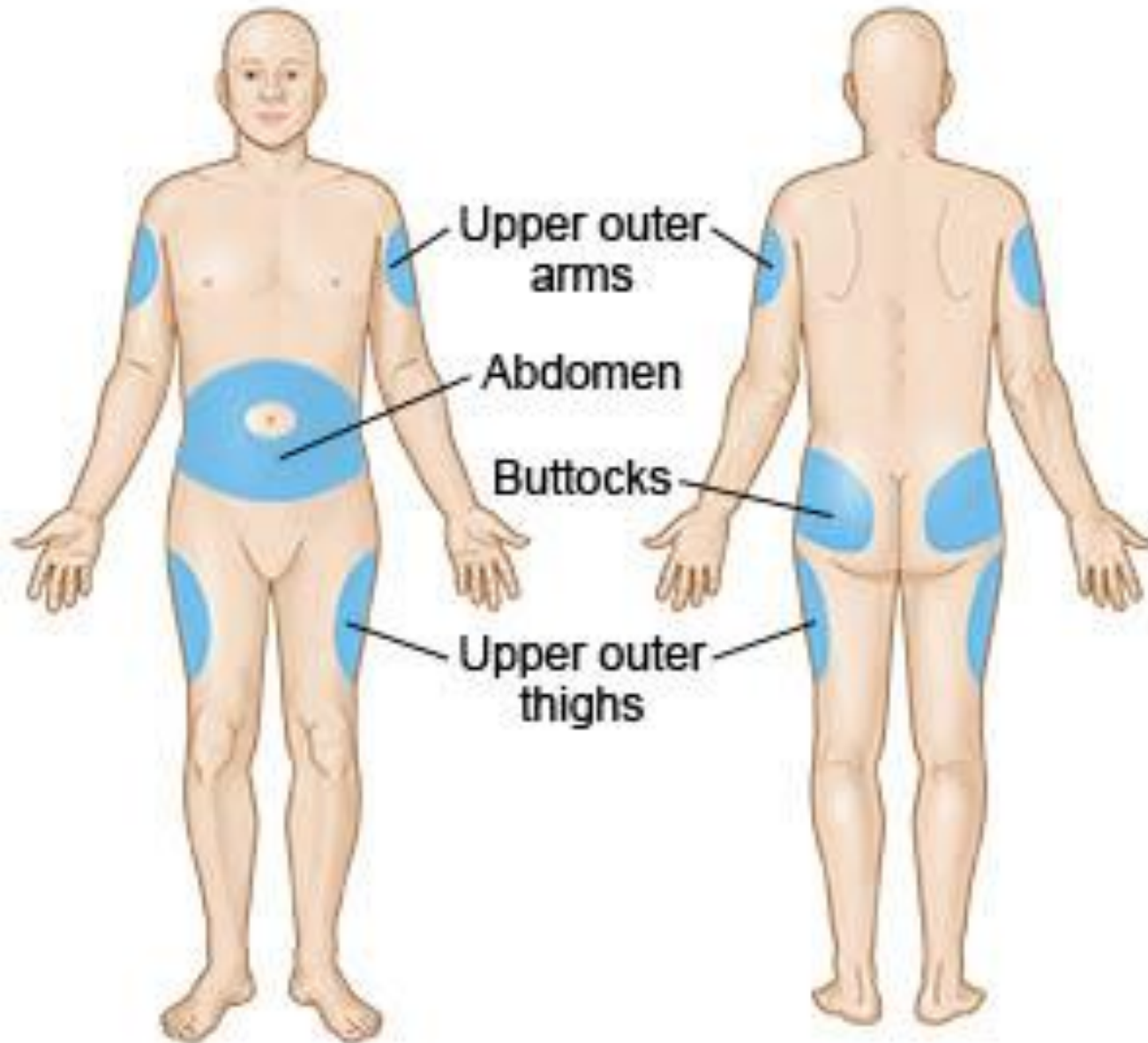
Fig 2. **Subcutaneous injection sites**



## Rotating injection sites



# Insulin Injection Sites



# Planning out the pattern of your track marks..

• **Horizontal Pattern**



• **Curve Pattern**



• **Zig Zag Pattern**



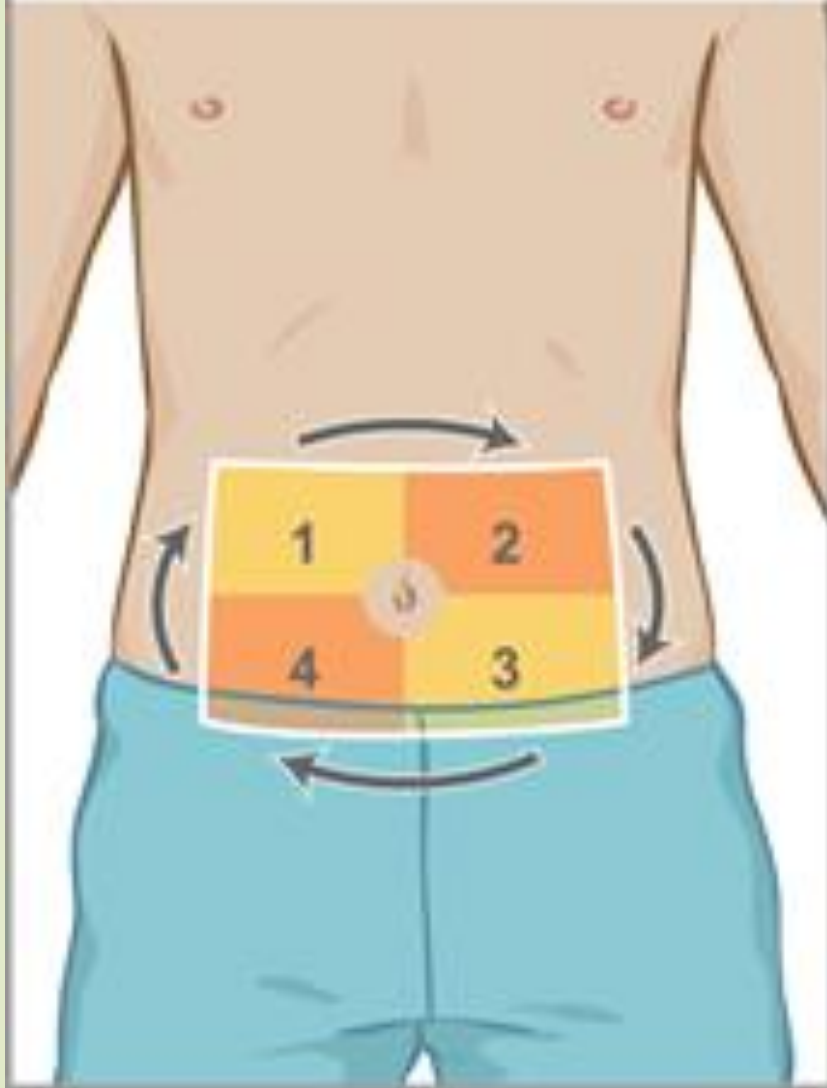
• **Crisscross Pattern**



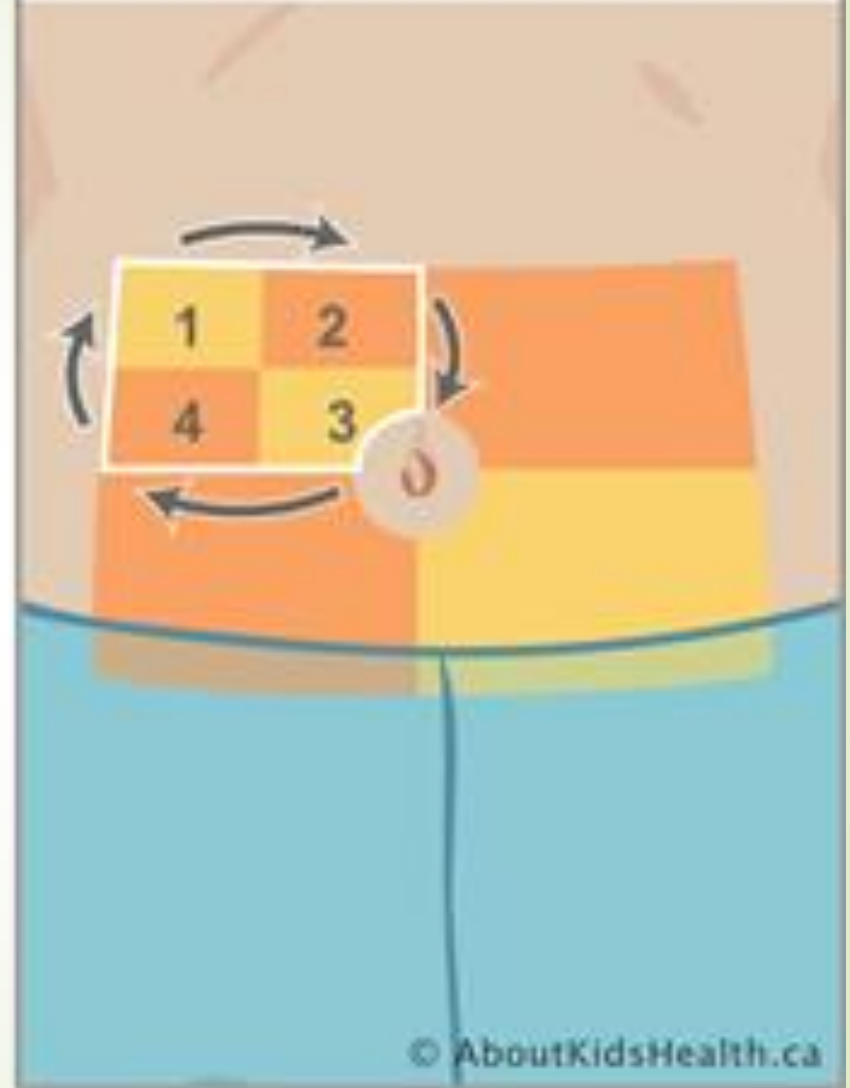
Type 1 Diabetes Memes

*Just diabetic things*

Rotate between the sites



Rotate within the sites



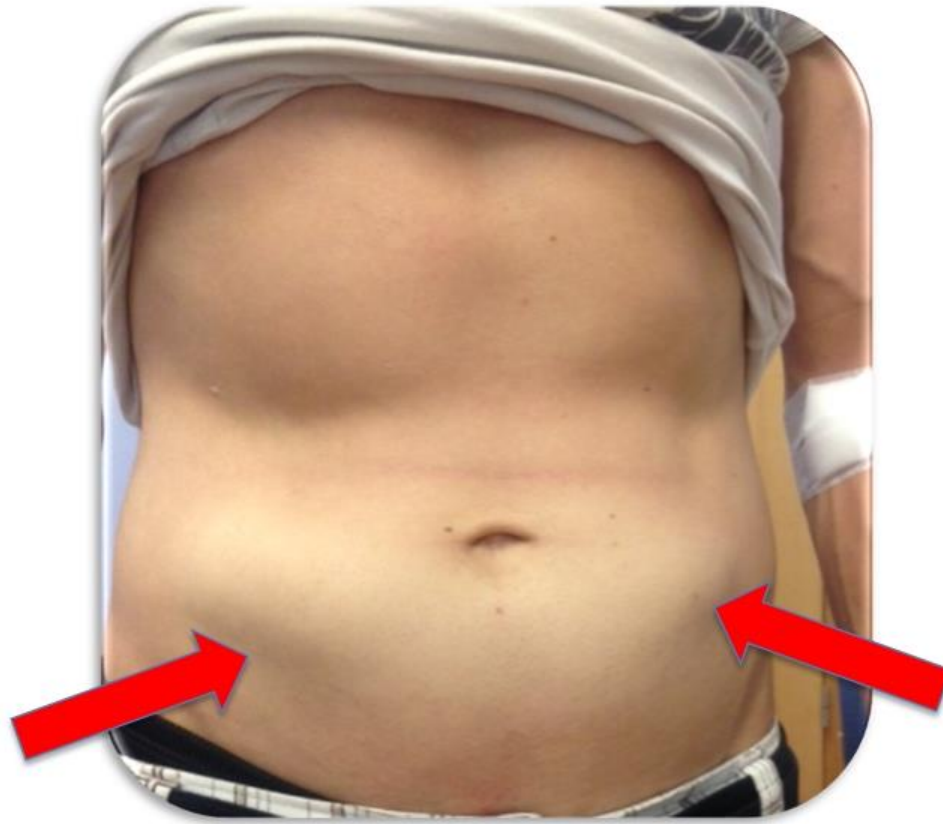
© AboutKidsHealth.ca

To avoid lipohypertrophy

# Lipohypertrophy (LH)

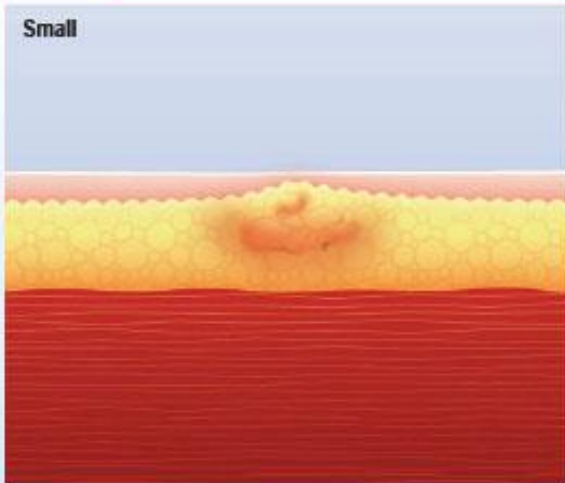
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Dense tissue formed in an area repeatedly injected with insulin, due to the anabolic effect of insulin causing local fat cells to enlarge and proliferate.

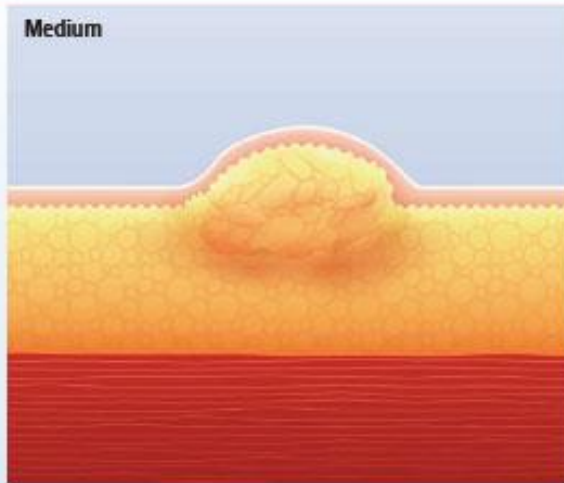




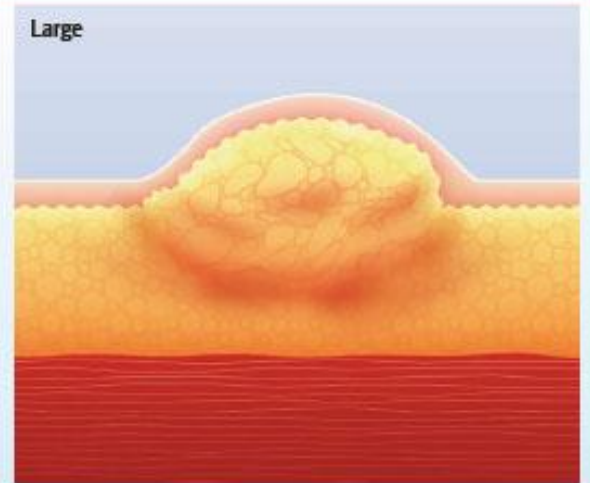
Small



Medium



Large



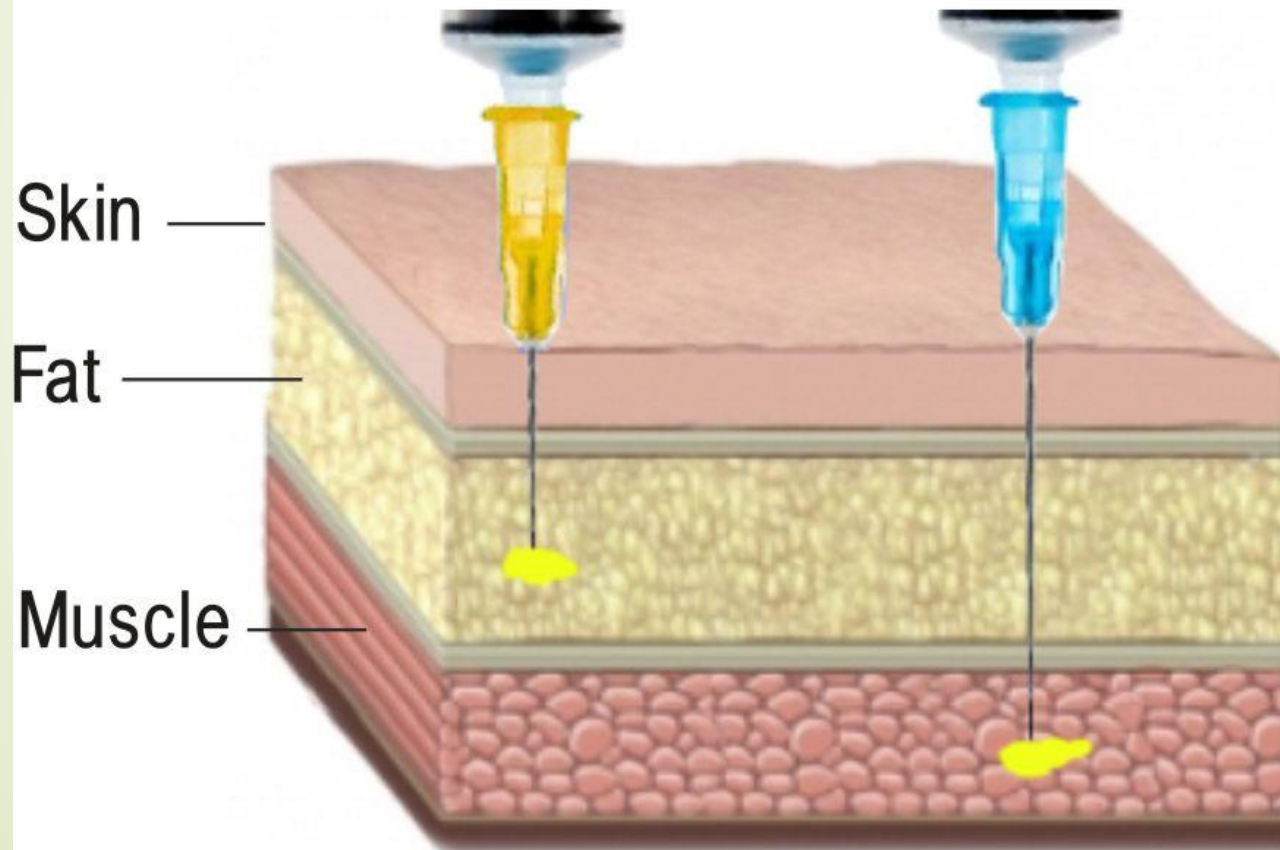
(Becton, Dickinson and Company 2015)

More effect / Less side effects

# Depot control

Subcutaneous

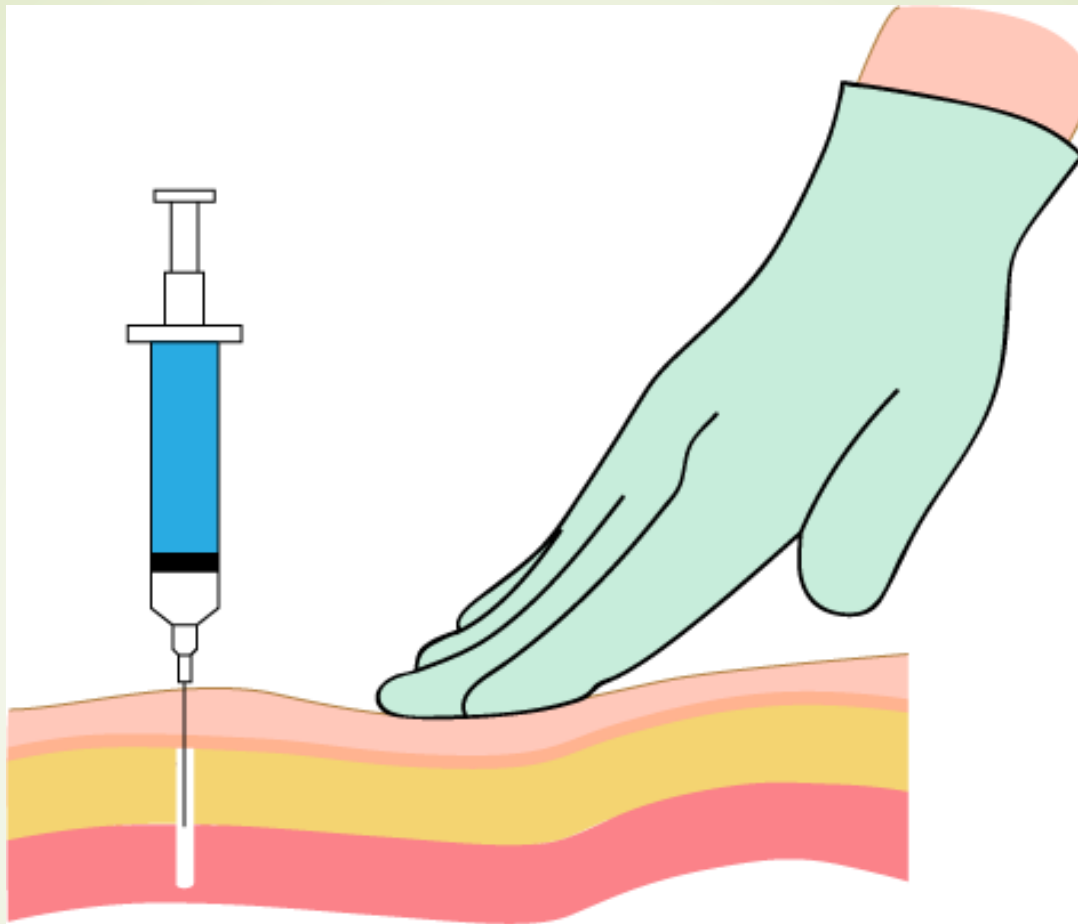
Intramuscular





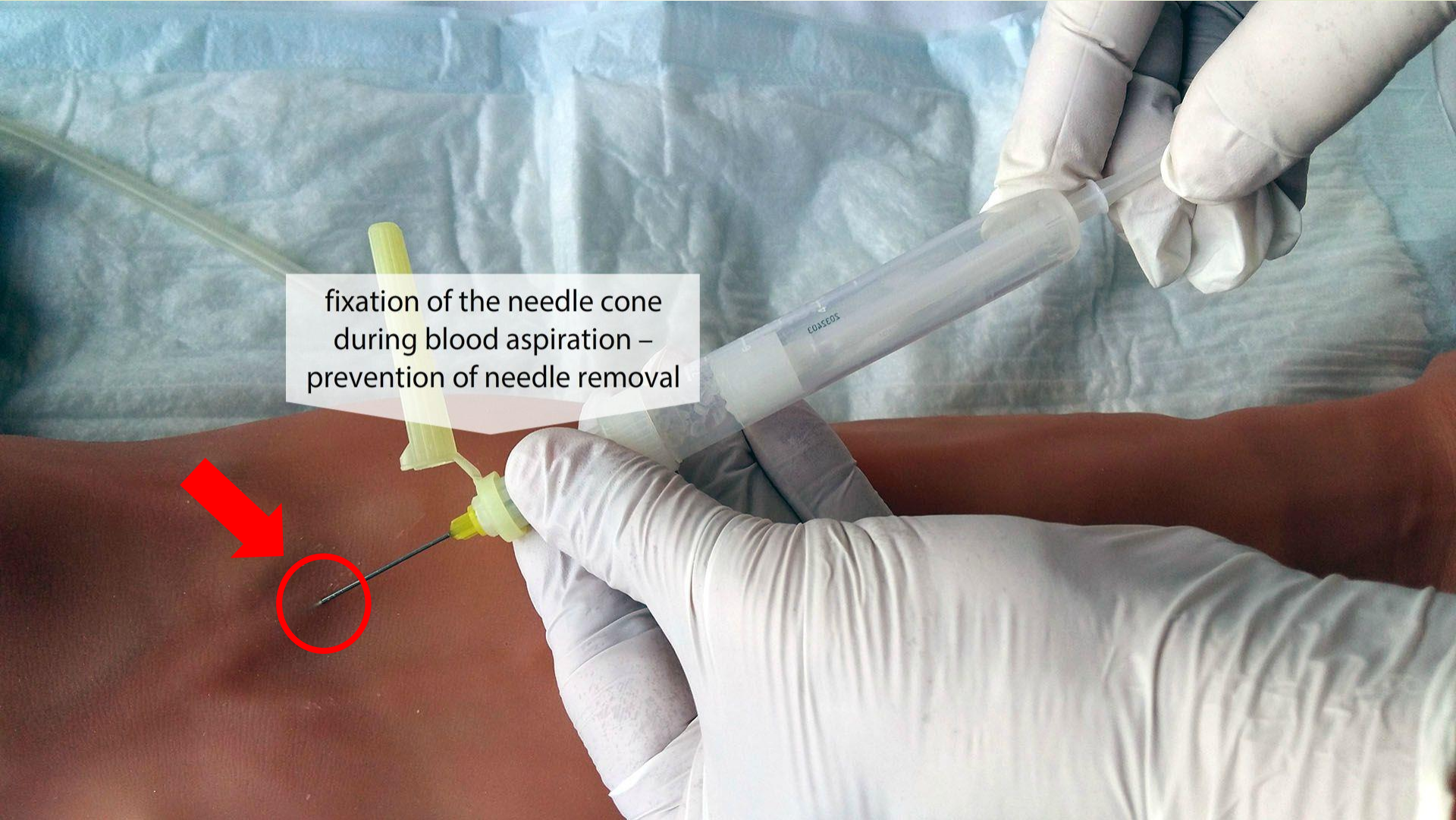
# Aspiration

**To Aspirate,  
or not to Aspirate,  
that is the question?**



After cleaning the site, inject the needle into the tissue at a 90 degree angle and aspirate for blood return. If no blood return, slowly inject the medication.

## **Aspiration**



fixation of the needle cone  
during blood aspiration -  
prevention of needle removal

# Aspiration

# World Health Organization (WHO)

“Aspiration is defined as the pulling back of the plunger of a syringe (for 5–10 seconds) prior to injecting medicine.

Aspiration is most commonly performed during an intramuscular (IM) or subcutaneous (SC) injection, and is meant to ensure that the needle tip is located at the desired site, and has not accidentally punctured a blood vessel.”

**“There is no evidence that this procedure is essential or truly beneficial.”**

# Center for Disease Control

## Aspiration

- Evidence based nursing
- Following the results of numerous studies, the CDC has changed its position on the issue several times over the past ten years.
- The current position is to **not** aspirate.
- The chances of hitting a blood vessel are minute.
- But wiggling the needle when aspirating, which is unavoidable, causes increased irritation to the site and increases patient discomfort.

# Center for Disease Control

"Aspiration before injection of vaccines or toxoids (i.e., pulling back on the syringe plunger after needle insertion but before injection) **is not necessary** because no large blood vessels are present at the recommended injection sites, and a process that includes aspiration might be more painful"

Do you need to aspirate when giving intramuscular injections (IM)?

<https://ed-areyouprepared.com/wp-content/uploads/2018/12/Do-you-need-to-aspirate-when-giving-intramuscular.pdf>

# Preparation

# Packaging of Parenteral Medications

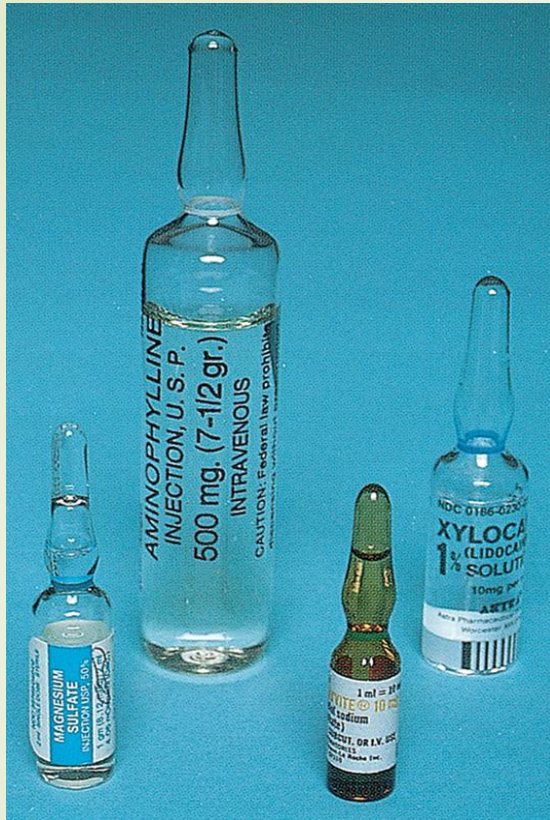
## Ampules

- Sealed glass container designed to hold single dose
- Designed to snap open
- Use protective sleeve, alcohol wipe, or gauze to hold while snapping open.
- Insert filter needle into open ampule and withdraw medication by pulling back on syringe plunger.
- Withdraw meds with *filter needle* to prevent aspiration of tiny glass shards.
- Remove and discard filter needle and attach appropriate needle for med administration.

# Packaging of Parenteral Medications

## Vials

- ▶ Plastic or glass with rubber stopper or diaphragm
- ▶ Single dose or multi-dose
  - ▶ Always measure regardless
- ▶ May require reconstitution
- ▶ Injection of air equal to amount to be withdrawn facilitates removal of solution—DO NOT OVERFILL.
- ▶ Draw up only amount of solution needed for dose.

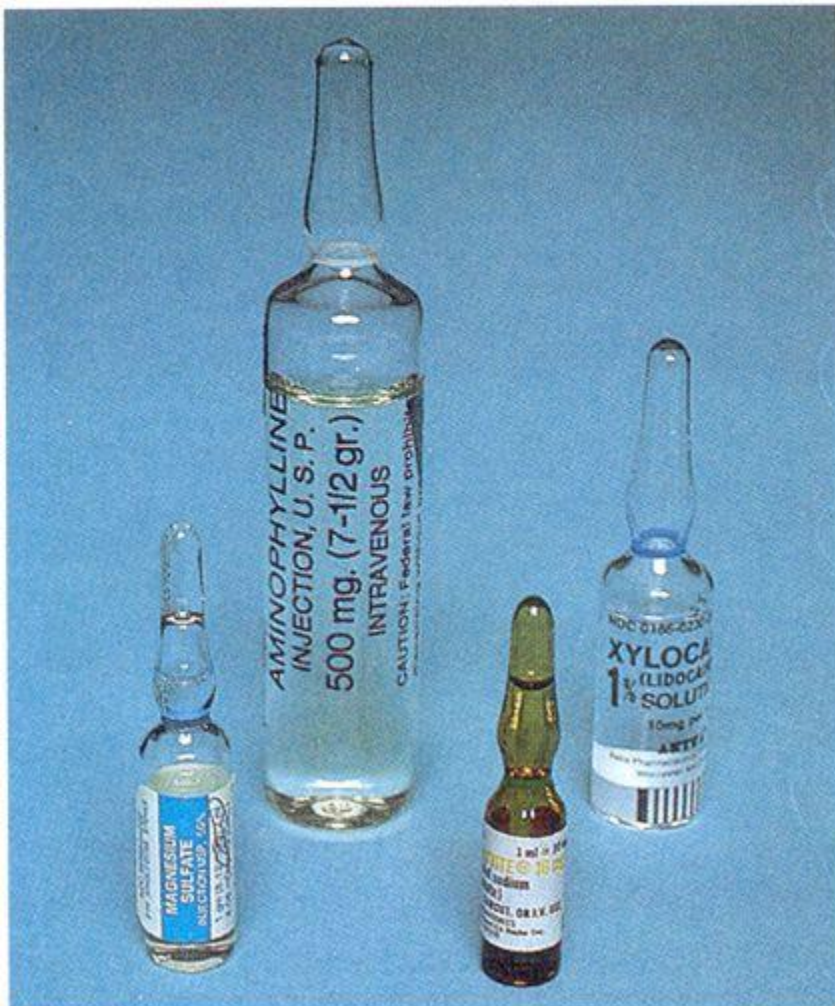


**Figure 18-1** Medication in ampules. (From Perry AG, Potter PA, Elkin MK: *Nursing interventions and clinical skills*, ed 6, St Louis, 2016, Mosby.)



**Figure 18-2** Medication in vials. (From Perry AG, Potter PA, Elkin MK: *Nursing interventions and clinical skills*, ed 6, St Louis, 2016, Mosby.)

# Ampules versus Vial





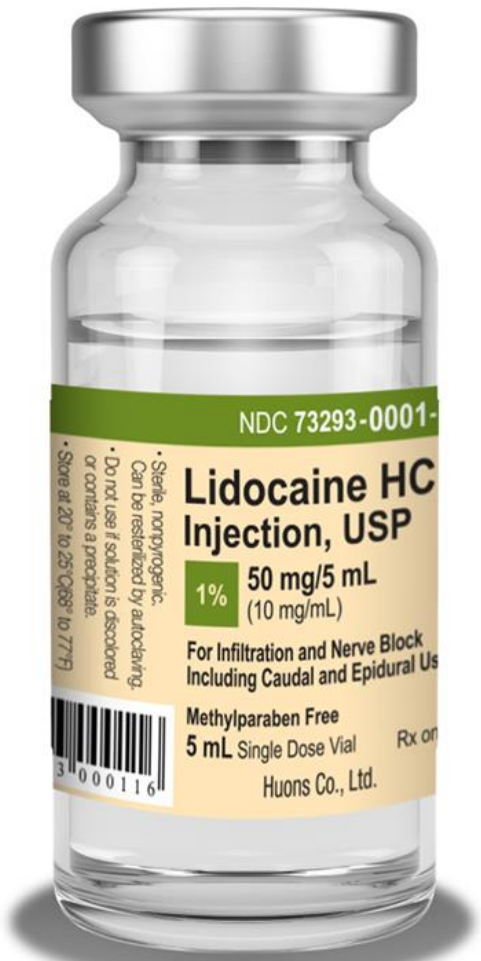
6 mL  
**Novocain 1%**  
Sodium Chloride  
Sulfate of procaine HCl USP  
Do not use if crystals appear  
Winthrop Laboratories  
New York, N. Y. 10021

Preparative from  
**1% LIDOCAINE HCl**  
Injection, USP  
10 mg/mL  
Rx only 58-1370-2/R7-1/98  
Abbott Labs., N. Chicago, IL 60064, USA.

**NOT FOR INTRAVENOUS USE**

**0.4 mg/ml**  
**1 mL AMPUL**  
FOR IM, SC OR IV USE

**Inderal**  
1 mL (1 mg)  
FOR IV USE



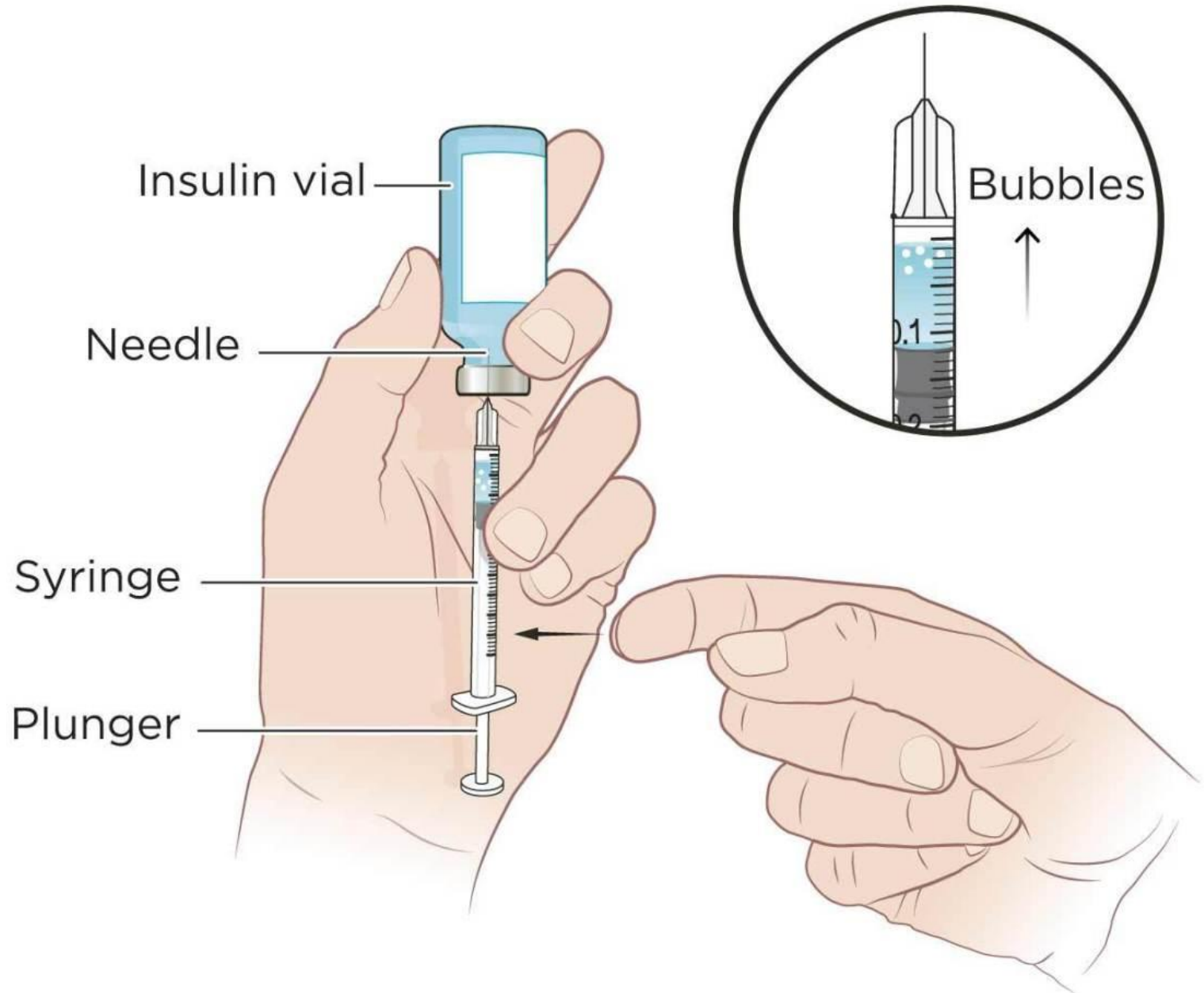












# Ampules



- Is a glass flask that contains a single dose of medication for parenteral administration
- If not all the medication is used, the remainder must be discarded
- Medication is removed from an ampule after its thin neck is broken.
- The ampule can be inverted or placed on a flat surface to draw the solution into the syringe.
- Care must be taken not to contaminate the needle by touching the rim of the ampule

# Drawing Up Medication From an Ampules



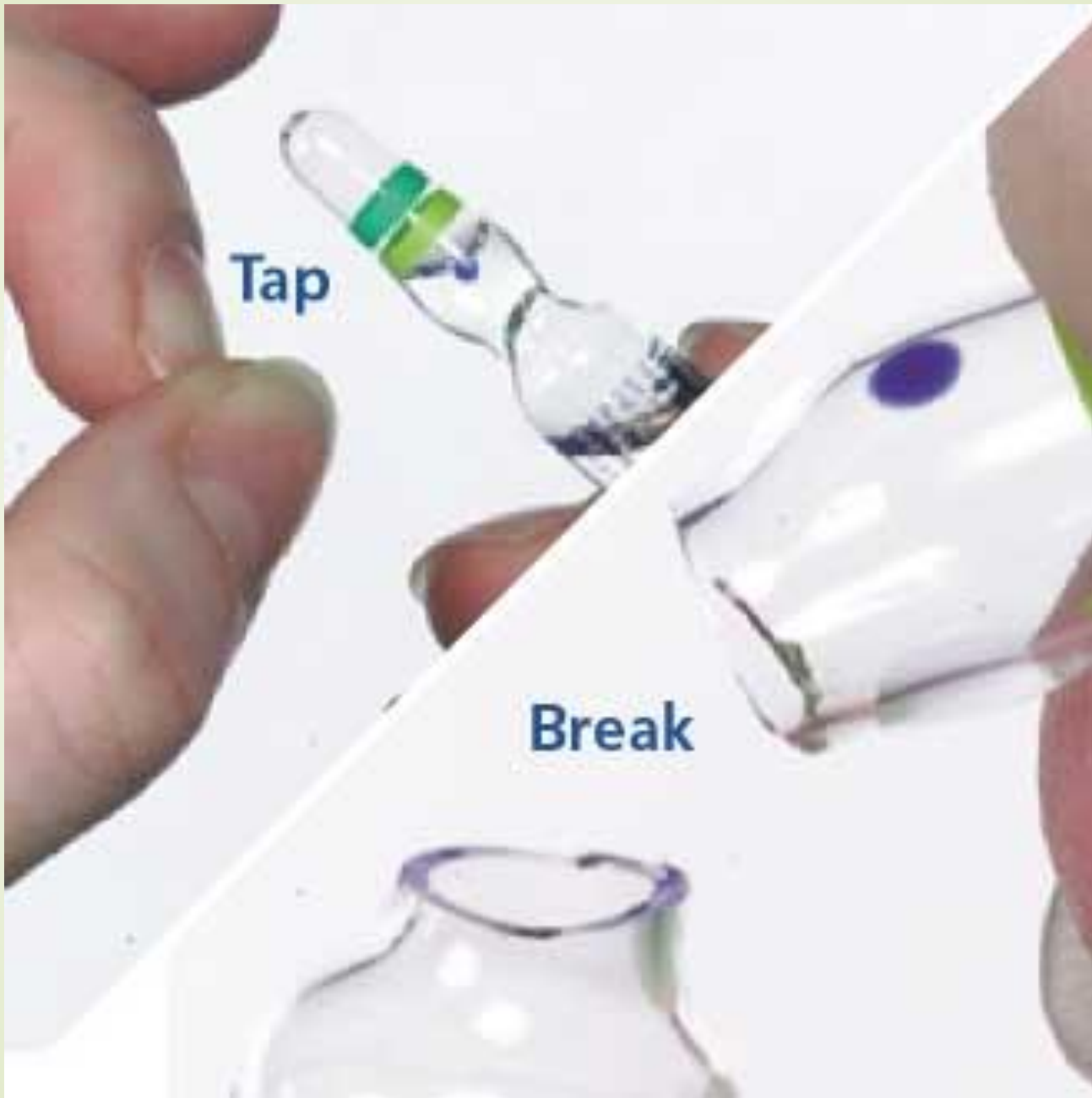
- Wash hands and gather equipment.
- Grasp the stem with an alcohol swab

# Ampules

## Opening an Ampule



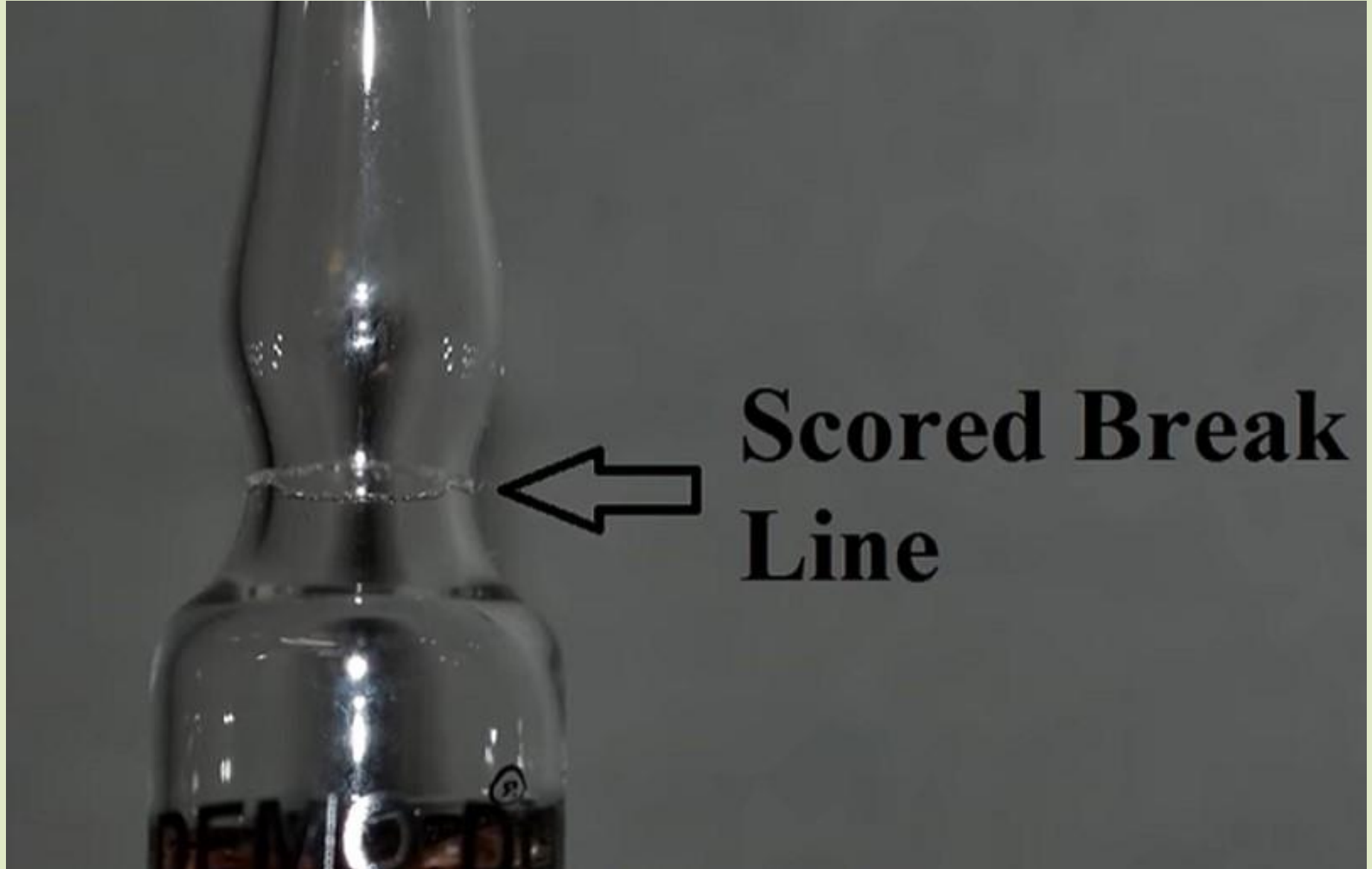
Clean the neck with an alcohol swab; then grasp the ampoule between the thumb and index finger at the neck with the swab still in place.

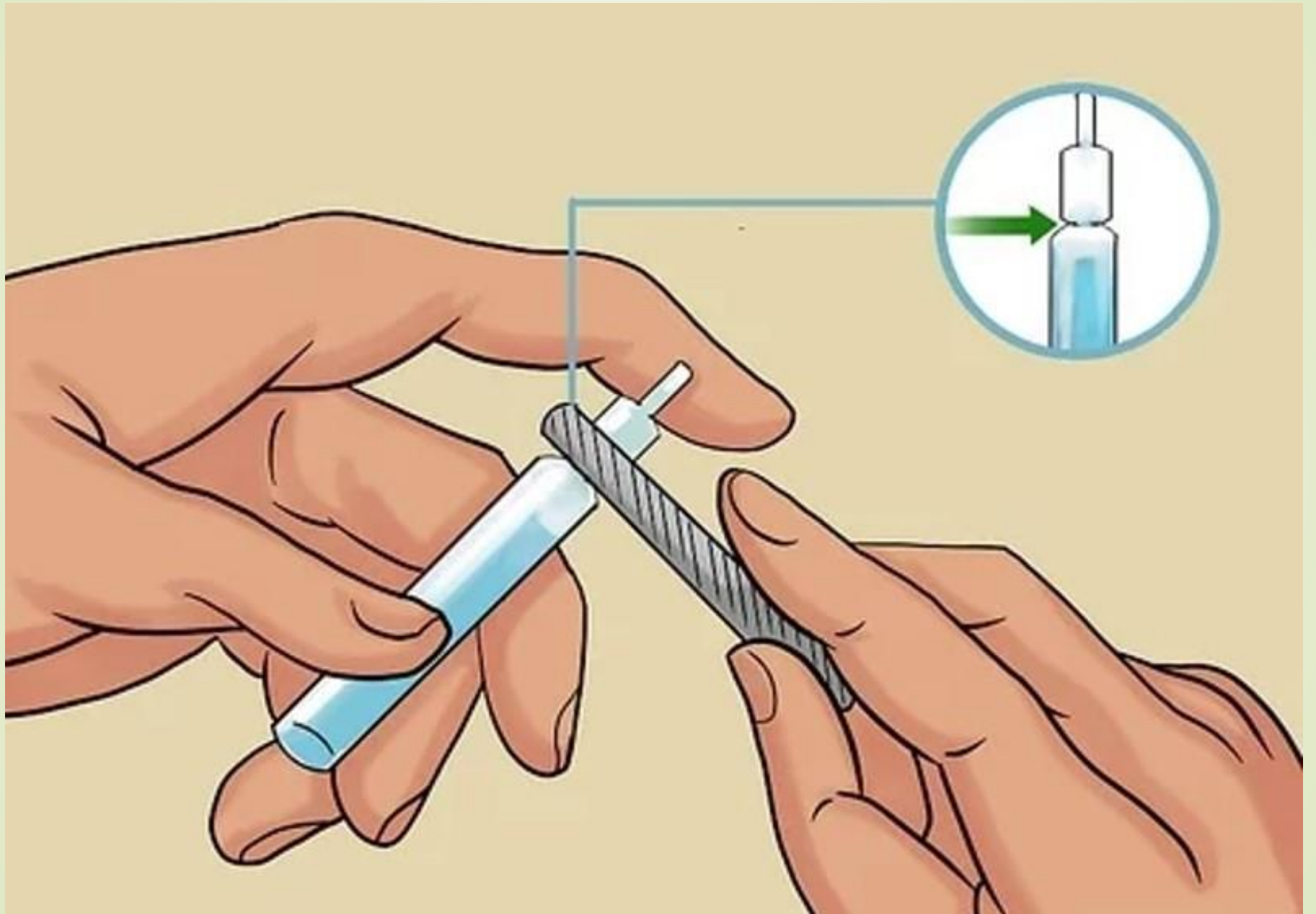


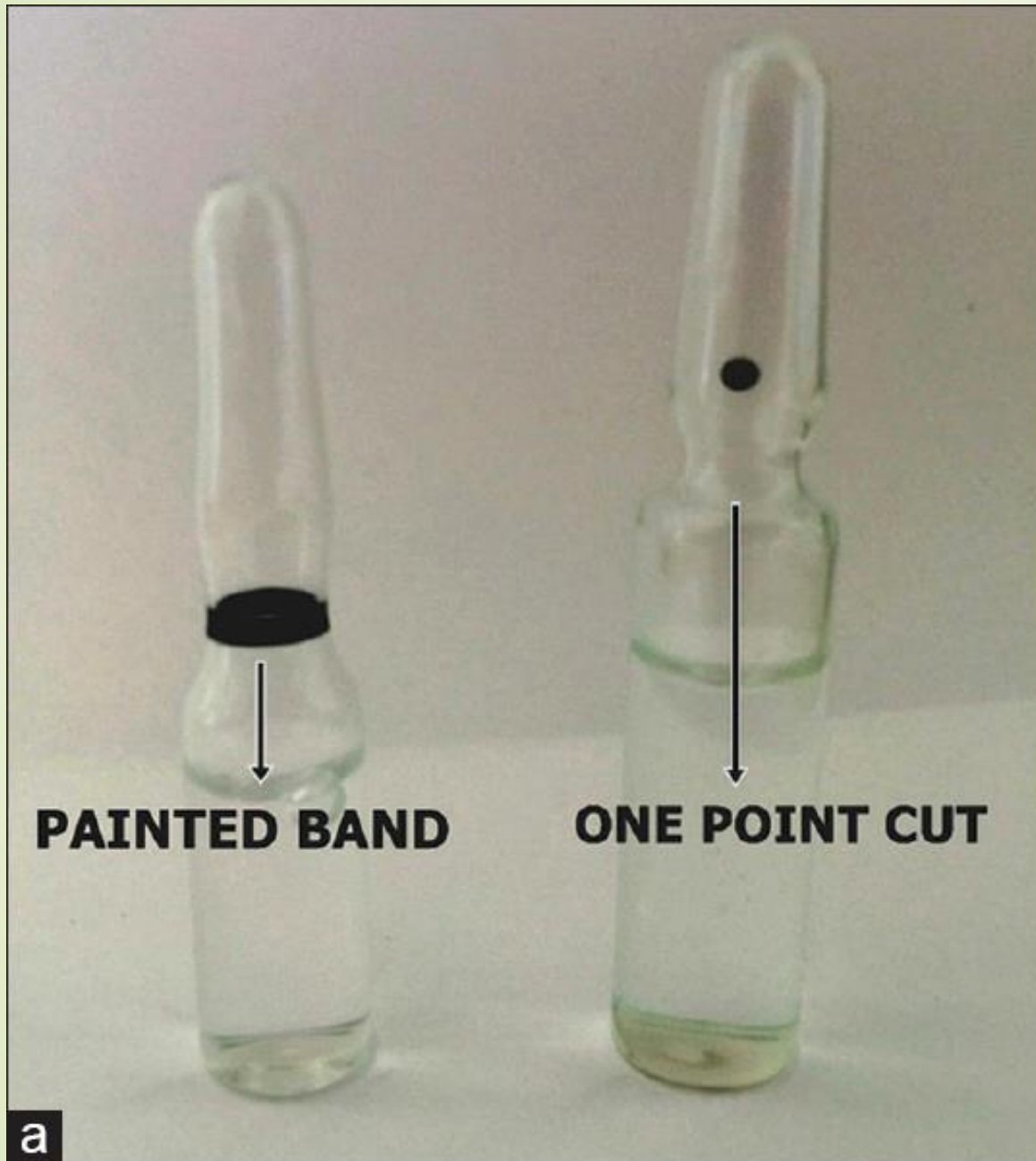
**Tap**

**Break**

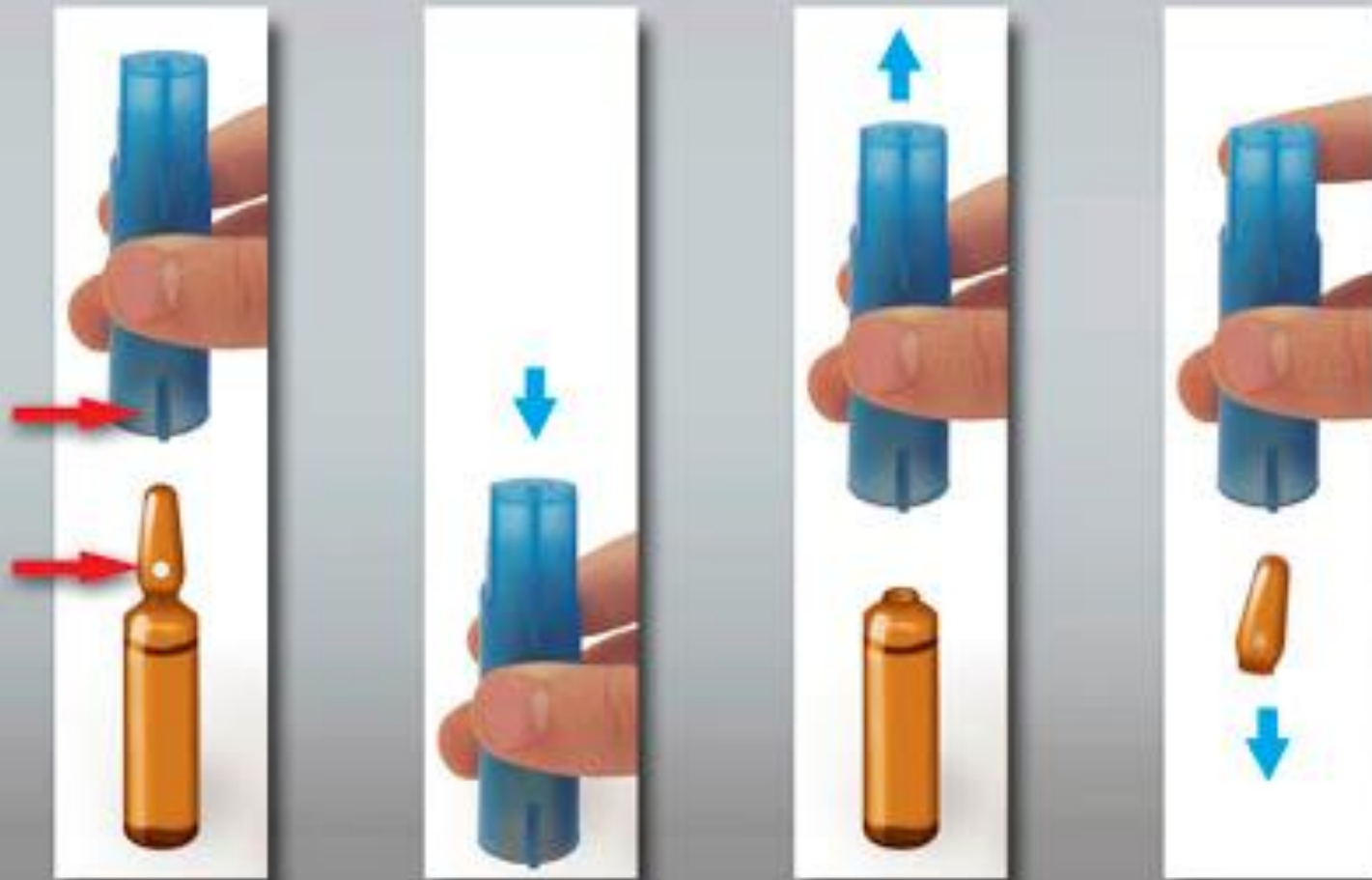












# Risks of Parenteral Preparations

## *Preparation Risks*

- A preparation risk unique to ampule-based preparations is the presence of broken glass during the opening of an ampule





L-07096771

F-09/07

✓ 09/19

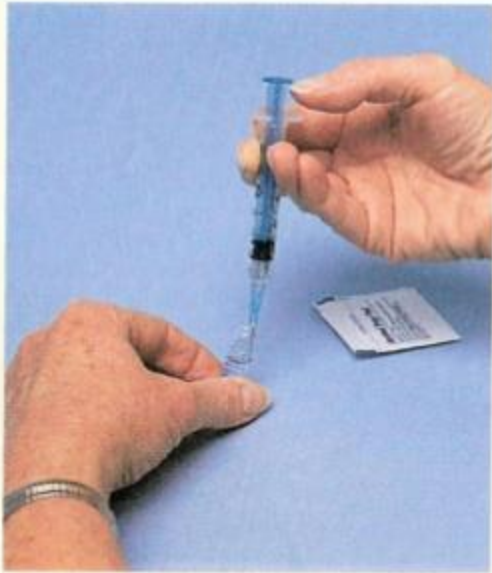








## Continue Drawing Up Medication From an Ampules



- Uncap the needle and insert the needle into the ampule. Avoid touching the rim with the needle.





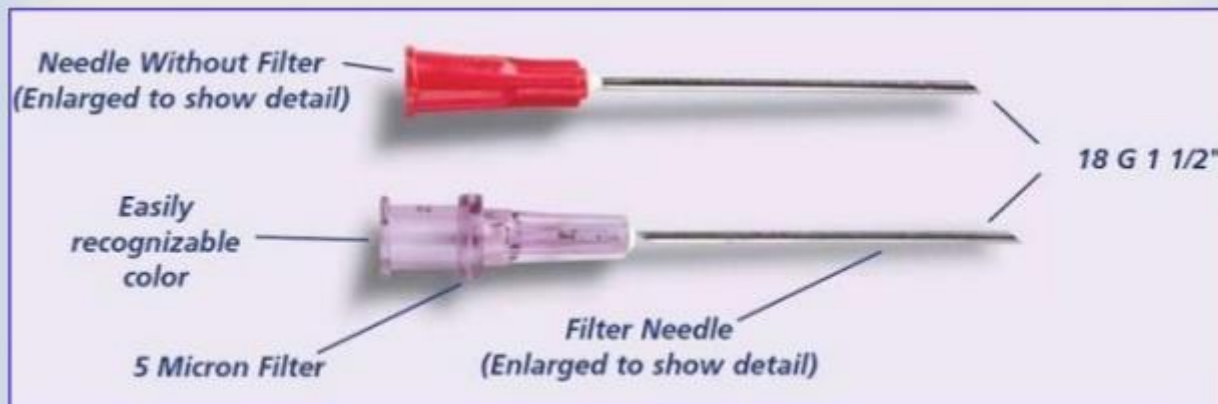


# Without Filter vs. With Filter



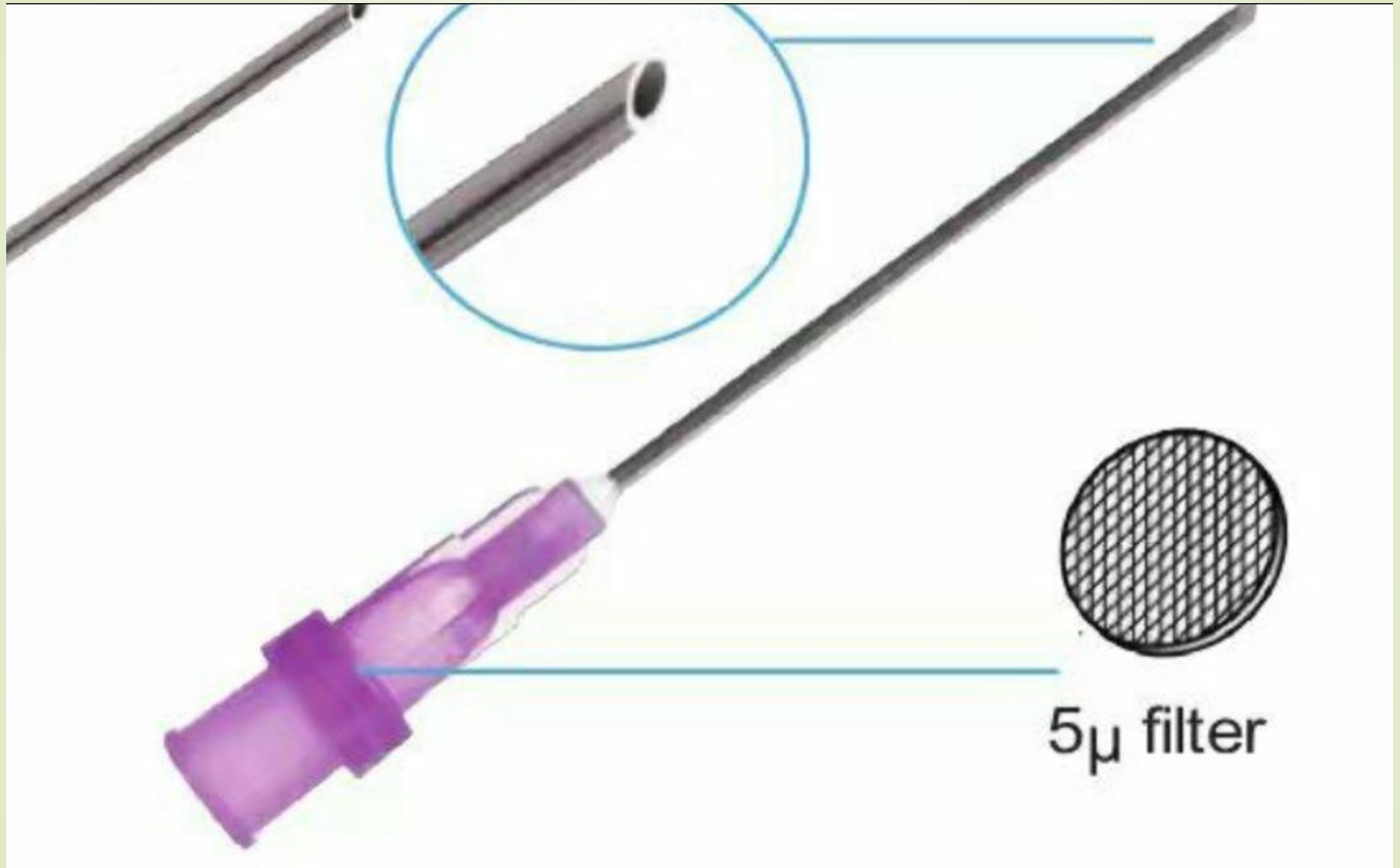
5 micron filter stops 98% of particulates

CLEAR=GLASS



(Medsav, 2014)



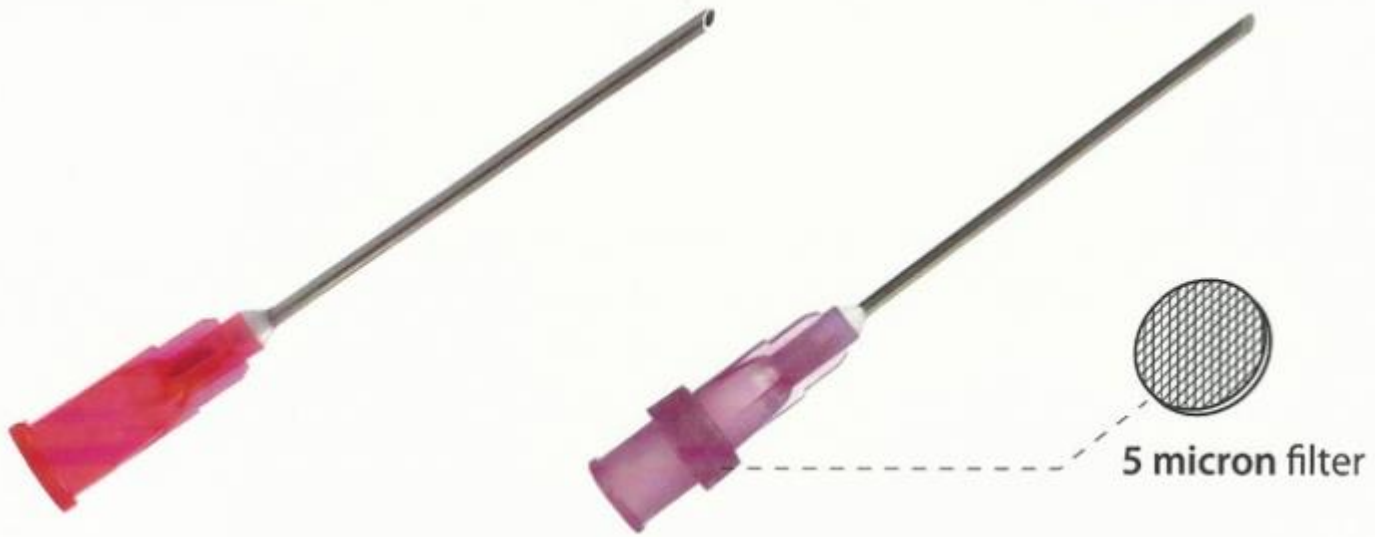


# Blunt Needle & Safety Fliter Needle



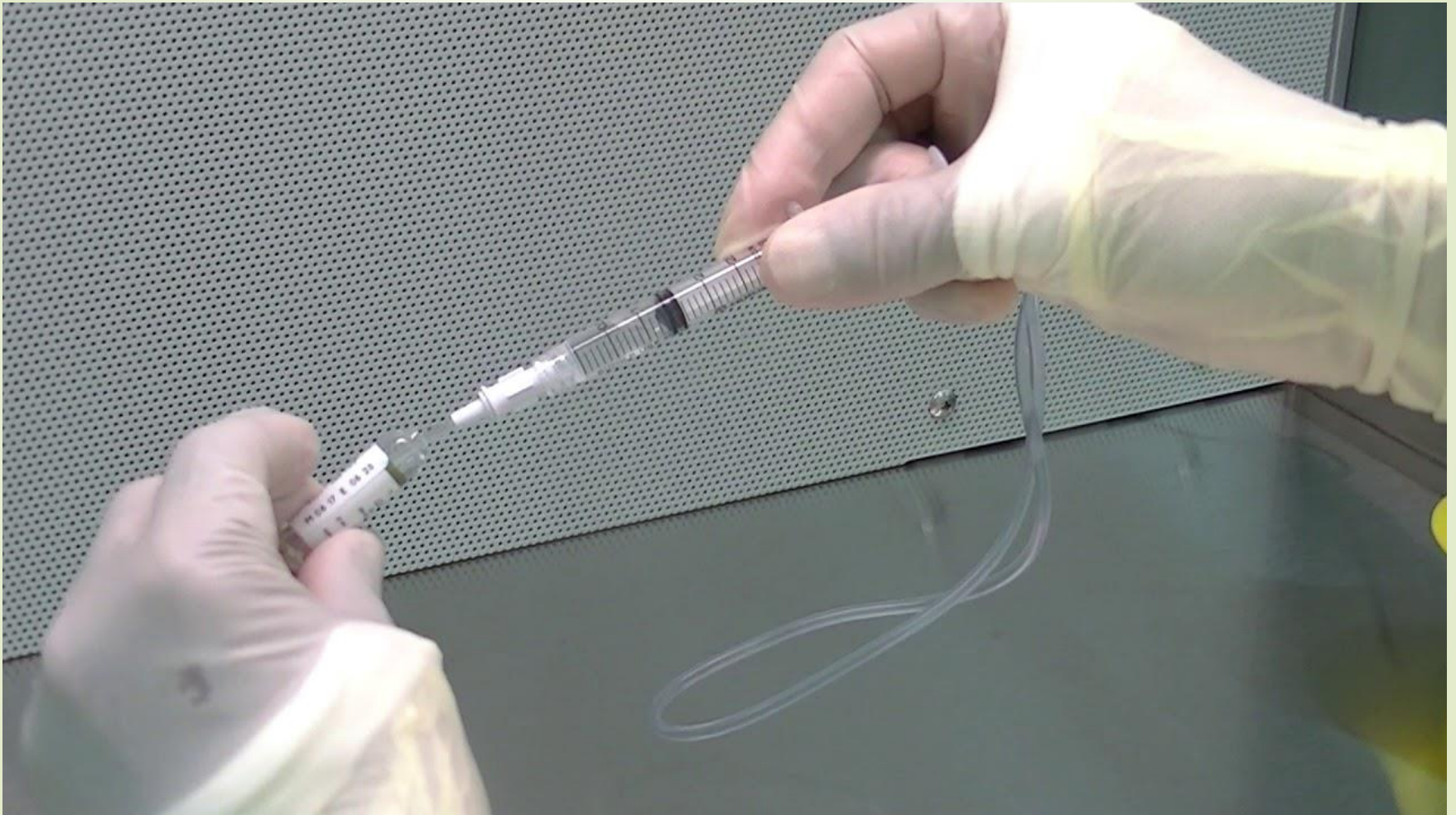
# BD™ Blunt Fill & Blunt Filter Needles

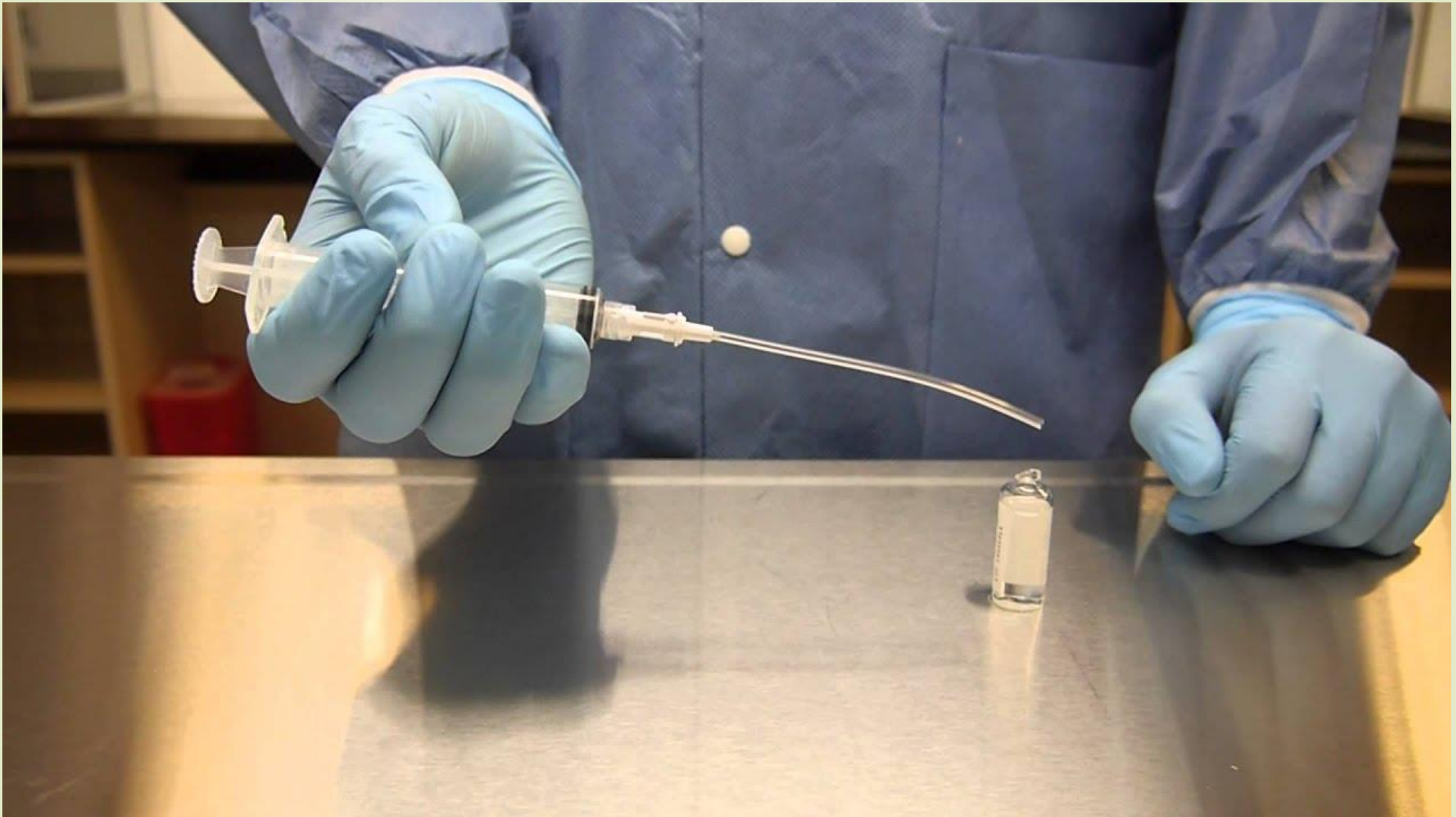












# Packaging of Parenteral Medications (Cont.)

## ➤ **Mix-o-vial**

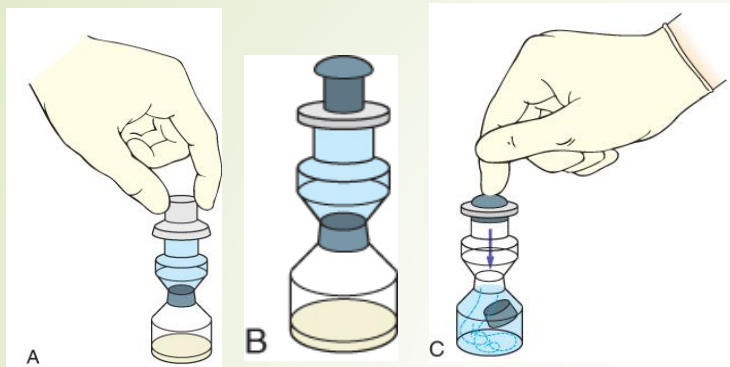
- Has two compartments—powder separated by stopper from sterile solution; mix before administration

## ➤ **Cartridge**

- Prefilled glass or plastic, fits into an applicator
- White tip can be removed to reveal rubber stopper

## ➤ **Prefilled syringe**

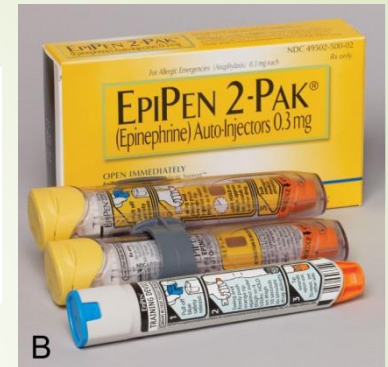
- Premeasured single dosage in a syringe with or without needle attached



**Figure 18-3** Mix-o-vial directions. A, Remove plastic lid protector. B, Powdered drug is in lower half; diluent is in upper half. C, Push firmly on the diaphragm-plunger. Downward pressure dislodges the divider between the two chambers. (Modified from Clayton BD, Willihnganz M: *Basic pharmacology for nurses*, ed 17, St Louis, 2017, Mosby.)



A

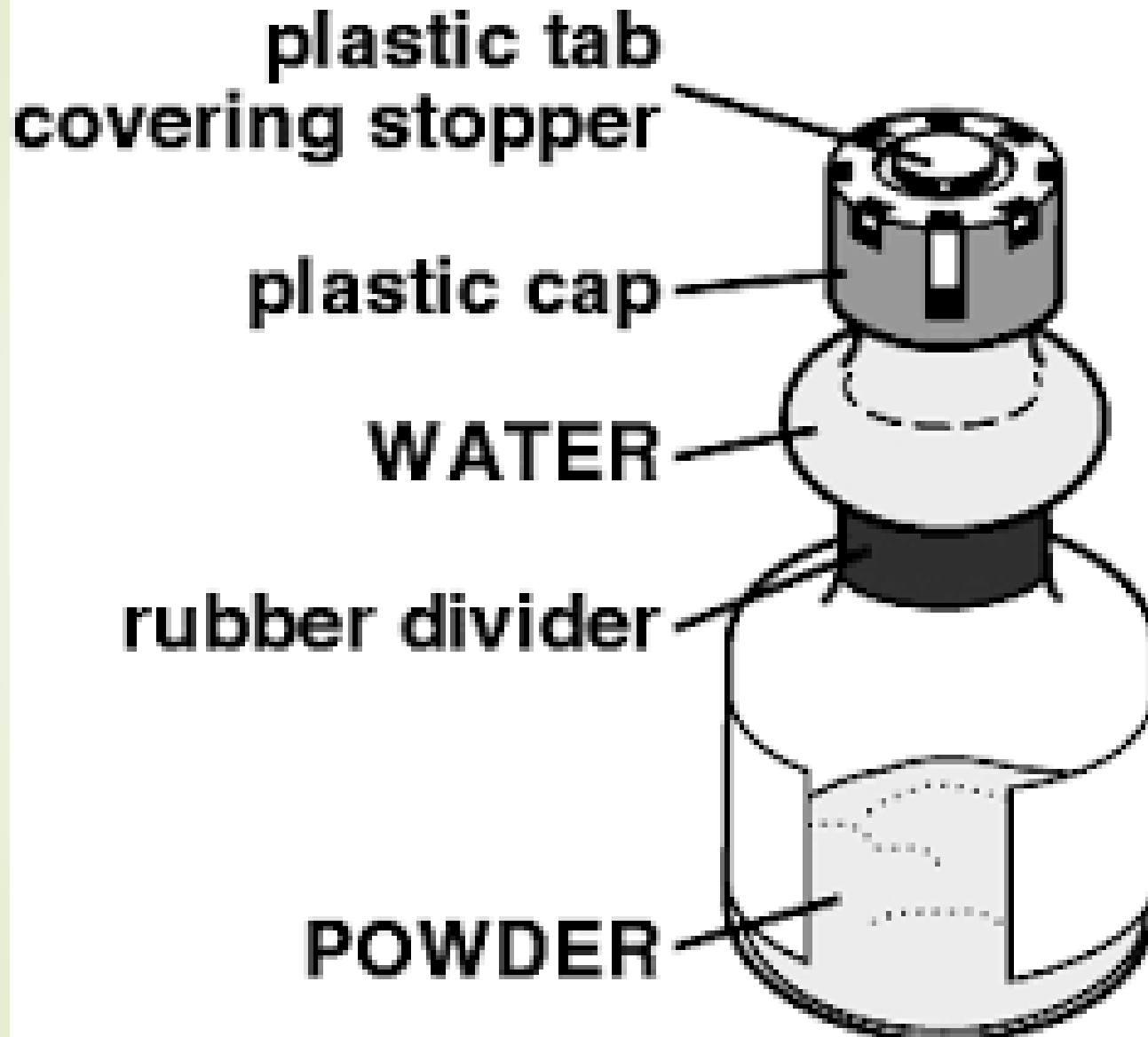


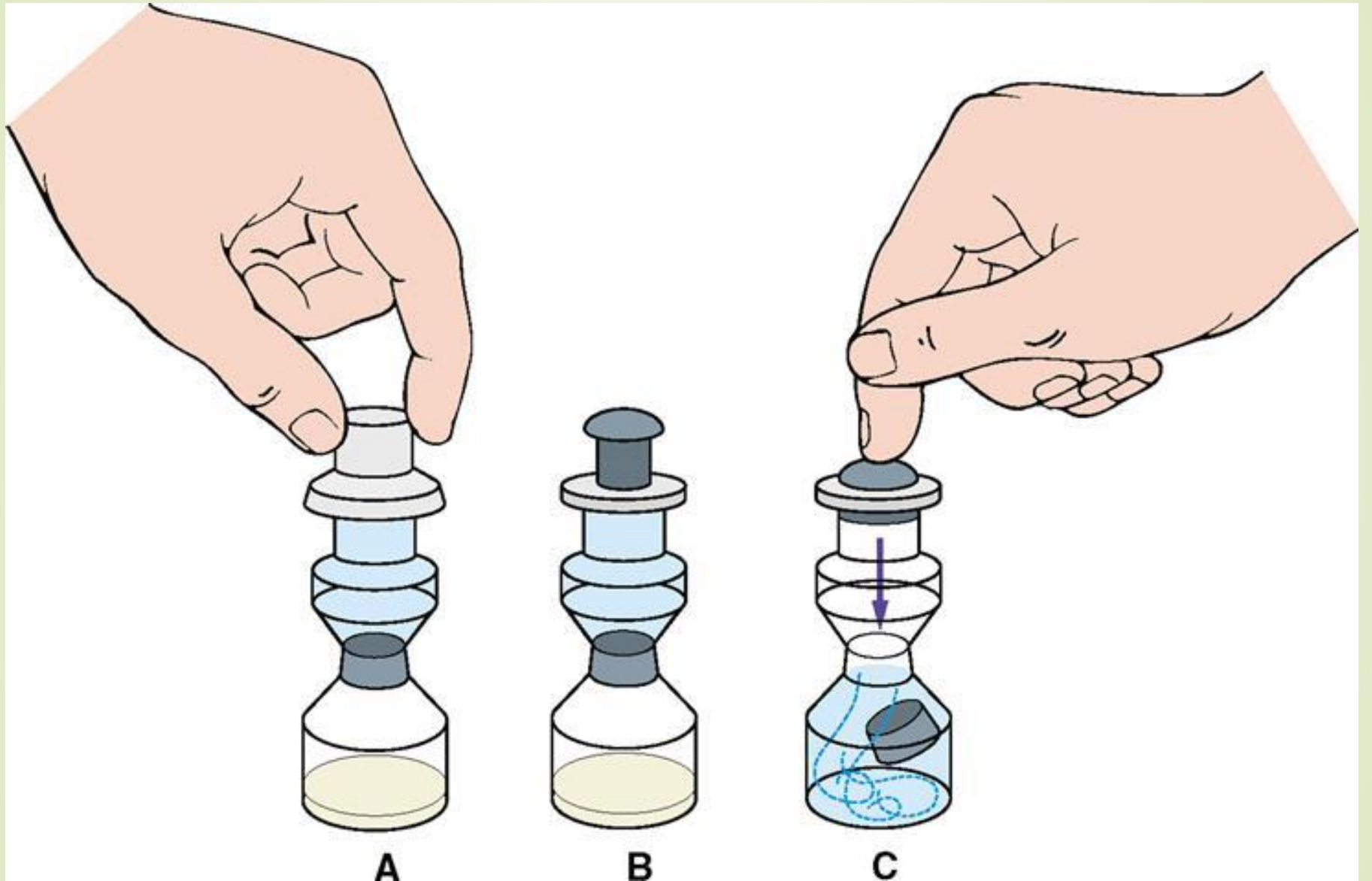
B

**Figure 18-4** A, Carpuject syringe holder and needleless, prefilled sterile cartridge. B, EpiPen 2-Pak. (A, From Hospira, Inc., Lake Forest, IL. B, From Mylan Specialty L.P., Basking Ridge, NJ.)

**In the Mix-O-Vial system, the vials are joined at the neck. Confirm the labels.**













**Prefilled syringe  
(single dose)**

# EpiPen<sup>®</sup> works in two simple steps



Form fist around the EpiPen<sup>®</sup> and pull off the blue safety release



Push the orange end hard into outer thigh so it "clicks" and hold for 10 seconds.\*



\* After administration of EpiPen<sup>®</sup> Adrenaline Auto-Injector, always seek medical attention - call 111



Form fist around EpiPen® and pull off  
**BLUE SAFETY RELEASE**



Push **ORANGE** end hard into outer thigh  
so it 'clicks' and hold for 10 seconds‡

‡After administration of EpiPen® Adrenaline Auto-Injector  
always seek medical attention – call 000.





# Case Study

Mrs. Garcia's fever has subsided, and she states she is feeling better. She has blood glucose checks with sliding scale insulin ordered every 6 hours. On the basis of the order, you will administer 2 units of Humulin Regular U-100 insulin subcut for a blood glucose level of 164 mg/dL.

Which syringe will you use to draw up the insulin, and what will you do before administering it?

# Case Study

ANSWER:

Choose the Lo-dose 30-unit insulin syringe for the best accuracy. Check the dose with another nurse using the 6 rights of medication administration. Also be sure to check the expiration date on the vial.

# Reading Parenteral Labels

- ▶ Depicts total volume in container
- ▶ Dosage strength expressed as the amount of medication contained in a volume of solution and expressed in mL
- ▶ READ LABELS CAREFULLY.

# Drugs Labeled in Percentage Strengths

- Label gives med in percent and in mg/mL.
- Express the number of grams of medication per 100 mL of solution (g/100mL).
- Typically prescribed in number of mL to give, rather than dosage.

NDC 10019-017-56

**Lidocaine 1%**  
**HCl Injection, USP**

**(10 mg/mL)**      **Rx only**

**FOR INFILTRATION AND NERVE BLOCK  
NOT FOR SPINAL OR EPIDURAL ANESTHESIA**

**30 mL Multiple Dose Vial**

**Baxter**      **SILEDERLE™**

Mfd. for **Baxter Healthcare Corporation** affiliate  
by: **Elkins-Sinn, Cherry Hill, NJ 08003**      400-741-01

Each mL contains lidocaine hydrochloride 10 mg, sodium chloride 7 mg and methylparaben 1 mg in Water for Injection, pH 5.0-7.0; sodium hydroxide and/or hydrochloric acid used, if needed, for pH adjustment.

**Usual Dosage:** See package insert for complete prescribing information.

**Store at controlled room temperature 15°-30°C (59°-86°F).**

Lot:      Exp.:



# Solutions Expressed in Ratio Strength

- Most commonly epinephrine
- Usually ordered by number of mL
- **CAUTION:** - may confuse 1:1,000 with 1:10,000



<p>NDC 61570-401-11</p> <p>STERI-VIAL®</p> <p><b>Adrenalin®</b> <b>Chloride Solution</b> (Epinephrine Injection, USP)</p> <p><b>1 mg per mL</b> <b>1:1000</b> <b>30 mL</b> <b>MULTIPLE DOSE VIAL</b></p>	<p><b>Rx only.</b> Each mL contains 1 mg of Adrenalin (epinephrine) as the hydrochloride, dissolved in Water for Injection, USP with sodium chloride added for isotonicity, 0.5% Chlorobutanol (chloroform derivative) as a preservative and not more than 0.15% sodium bisulfite as an antioxidant.</p> <p>Adrenalin Chloride Solution must not be brought into contact with oxidizing agents. The solution is also quickly decomposed by iron salts and alkalies.</p> <p><b>Note</b>—Do not use the solution if it is pinkish or darker than slightly yellow or if it contains a precipitate. A sterile solution intended for intramuscular or subcutaneous injection. When diluted, it may also be administered intracardially or intravenously.</p> <p><b>Usual Dosage</b>— See package insert for complete prescribing information.</p> <p>Vial and contents must be discarded 30 days after initial use.</p> <p><b>Store between 15° and 25°C (59° and 77°F). Protect from light and freezing.</b></p> <p>Manufactured for: Monarch Pharmaceuticals, Inc. Bristol, TN 37620 By: Parkedale Pharmaceuticals, Inc. Rochester, MI 48307</p> <p><b>401G011</b></p>
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# Parenteral Medications Measured in Units

- ▶ Heparin, Pitocin, insulin, and penicillin
- ▶ Units measure drug in terms of action.



10 mL MULTIPLE DOSE Vial  
NDC 0641-2440-41

**HEPARIN**  
SODIUM INJECTION, USP

**1000 units / 1 mL**  
FOR IV OR SC USE

DERIVED FROM  
PORCINE INTESTINES  
Caution: Federal law prohibits dispensing without prescription.  
Product Code 2440-41  
LOT A-24409  
EXP.

Usual Dose: See enclosed insert for complete prescribing information.  
Each mL contains heparin sodium 1000 USP units, sodium chloride 8.6 mg and benzyl alcohol 0.01 mL in Water for Injection, pH 5.0-7.5; sodium hydroxide and/or hydrochloric acid added, if needed, for pH adjustment.


**esi** ELKINS-SINN, INC. Cherry Hill, NJ 08034  
A subsidiary of A. H. Robins Company

# Parenteral Medications in Milliequivalents

- ▶ Potassium and sodium bicarbonate
- ▶ Specific to medication being used
- ▶ Measure electrolytes and express ionic activity.

<p><b>LyphoMed<sup>®</sup></b></p> <p><b>SODIUM BICARBONATE</b> INJECTION, USP</p> <p><b>8.4%</b></p> <p>50 mEq/50 mL (1 mEq/mL)</p> <p>FOR SLOW INTRAVENOUS USE</p> <p>pH 7.0 – 8.5</p> <p>50 mL</p> <p>Single Dose Vial</p>	<p>N 0469-0019-25 Sterile. Nonpyrogenic. 19-50</p> <p>Each mL contains: Sodium Bicarbonate 84 mg; Water for Injection, q.s. pH adjusted with carbon dioxide if necessary and as a result, pressure may be present. 2000 mOsmol/L</p> <p>Usual Dose: See Package Insert.</p> <p><b>WARNING:</b> No preservative added. Unused portion of vial should be discarded.</p> <p><b>DO NOT USE IF PRECIPITATE IS VISIBLE.</b></p> <p><b>CAUTION:</b> Federal (USA) law prohibits dispensing without prescription.</p> <p>LyphoMed, Inc., Rosemont, IL 60018</p> <p>1A-87</p>
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# Calculating Parenteral Doses

- Use same rules and methods as for oral calculations.
- Convert if necessary.
- 3-mL syringe: calculate to hundredths, round to nearest tenth.
- 1-mL syringe: calculate to thousandths, round to nearest hundredth.
- NEVER round to the whole number 

# Calculating Parenteral Doses (Cont.)

- ▶ For injectable meds, consider
  - ▶ condition of the client
  - ▶ site selected
  - ▶ absorption and consistency of med.
- ▶ When the amount exceeds the amount that can be administered in a single site, divide into two injections.
- ▶ It is critical to choose the correct size syringe to ensure accurate measurement.

# Calculating Parenteral Doses

## Injectable Guidelines

### Maximum Volume to Administer

- ▶ Intramuscular:
  - ▶ Average adult = 3 mL (deltoid muscle = 1 mL)
  - ▶ Children ages 6–12 years = 2 mL
  - ▶ Children ages  $\leq 5$  years = 1 mL
- ▶ Subcutaneous:
  - ▶ Adults = 1 mL
- ▶ Intravenous:
  - ▶ Injectable medications should be added to IV solutions to produce a volume greater than 5 mL.

# Mixing Medications in the Same Syringe

- ▶ Two meds may be mixed
  - ▶ IF they are compatible with each other
  - ▶ AND the total amount does not exceed the amount that can be safely administered in a site
- ▶ Calculate the dosage to be administered to the nearest tenth for each med.
- ▶ Add the results to find the total volume.



# Problem:

Order: Gentamicin 75 mg IM q8h

Available: Gentamicin labeled as 40 mg per mL

How many mL will you administer?

# Dimensional Analysis Method

$$x \text{ mL} = \frac{1 \text{ mL}}{40 \text{ mg}} \times \frac{75 \text{ mg}}{1}$$
$$x = \frac{75}{40}$$
$$x = 1.87 \text{ mL} = 1.9 \text{ mL}$$

# Points to Remember

- ▶ Read med labels and syringe calibrations carefully.
- ▶ There is no conversion of units and mEq.
- ▶ Do not exceed the dosage administration guidelines.
- ▶ 1 mL syringe calibrated in 0.01 mL. Round to the nearest hundredth.
- ▶ 3 mL syringe calibrated in 0.1 mL. Round to the nearest tenth.
- ▶ 5 -, 6 -, and 12 mL syringes calibrated in 0.2 mL. Round to nearest tenth.

# Practice Problems



**20 mL** Single-dose Ampul **NDC 0074-7386-01**

**AMINOPHYLLINE** Each mL contains aminophylline (calculated as the dihydrate) 25 mg (equivalent to 19.7 mg/mL of anhydrous theophylline). May contain an excess of ethylenediamine for pH adjustment. pH 8.8 (8.6 to 9.0). Discard unused portion. Sterile, nonpyrogenic. For I.V. use. Usual dose: See insert.

**Inj., USP** **Rx only**

**500 mg (25 mg/mL)**

**Protect from light.**

**DO NOT USE IF CRYSTALS HAVE SEPARATED FROM SOLUTION.** 58-3947-2/R12-12/02

ABBOTT LABORATORIES, NORTH CHICAGO, IL 60064, USA

100 00 0 112000000 1 000 001

- What is the total volume in the ampule?
- What is the dosage strength?
- The order reads:  
250 mg Aminophylline IV over 30 minutes now  
How many mL are needed and what syringe would you use to measure the dosage?

# Practice Problems



**20 mL** Single-dose Ampul **NDC 0074-7386-01**

**AMINOPHYLLINE** Each mL contains aminophylline (calculated as the dihydrate) 25 mg (equivalent to 19.7 mg/mL of anhydrous theophylline). May contain an excess of ethylenediamine for pH adjustment. pH 8.8 (8.6 to 9.0). Discard unused portion. Sterile, nonpyrogenic. For I.V. use. Usual dose: See insert.

**Inj., USP** **Rx only**

**500 mg (25 mg/mL)**

**Protect from light.**

**DO NOT USE IF CRYSTALS HAVE SEPARATED FROM SOLUTION.**

58-3947-2/R12-12/02

ABBOTT LABORATORIES, NORTH CHICAGO, IL 60064, USA

100 00 0 110000000 1 000 001

- What is the total volume in the ampule? **20 mL**
- What is the dosage strength?
- The order reads:  
250 mg Aminophylline IV over 30 minutes now  
How many mL are needed and what syringe would you use to measure the dosage?

# Practice Problems



**20 mL** Single-dose Ampul **NDC 0074-7386-01**

**AMINOPHYLLINE** Each mL contains aminophylline (calculated as the dihydrate) 25 mg (equivalent to 19.7 mg/mL of anhydrous theophylline). May contain an excess of ethylenediamine for pH adjustment. pH 8.8 (8.6 to 9.0). Discard unused portion. Sterile, nonpyrogenic. For I.V. use. Usual dose: See insert.

**Inj., USP** **Rx only**

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**Protect from light.**

**DO NOT USE IF CRYSTALS HAVE SEPARATED FROM SOLUTION.** 58-3947-2/R12-12/02

ABBOTT LABORATORIES, NORTH CHICAGO, IL 60064, USA

100 00 0 110000000 1 000 001

a. What is the total volume in the ampule? **20 mL**

b. What is the dosage strength? **25 mg/mL**

c. The order reads:

250 mg Aminophylline IV over 30 minutes now

How many mL are needed and what syringe would you use to measure the dosage?

# Practice Problems



The image shows a white rectangular label for a single-dose ampule of Aminophylline Inj., USP. The label features a stylized 'A' logo on the left. The text on the label includes: '20 mL Single-dose Ampul', 'NDC 0074-7386-01', 'AMINOPHYLLINE Inj., USP Rx only', '500 mg (25 mg/mL)', 'Protect from light.', 'DO NOT USE IF CRYSTALS HAVE SEPARATED FROM SOLUTION.', 'Each mL contains aminophylline (calculated as the dihydrate) 25 mg (equivalent to 19.7 mg/mL of anhydrous theophylline). May contain an excess of ethylenediamine for pH adjustment. pH 8.8 (8.6 to 9.0). Discard unused portion. Sterile, nonpyrogenic. For I.V. use. Usual dose: See insert.', '58-3947-2/R12-12/02', and 'ABBOTT LABORATORIES, NORTH CHICAGO, IL 60064, USA'. At the bottom, there is a barcode.

a. What is the total volume in the ampule? **20 mL**

b. What is the dosage strength? **25 mg/mL**

c. The order reads:

250 mg Aminophylline IV over 30 minutes now

How many mL are needed and what syringe would you use to measure the dosage? **10 mL in 10 mL syringe**

# Case Study

Later in your shift, you notice increasing edema to Mrs. Garcia's lower extremities. She tells you that she feels slightly short of breath. Her oxygen saturation is 90% on room air and you place 2 L of O<sub>2</sub> via nasal cannula. You auscultate coarse crackles to bilateral lung bases and immediately call the respiratory therapist and the physician, who tells you to discontinue IV fluid and administer Lasix 20 mg IM stat.

# Case Study

- How many mL will you administer?
- What syringe will you use?
- Where will you inject the medication?

NDC 63323-280-02 28002

**FUROSEMIDE**

*INJECTION, USP*

**20 mg/2 mL**

(10 mg/mL)  
For IM or IV Use Rx only  
**2 mL** Single Dose Vial  
**Preservative Free**  
Discard unused portion.  
**PROTECT FROM LIGHT.**  
Do not use if discolored.  
**Abraxis**  
*Pharmaceutical Products*  
Schaumburg, IL 60173

401803C

LOT/EXP



3 63323-280-02 4

# Case Study

- How many mL will you administer? **2 mL**
- What syringe will you use?
- Where will you inject the medication?

NDC 63323-280-02 28002

**FUROSEMIDE**

*INJECTION, USP*

**20 mg/2 mL**

(10 mg/mL)  
For IM or IV Use Rx only  
**2 mL** Single Dose Vial  
**Preservative Free**  
Discard unused portion.  
**PROTECT FROM LIGHT.**  
Do not use if discolored.  
**Abraxis**  
*Pharmaceutical Products*  
Schaumburg, IL 60173

401803C

LOT/EXP



3 63323-280-02 4

# Case Study

a. How many mL will you administer? **2 mL**

b. What syringe will you use? **3 mL**

c. Where will you inject the medication?

NDC 63323-280-02 28002

**FUROSEMIDE**

*INJECTION, USP*

**20 mg/2 mL**

(10 mg/mL)  
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**2 mL** Single Dose Vial  
**Preservative Free**  
Discard unused portion.  
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Do not use if discolored.  
**Abraxis**  
*Pharmaceutical Products*  
Schaumburg, IL 60173

401803C

LOT/EXP



3 63323-280-02 4

# Case Study

a. How many mL will you administer? **2 mL**

b. What syringe will you use? **3 mL**

c. Where will you inject the medication?

**Administer into a large muscle**

**(3 mL exceeds injectable guidelines for the deltoid muscle).**

NDC 63323-280-02 28002

**FUROSEMIDE**

*INJECTION, USP*

**20 mg/2 mL**

(10 mg/mL)  
For IM or IV Use Rx only  
**2 mL** Single Dose Vial  
**Preservative Free**  
Discard unused portion.  
**PROTECT FROM LIGHT.**  
Do not use if discolored.  
**Abraxis**  
*Pharmaceutical Products*  
Schaumburg, IL 60173

401803C

LOT/EXP



3 63323-280-02 4

**The End**





# Chapter 12

## Parenteral Dosages



# Lesson 12.1

## Parenteral Dosages

1. Using the dimensional analysis method to solve parenteral dosage problems
2. Converting all measures within the problem to equivalent measures in one system of measurement if required
3. Using a proportion to solve parenteral dosage problems
4. Using the stated formula as an alternative method of solving parenteral dosage problems



# Parenteral Dosages (1 of 2)

- Review **Figure 12-1** to view intramuscular, subcutaneous, and intradermal injections, with comparison of the angles of insertion
- May be diluted and administered by themselves
- May be administered in conjunction with existing IV fluids
- May be administered in addition to IV fluids



# Parenteral Dosages (2 of 2)

- Packaging of parenteral medications:
  - Ampules
  - Vials
  - Mix-O-Vials
  - Syringes

# Syringes

- Parts of a syringe
  - Tip
  - Barrel
  - Plunger
- Types of syringes
  - Hypodermic
  - Tuberculin
  - Insulin



# Needleless System

- ▶ Why does Occupational Safety and Health Administration recommend the administration of parenteral medications with a needleless system?
  - ▶ To protect both patient and nurse
  - ▶ Because the system provides a shield to cover device

# Calculation of Parenteral Drug Dosages: Dimensional Analysis Method

► For example:

► The order states Kantrex 200 mg IM q6 h. Kantrex is supplied 0.5 g/2 mL. How many milliliters will the nurse administer?



# Calculation of Parenteral Drug Dosages: Proportion Method

➤ For example:

➤ The order states D5W 500 mL plus KCl 20 mEq at 42 mL/h IV. KCl is supplied in a 20-mL ampule containing 40 mEq. How many milliliters of KCl will be added to the 500 mL of D5W?

# Parenteral Drug Dose Calculation: Alternative Formula Method

- ▶ For example:
  - ▶ The physician orders morphine 30 mg IM q4 h prn for pain. Morphine gr i/5 mL is available. How many milliliters will the nurse administer?