Chapter 13

Insulin

Insulin: Objectives

After reviewing this chapter, you should be able to

1. identify important information on insulin labels.
2. identify various methods for insulin administration.
3. read calibrations on 30-, 50-, and 100-unit syringes.
4. measure insulin in single dosages.

Insulin: Objectives (Cont.)

5. measure combined insulin dosages.
6. calculate doses for U-500 Insulin using a 1 mL syringe.
7. calculate doses for U-500 Insulin to measure using a U-100 insulin syringe.

Background: Insulin

- Natural hormone secreted by the pancreas
- Used to control blood sugar levels in people who cannot produce enough (e.g., in diabetes mellitus)
- Doses are measured in units
  - Typically U-100 (100 units per mL)
  - U-500 Rare—(500 units per mL) for diabetic clients who have blood sugars that fluctuate to extremely high levels

SAFETY ALERT!

HIGH ALERT MEDICATION

Accuracy in insulin preparation and administration is crucial. Inaccurate dosages can lead to serious or life-threatening effects!

U-500 Insulin

Notice the red "High Potency" warning

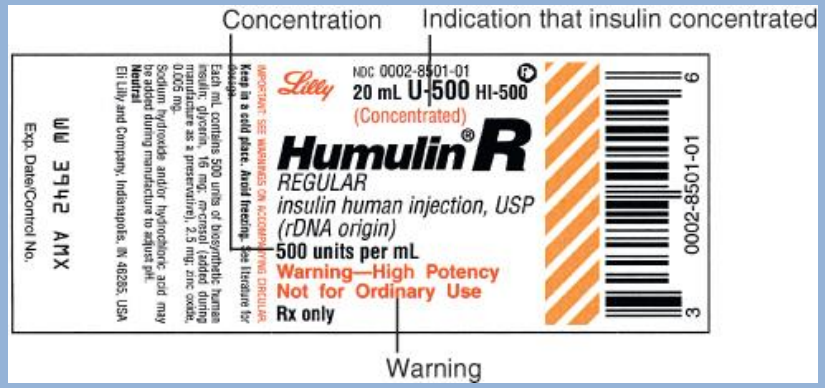


Figure 20-1 Label for U-500 insulin.

SAFETY ALERT!

U-500 insulin is **FIVE TIMES** as concentrated as U-100. It is crucial to **USE EXTREME CAUTION** when administering U-500 insulin to prevent unintentional overdose, which can result in irreversible insulin shock and death for a client.

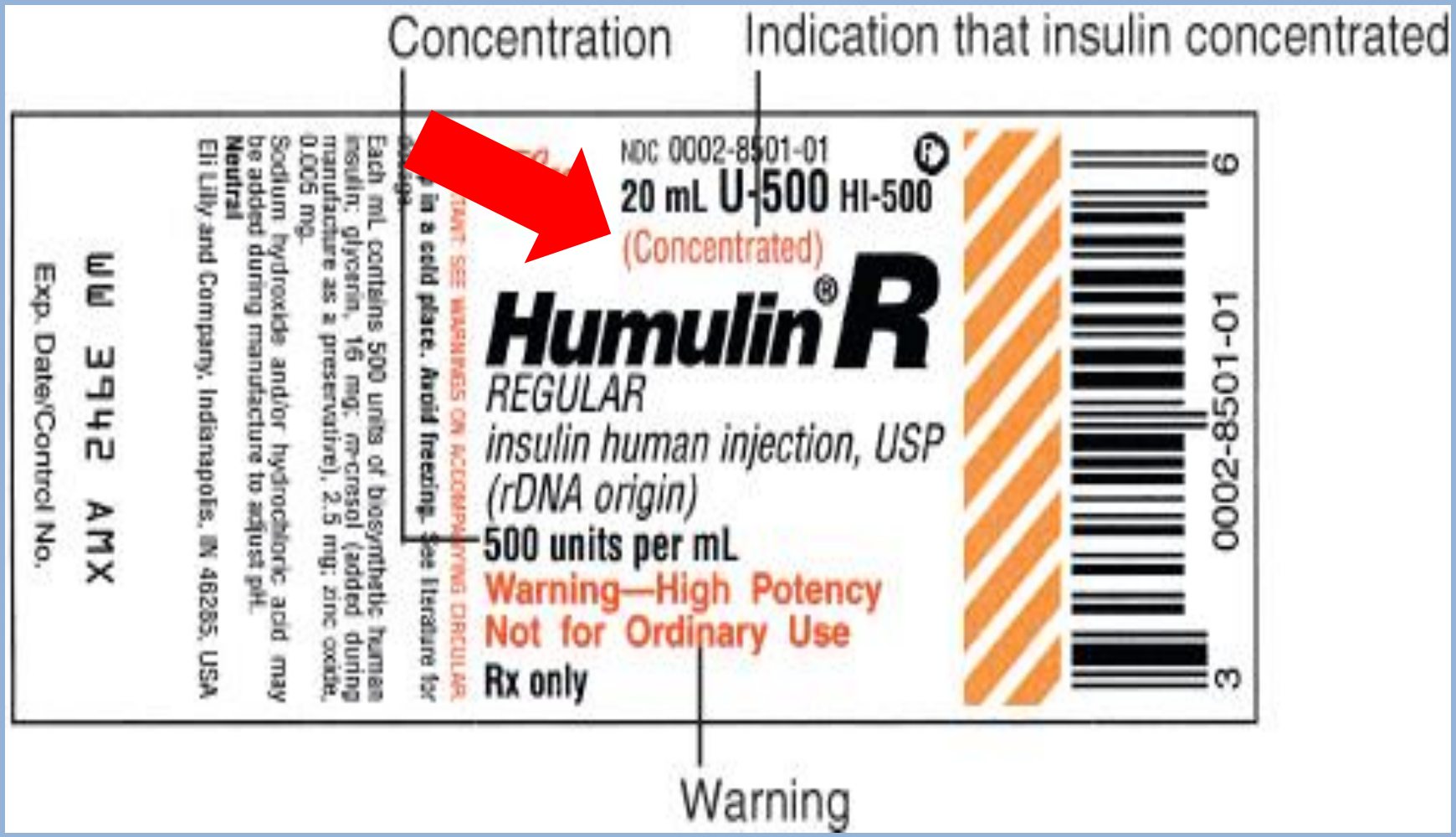


Figure 20-1 Label for U-500 insulin.

Common Medication Errors With Insulin

- Knowledge deficits regarding insulin concentrations (specifically that “U-100” means the concentration is 100 units per mL) and the differences between insulin syringes and other parenteral syringes
- Reading medication labels incorrectly
- Incorrect preparation of insulin for IV infusion
- Mental slips leading to confusion between heparin and insulin, because both are measured in units, administered subcutaneously or intravenously, and are supplied in multidose vials that may look similar

SAFETY ALERT! 

Nurses must correctly interpret insulin orders and use the correct syringe to measure insulin for administration.

Accuracy in insulin preparation and administration is crucial to prevent administration of inaccurate dosages, which can result in serious or life-threatening effects.

Types of Insulin by Action Time

- Rapid-acting:
  - clear solution—can mix
  - Subcut *or IV*
  - *Onset 5–15 minutes*
  - Humalog (lispro), Novolog (aspart), Apidra (glulisine)
- Short-acting:
  - clear solution—can mix
  - Subcut *or IV*
  - *Onset 30–45 min*
  - Regular (R)
- Intermediate-acting
  - Cloudy solution—can mix
  - Subcut *only*
  - Onset 1–3 hrs
  - NPH (N)

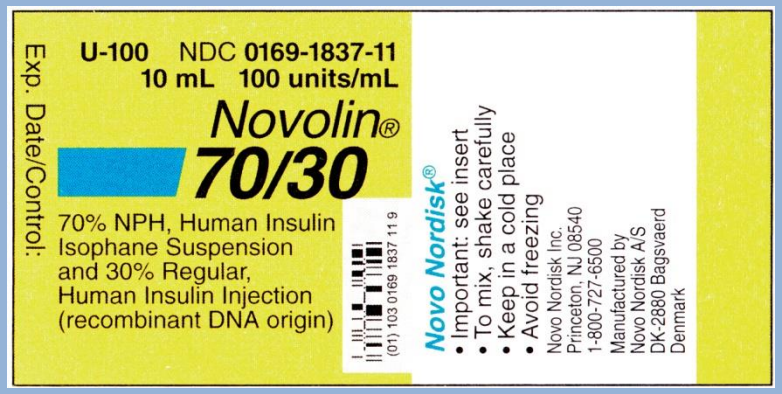
Types of Insulin (Cont.)

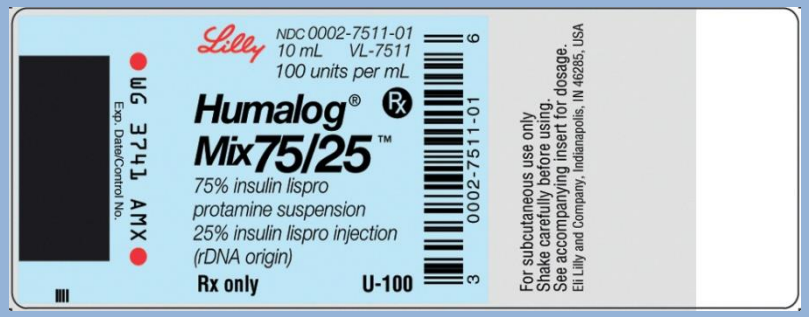
- *Long-acting*:
  - Lantus (insulin glargine)
    - Clear and cannot be mixed
    - Subcut only
    - No peak, 24-hr duration
    - Give at same time daily
  - Levimir (detemir)
    - Not as long-lasting as Lantus
    - May need two daily doses
    - Clear and cannot be mixed
    - Subcut only
  - Tresiba (insulin degludec injection)
    - Clear and cannot be mixed
    - Subcut only
    - No peak, 24 hr duration
    - Available in the FlexTouch pen in two concentrations
      - 100 units per mL and 200 units per mL.

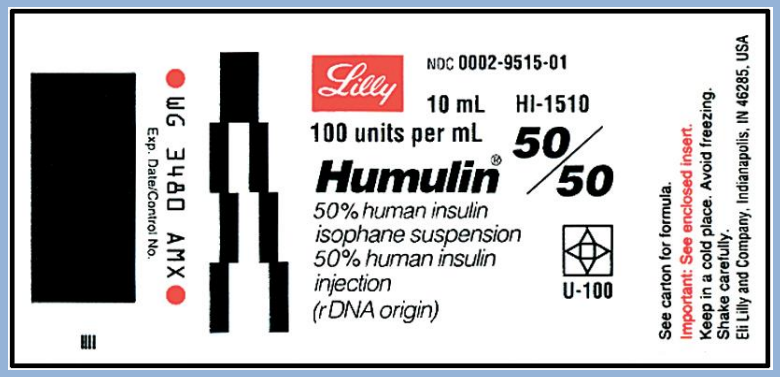
Figure 20-2 Labels for insulin grouped by action times. A, Rapid acting (fast acting). B, Short acting. Labels for insulin grouped by action times. C, Intermediate acting. D, Long acting.

Fixed Combinations of Insulin

- Popular admixtures of fast- and intermediate-acting insulins
- Available in vials and pens
- Read an insulin label carefully.
- Combine mealtime and basal insulin
  - Novolin 70/30 = 70% NPH with 30% of regular
  - If 30 units Novolin 70/30 is to be given, client receives 21 unit of NPH and 9 units of regular







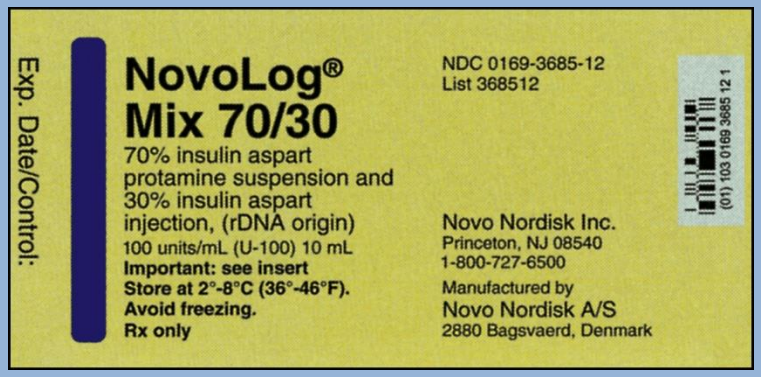


Figure 20-3 Fixed-combination insulins.

Case Study

Mrs. Garcia receives two types of insulin daily:

Humulin R U-100 insulin

Lantus U-100 insulin

Are these rapid, short, intermediate, or long-acting insulins?

Case Study Cont.)

ANSWER:

Humulin R is short acting.

Lantus is long acting.

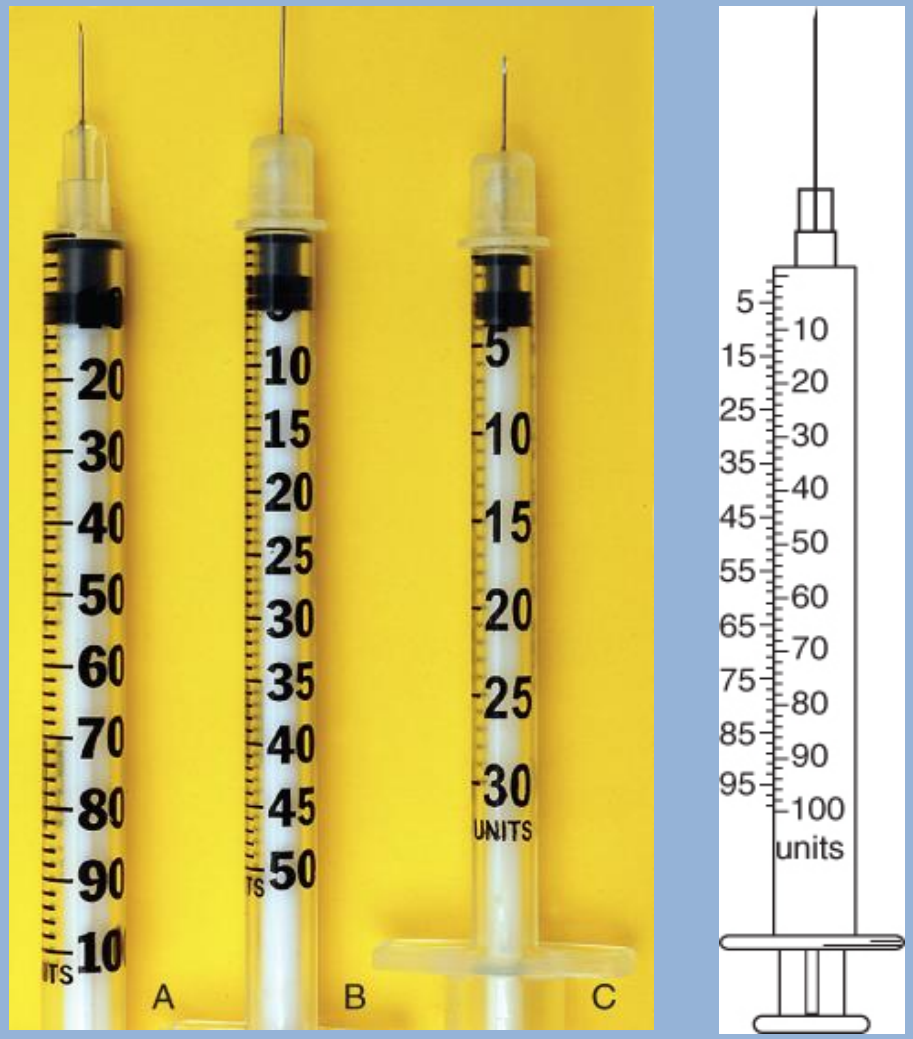


Figure 20-4 Types of insulin syringes. A, Single-scale (100 units). B, Lo-Dose insulin syringe (50 units). C, Lo-Dose insulin syringe (30 units). D, Double-scale syringe (100 units).

Insulin Administration

- Subcutaneous injection
  - Major route
- Insulin Pumps
  - Deliver rapid or short-acting insulin continuously for 24 hr a day through a catheter placed under the skin.
  - Basal: delivered continuously
  - Bolus: delivered before meals
- Insulin Pens
  - Looks like an ink pen when capped.
  - Disposable or with replaceable insulin cartridges

Figure 20-5 A, Humulin N pen with no cap. B, Paradigm® 515 insulin pump and Paradigm Link™ blood glucose monitor. C, Prefilled pens, Humulin 70/30 and Humulin N. (A and C, Copyright © Eli Lilly and Company. All rights reserved. Used with permission. ® Humalog and Humulin are registered trademarks of Eli Lilly and Company. B, From Medtronic, Minneapolis, MN.)

Measuring Insulin in a U-100 Syringe

- No calculations are required.
- Check calculations and preparations with 2 nurses.
- The insulin syringe is designed to measure insulin in units, and insulin is ordered in units.
- Various types of syringes are used:

  Lo-Dose:
  - 0.5 mL capacity to deliver 50 units
  - 0.3 mL capacity to deliver 30 units

  Two types of 1 mL syringe:
  - Single scale
  - Odd-even scale—read on appropriate side for the dose being delivered (e.g., 16 units on even side, 17 units on odd)

SAFETY ALERT!

Administer insulin in an insulin syringe used only for the administration of U-100 insulin.

Do not use an insulin syringe to measure other medications that are measured in units. Syringes of 30 and 50 units measure a smaller volume of insulin but are intended for the measurement of U-100 insulin only.

Use the smallest capacity insulin syringe available to ensure the accuracy of dosage preparation.

U-500 Insulin

- 500 units per mL
- Check insulin label carefully.
- Clarify and uncertainty- NEVER ASSUME!
- Always calculate and double-check the volume ordered before administering.
- Have another nurse perform an *independent* verification.
- Administer U-500 insulin with a 1 mL syringe.
- Educate the client about U-500 Insulin and dosages.

U-500 Insulin (Cont.)

- Example Order:

  Humilin Regular U-500 insulin 155 units (0.31) mL subcut stat

  - Verify no conversion needed
  - Think 155 units of U-500 insulin is < 1/2 mL
  - Calculate:

- $X \text{ mL} = \dfrac{1 \text{ mL}}{500 \cancel{\text{ units}}} \times \dfrac{155 \cancel{\text{ units}}}{1}$
- $X =$ 0.31 mL (verifies the amount in order)

Insulin Orders: Scheduled

- Must be written clearly and must include the following:
  - Brand name (e.g., “HumulinR”—human origin and rapid onset)
  - Number of units to be administered (e.g., “20 units”)
  - Route (e.g., “subcut”)
  - Time (e.g., “½ hr before meals”)
  - Strength of solution (e.g., “U-100” or “70/30”)

SAFETY ALERT! 

NEVER USE “U” FOR UNITS, WRITE OUT THE WHOLE WORD. “U” HAS BEEN MISTAKEN FOR A ZERO RESULTING IN A 10-FOLD OVERDOSE!

Insulin Orders: Coverage

- Referred to as “Sliding Scale”
  - Avoid “SS” or “SSI”—confused with apothecary.
- Order rule is same as for scheduled insulin, with additional guidelines to “cover”:
  - Times to draw CBG (capillary blood glucose) (e.g., “q6h and p.r.n.” or “before meals and at bedtime”)
- Most sliding scales use regular insulin or lispro.
- Dosage specified on basis of specific blood glucose range
- Know your institution’s policies and procedure.

Sample Sliding Scale

HumulinR U-100 based on result of finger stick q8h:

CBG of 0–180 mg per dL…….No coverage
CBG of 181–240 mg per dL…….2 units subcut
CBG of 241–300 mg per dL…….4 units subcut
CBG of 341–400 mg per dL…….4 units subcut
CBG greater than 400 per dL…..8 units subcut and call health care provider. Repeat CBG in 2 hr.

Sliding Scale Insulin Orders

- *American Nurse Today* (2011) article "Controlling blood glucose levels in hospital patients: Current recommendations" indicates sliding scale insulin regimen is not ideal:
  - Largely ineffective because it treats hyperglycemia after it occurs rather than preventing it
  - Can be dangerous
  - Likely to remain unmodified throughout hospital stay when prescribed on admission
  - Exacerbation of hyper- and hypoglycemia has increased the risk of poor clinical outcomes and even death

Sliding Scale Insulin Orders (Cont.)

- *The* American Association of Clinical Endocrinologists and the American Diabetes Association recommends:
  - Scheduled Subcut insulin
  - Basal insulin uses long-acting insulin
  - Nutritional and Correctional components
  - Correction dose is determined by the patient's insulin sensitivity and current blood glucose level.

Measuring Two Types of Insulin in *Same* Syringe

- *ALWAYS* draw up regular or other short-acting insulin *FIRST* (clear solutions); then draw up cloudy intermediate-acting (cloudy solutions)
  - *The insulin that acts* first *is drawn up* first.
- Mix only same types such as HumulinR with HumulinN or NovolinR with Novolin N.
- NEVER mix Lantus or Levemir (clear).

SAFETY ALERT! 

ALWAYS CHECK EACH STEP TO VERIFY DOSAGES WITH ANOTHER NURSE!

Sequence for Mixing Insulins

1. Gently roll vials in palm to even suspension.
2. Cleanse tops of both vials with alcohol.
3. Inject air equal to dose of cloudy insulin into that vial first (do not touch solution with needle).
4. Remove needle from cloudy vial.
5. Using same syringe, inject air equal to needed dose into clear type mixable insulin; invert bottle and withdraw.

Sequence for Mixing Insulins (Cont.)

6. Remove needle from clear insulin vial and check for bubbles (small bubbles can alter dose). Tap, if necessary, to remove bubbles.
7. Invert cloudy insulin vial, insert needle into solution, and withdraw to desired total dosage. Stabilize plunger to avoid contamination with or loss of clear insulin.
8. The total volume should equal the total number of units ordered.

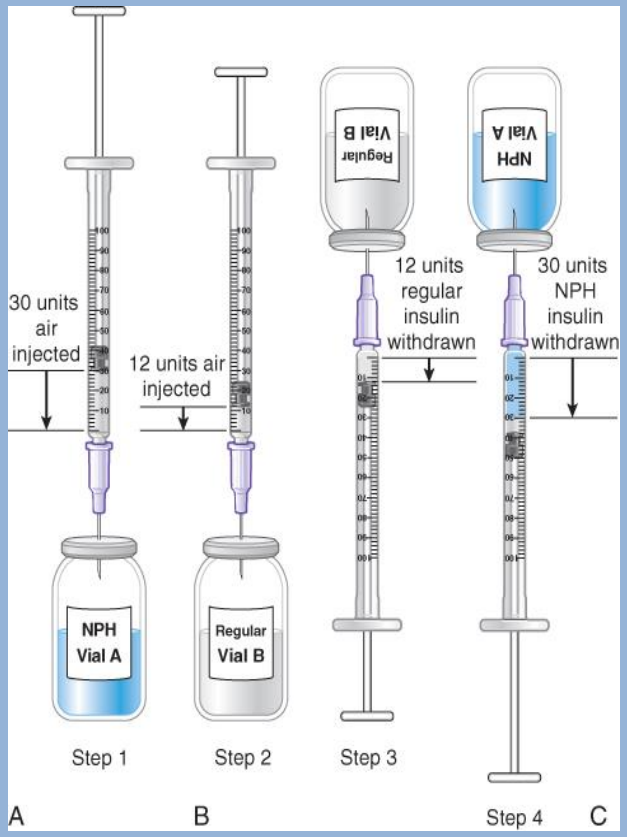


Figure 20-6 Mixing insulins. Order: Humulin N (NPH) U-100 30 units subcut, Humulin R (Regular) U-100, 12 units subcut. A, Inject 30 units of air into Humulin N first; do not allow needle to touch insulin. B, Inject 12 units of air into Humulin R and withdraw 12 units; withdraw needle. C, Insert needle into vial of Humulin N and withdraw 30 units. Total 30 units Humulin N (NPH) + 12 units Humulin R (Regular) = 42 units. (Modified from Harkreader H, Hogan MA: Fundamentals of nursing: caring and clinical judgment, ed 3, St. Louis, 2007, Saunders.)

SAFETY ALERT!

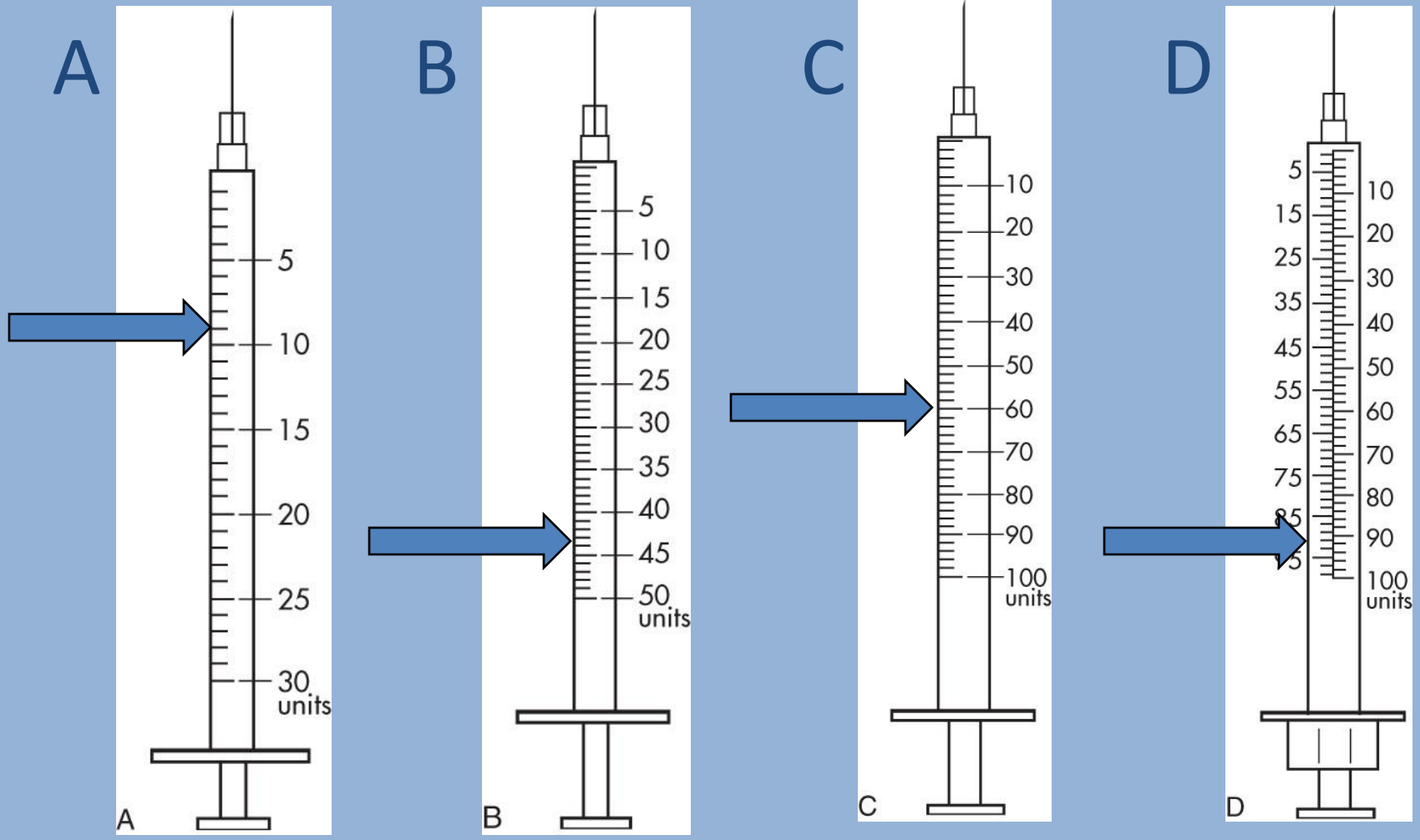
- Insulin doses are always checked by two (2) nurses!
- Have second nurse tell you what you have through each step—do not tell the nurse what you have drawn.
- Show second nurse your syringe and the vials.

SAFETY ALERT!

- NEVER combine long-acting insulin types (Lantus, Levemir) or dilute them with any other insulin preparation.

Practice Problems

Indicate the dosages shown by the arrows



Case Study

Mrs. Garcia has returned from surgery and has exhibited decreased signs and symptoms of infection. She needs blood glucose checks with sliding scale insulin ordered every 6 hours. On the basis of the order, you will administer 4 units of Humulin R U-100 insulin subcut for a blood glucose level of 196 mg/dL. She also has 30 units of Lantus U-100 insulin subcut ordered.

What are the steps to draw up the two insulins?

Case Study (Cont.)

ANS:

Use TWO separate syringes to draw up the insulins. NEVER mix long-acting insulins (Lantus). Have another nurse verify each dose and document per facility policy.

Practice Problems

- How much insulin would you administer for a CBG level of 331mg/dL on the basis of the following sliding scale order?

HumulinR U-100 based on result of finger stick q8h:
CBG of 0–180 mg per dL…….No coverage
CBG of 181–240 mg per dL…….2 units subcut
CBG of 241–300 mg per dL…….4 units subcut
CBG of 341–400 mg per dL…….4 units subcut
CBG > 400 per dL……8 units subcut and call health care provider. Repeat CBG in 2 hr.

Practice Problems (Cont.)

- There is an order for Humulin R U-100 8 units and Humulin N U-100 15 units subcut a.c.
- What are the steps to draw up the two insulins?
- What is the total amount in the syringe?

Practice Problems (Cont.)

- Name an insulin in each category
  - Short acting insulin
  - Intermediate acting insulin
  - Long acting insulin
- Describe the difference between
  - U-100 and
  - U-500

Practice Problems (Cont.)

- Name an insulin in each category
  - Short acting insulin - **Humulin R**
  - Intermediate acting insulin – **Humulin N**
  - Long acting insulin - **Lantus**
- Describe the difference between
  - U-100 – **100 units per 1 mL**
  - U-500 – **500 units per 1 mL**


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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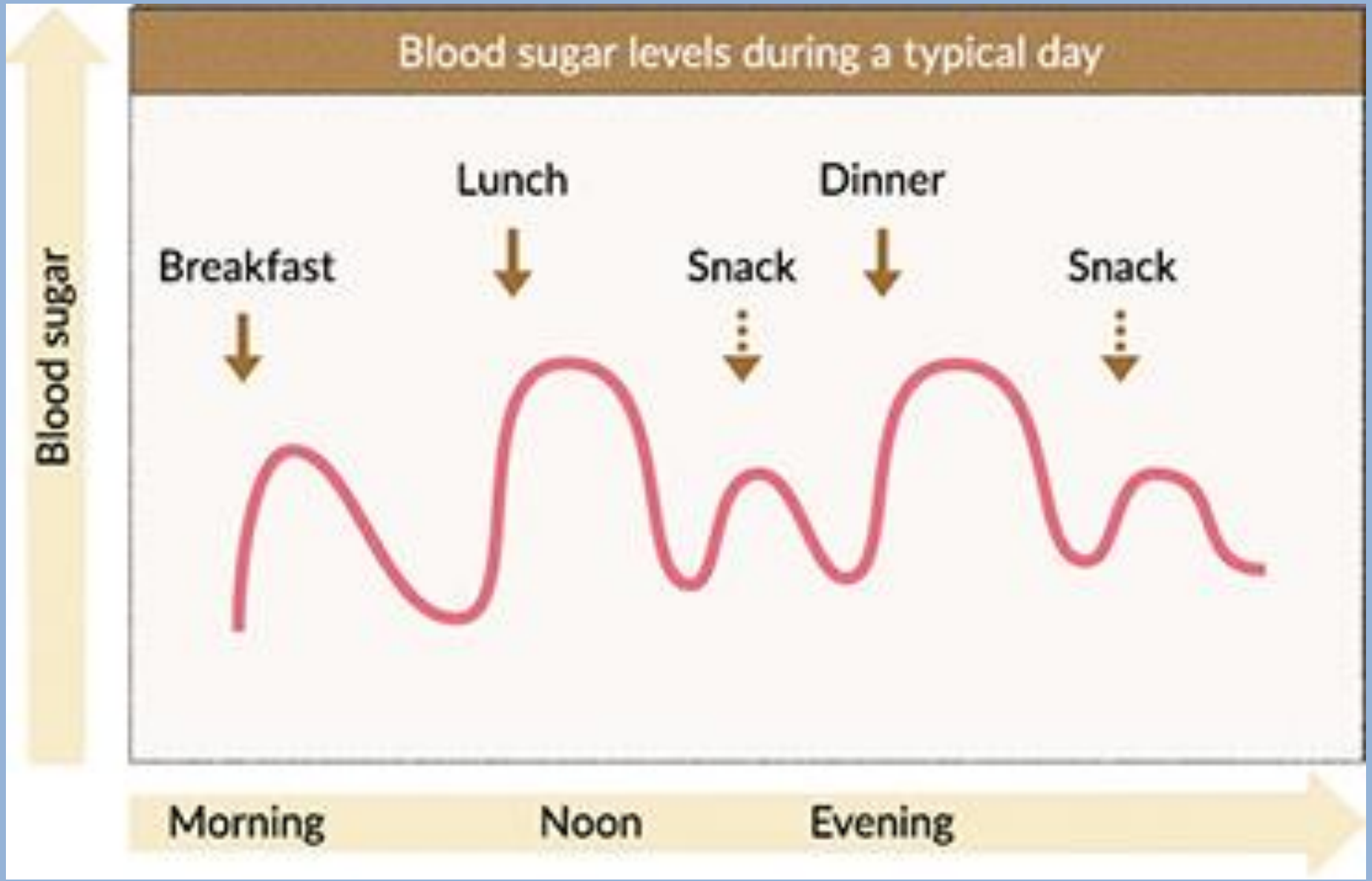
8·13·13
Your money or your life.
ARMAC
BIZARROCOMICS.COM
K2

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
Breakfast
Lunch
Snack
Dinner
Snack
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

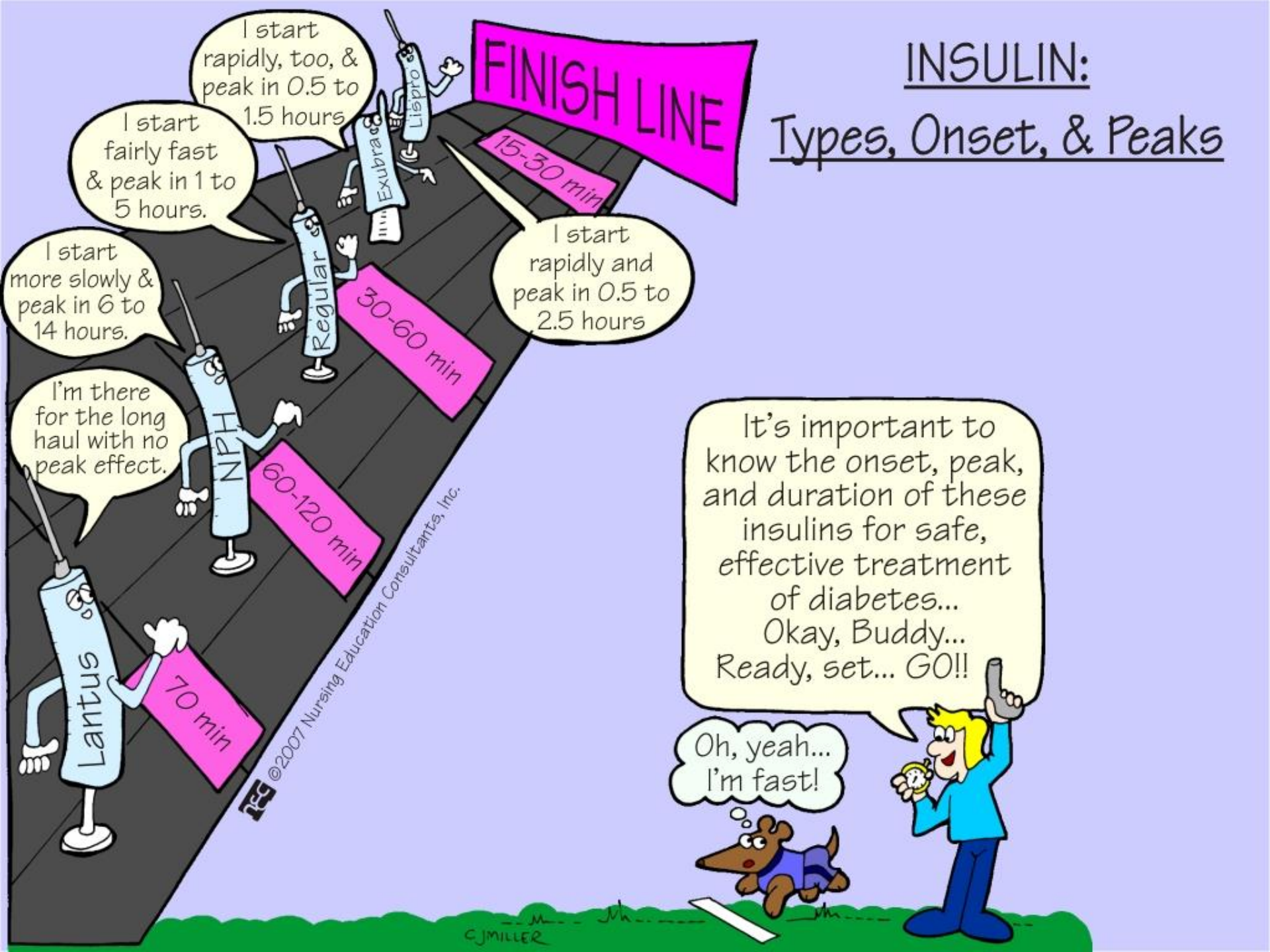
Main types of insulin preparations

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

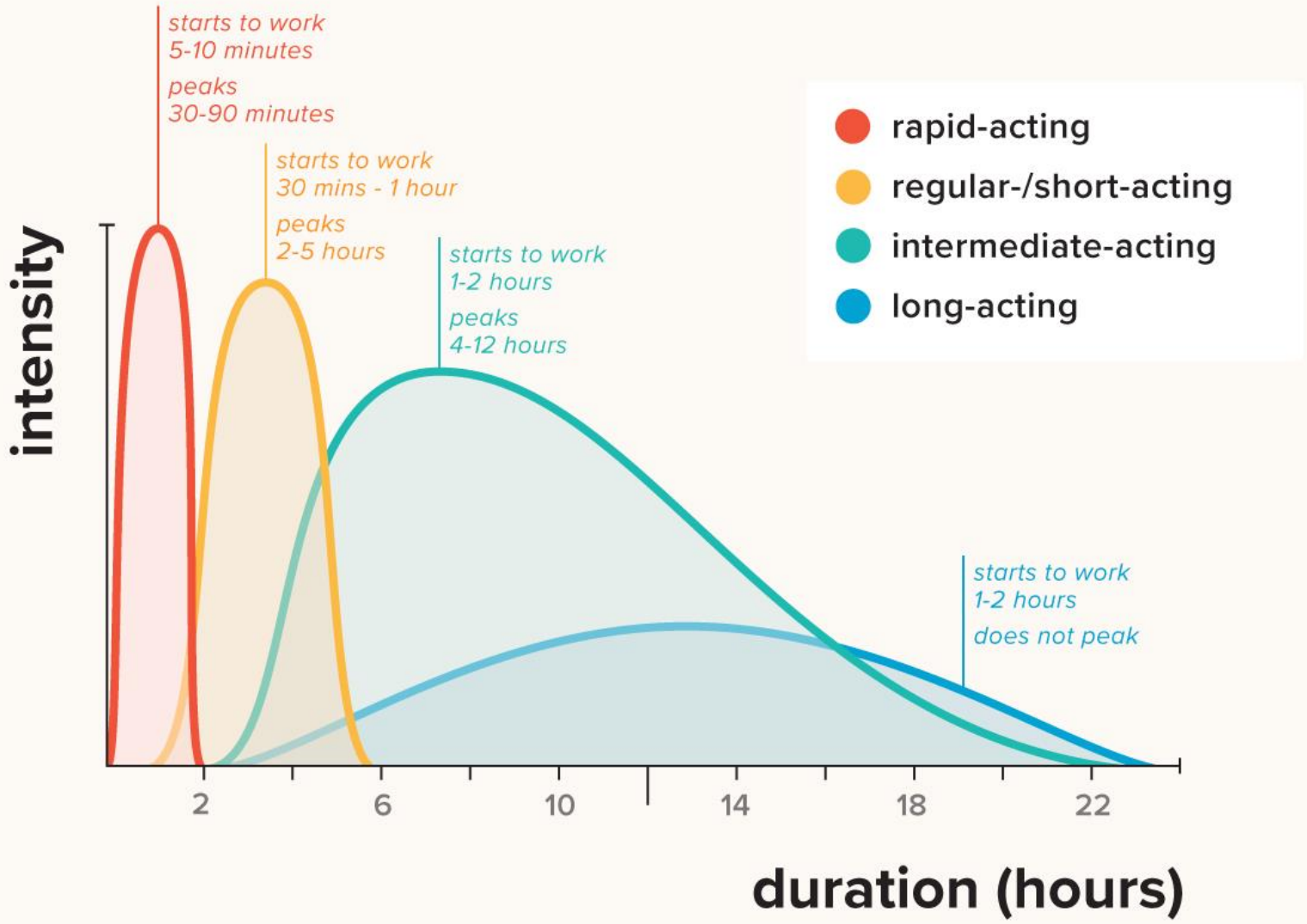
RAPID	Humalog or Lispro	< 15 min	60-90 min	3-5 hrs	• Inject 10-15 min before mealtime • Typically used in conjunction with longer-acting insulin.
	Novolog or Aspart	< 15 min	60-120 min	3-5 hrs	
	Apidra or Glulisine	< 15 min	60-90 min	1-2.5 hrs	
SHORT	Regular (R) Humulin, Actrapid or Novolin	30-60 min	2-5 hrs	6-8 hrs	• Inject at least 20-30 minutes before mealtime
	Velosulin	30-60 min	2-3 hrs	2-3 hrs	
INTERMEDIATE	NPH (N)	1-2 hrs	4-12 hrs	18-24 hrs	• Commonly used twice daily • Often combined with rapid- or short-acting insulin
	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	• Covers insulin needs for 24 hrs • If needed, often combined with rapid- or short-acting insulin
	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	• Combination of intermediate- and short-acting insulin • Commonly used twice daily before mealtime
	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	

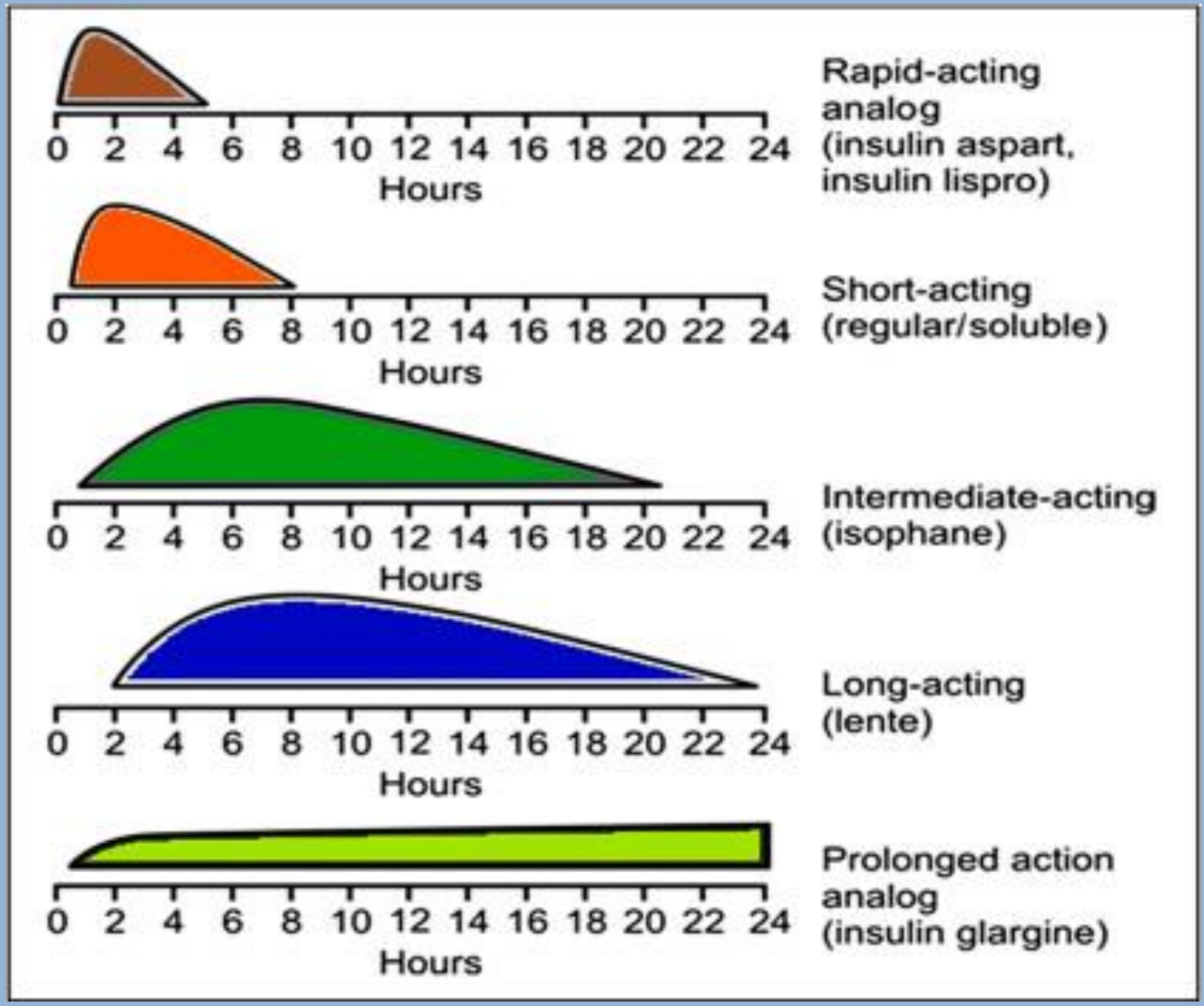
Sliding Scale Insulin Protocol

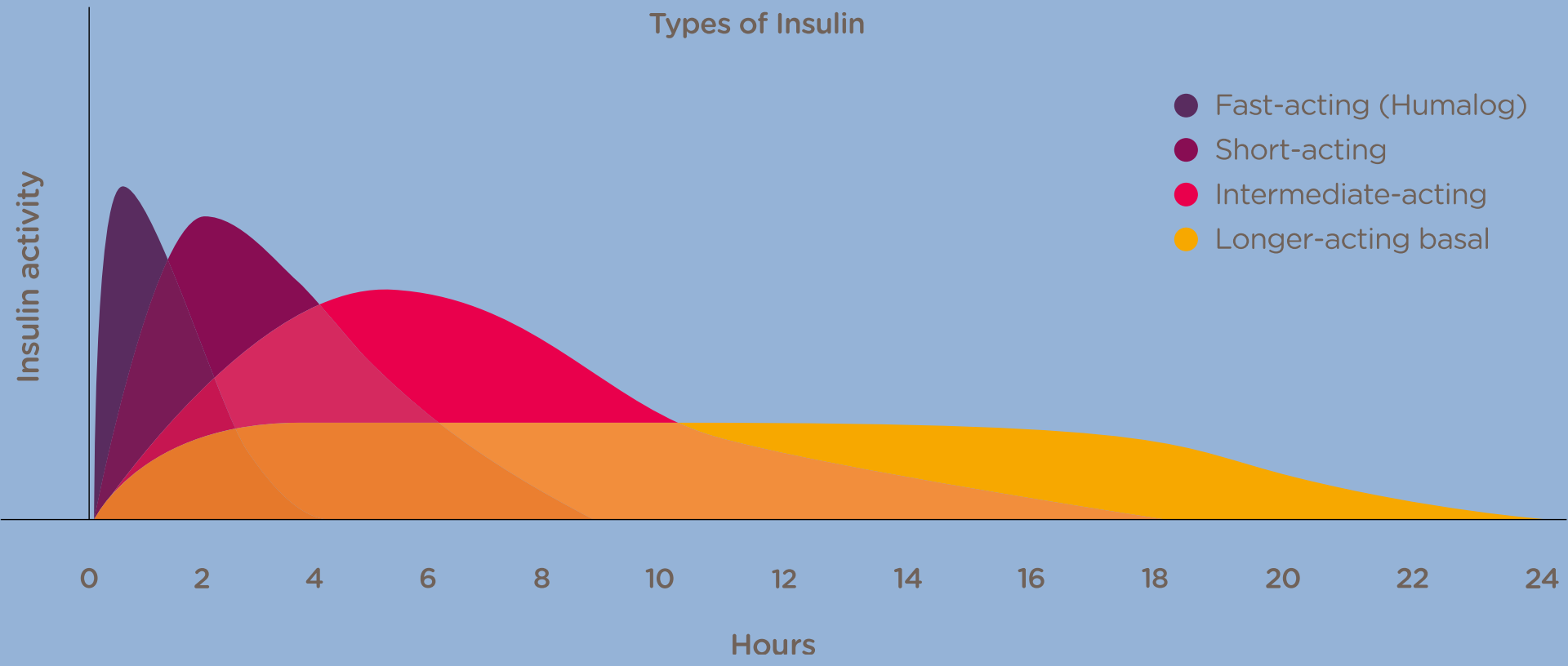
Blood Glucose Level, mg/dL	Human Insulin, IU[a]	Additional Action Requested
0-80	0	1 Ampule of D50, call physician
81-100	0	No action
101-150	0	No action
151-200	2	No action
201-250	4	No action
251-300	6	No action
301-350	8	No action
351-400	10	No action
>401	12	Call physician


INSULIN:
Types, Onset, & Peaks
FINISH LINE
I start rapidly, too, & peak in 0.5 to 1.5 hours
Lispro
Exubra
15-30 min
I start fairly fast & peak in 1 to 5 hours.
I start rapidly and peak in 0.5 to 2.5 hours
I start more slowly & peak in 6 to 14 hours.
Regular
30-60 min
I'm there for the long haul with no peak effect.
NPH
60-120 min
Lantus
70 min
©2007 Nursing Education Consultants, Inc.
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!
C.J.MILLER

types of insulin




Rapid-acting analog (insulin aspart, insulin lispro)
Short-acting (regular/soluble)
Intermediate-acting (isophane)
Long-acting (lente)
Prolonged action analog (insulin glargine)
0 2 4 6 8 10 12 14 16 18 20 22 24
Hours


Types of Insulin
Fast-acting (Humalog)
Short-acting
Intermediate-acting
Longer-acting basal
Insulin activity
0
2
4
6
8
10
12
14
16
18
20
22
24
Hours

The doctor is prescribing an insulin 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 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

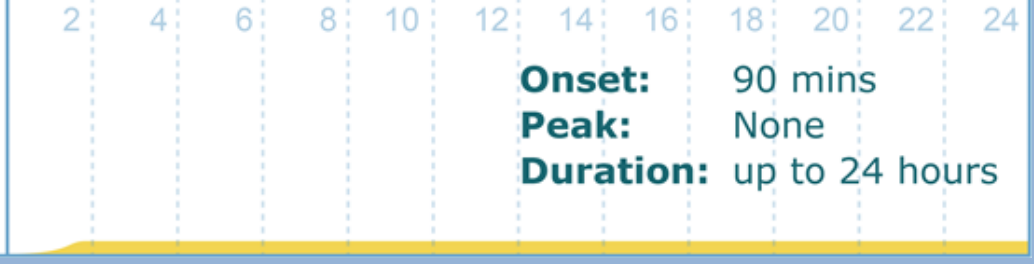
70% intermediate

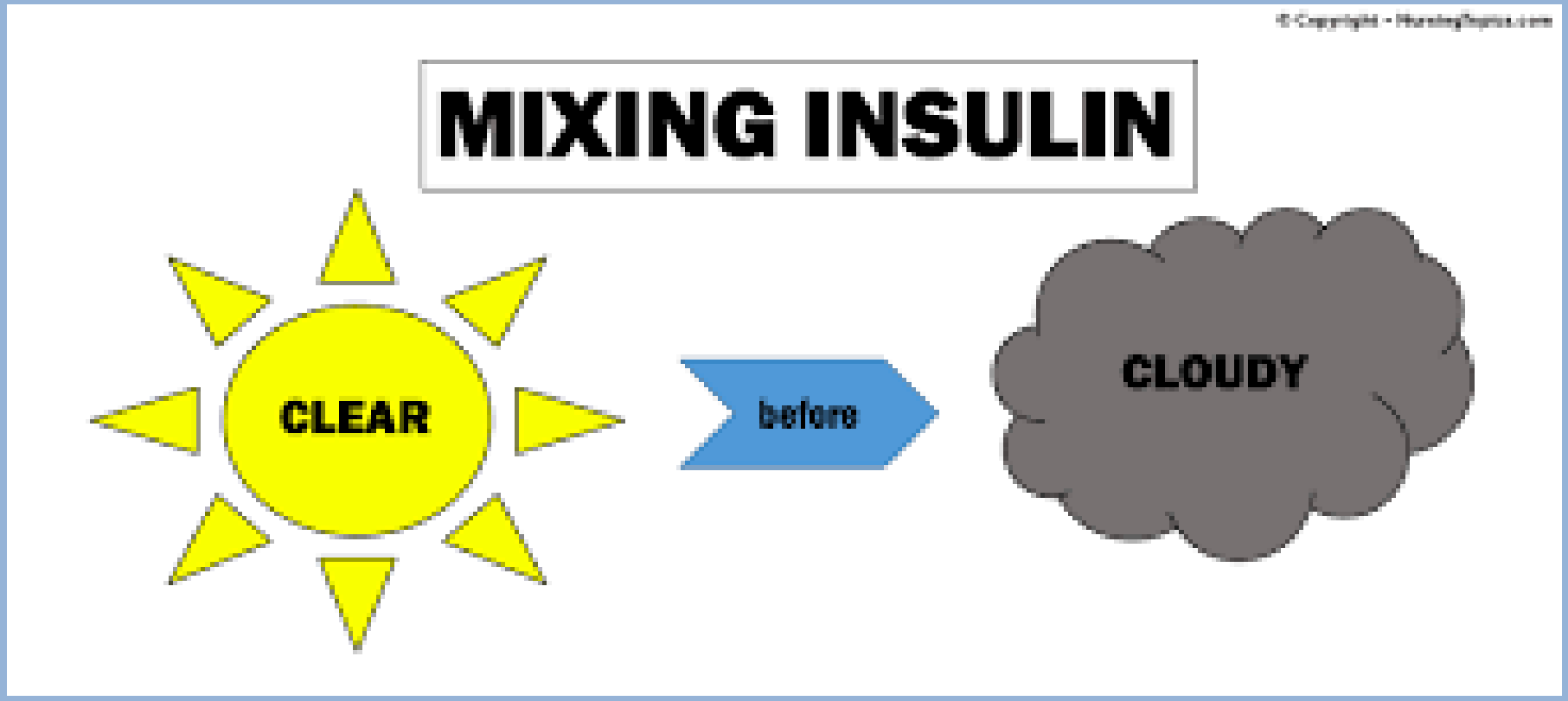
30% very fast acting

Novolin

70% intermediate

30% fast acting

Type of Insulin	Appearance	Action times after injection (in hours)
Rapid-acting ▪ Lispro (Humalog) ▪ Glulisine (Apidra) ▪ Aspart (NovoRapid)	Clear 	 **Onset:** 10 to 15 mins **Peak:** 1 to 2 hours **Duration:** 3 to 5 hours
Intermediate-acting ▪ NPH (Humulin-N, Novolin-NPH)	Cloudy 	 **Onset:** 1 to 3 hours **Peak:** 5 to 8 hours **Duration:** up to 18 hours
Slow or long-acting ▪ Glargine (Lantus) ▪ Detemir (Levemir)	Clear 	 **Onset:** 90 mins **Peak:** None **Duration:** up to 24 hours

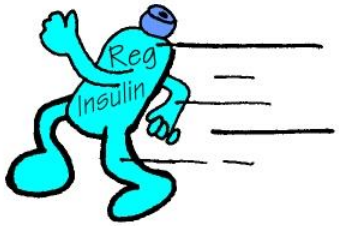


Never mix long acting glargine (Lantus) with any other insulin

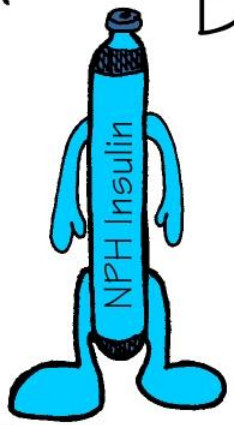
MIXING INSULIN:

Draw Up The Clear...

(Clear and Fast-Acting)

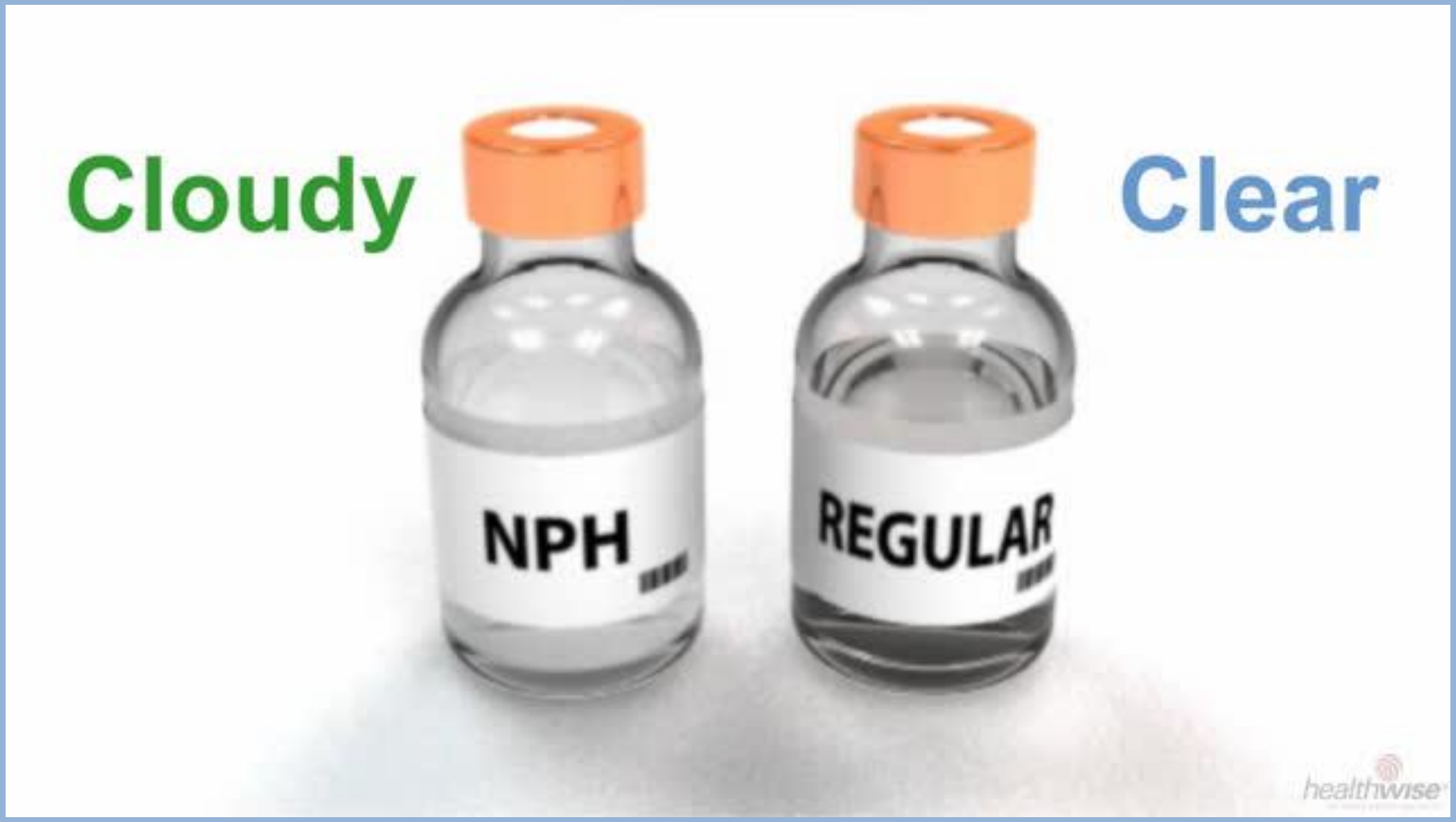


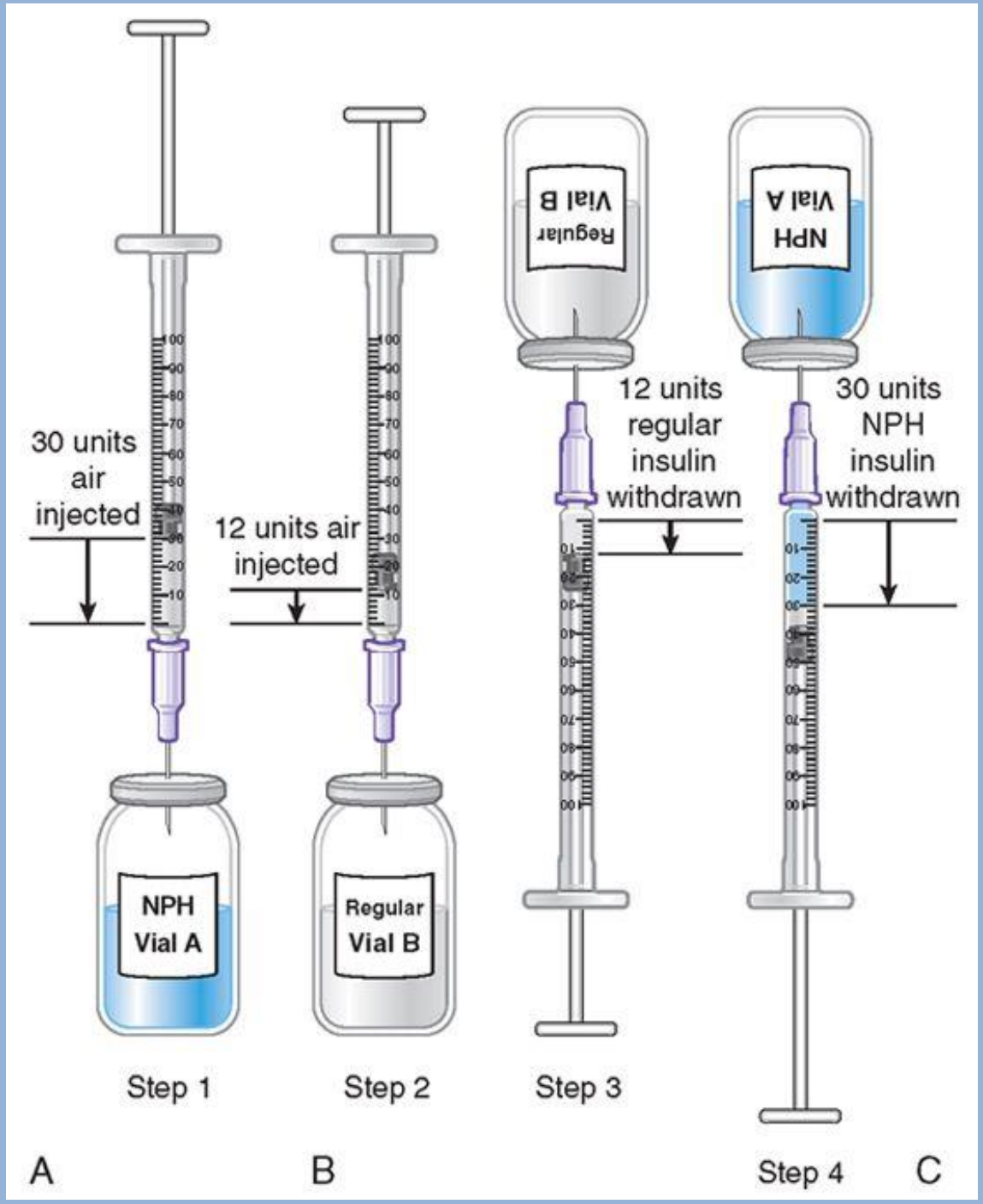
Before The Cloudy...



(Cloudy and Long-Acting)

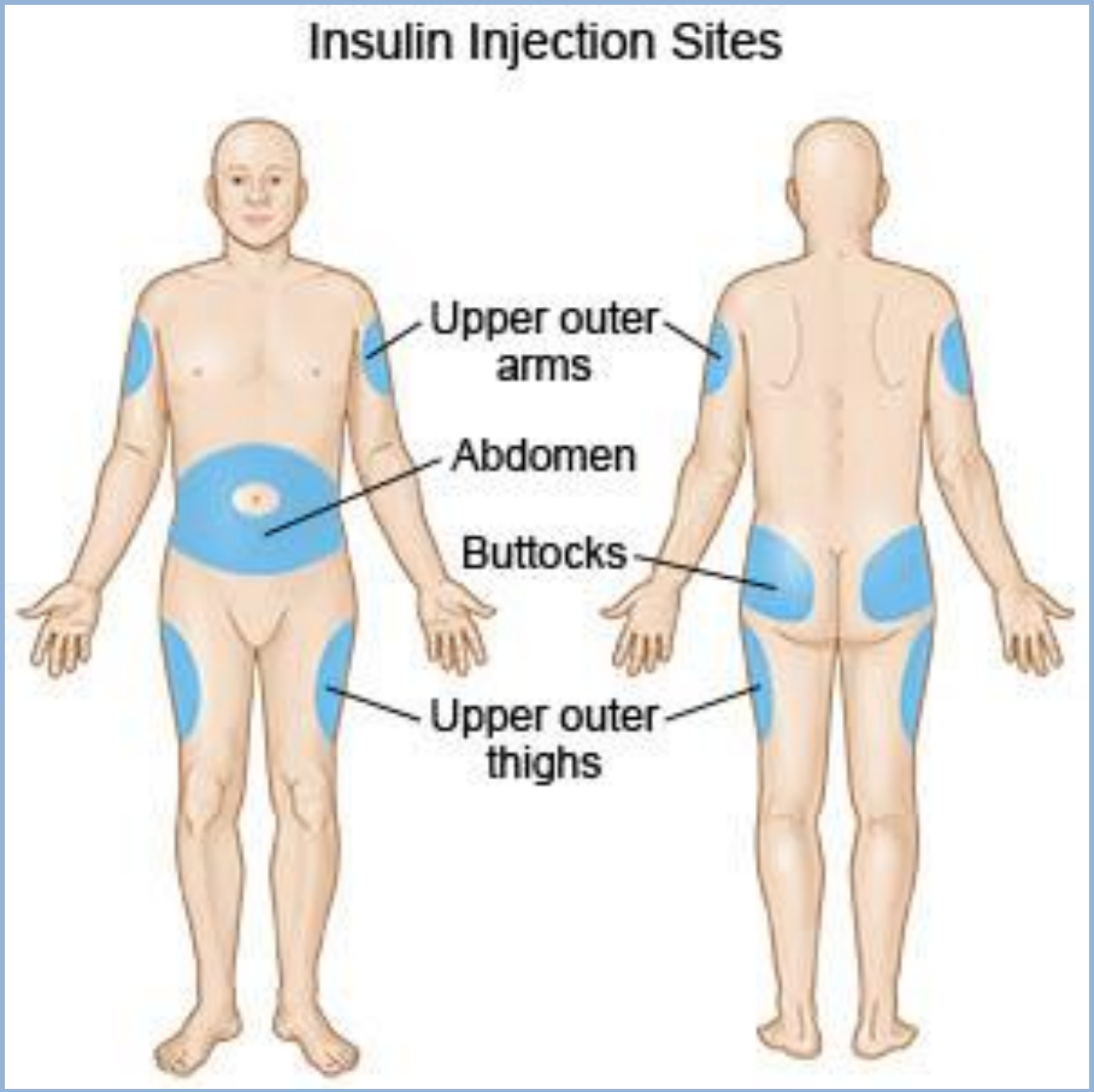
To Prevent Contaminating
A Short-Acting Insulin "Reg"
With A Long-Acting Insulin "NPH"

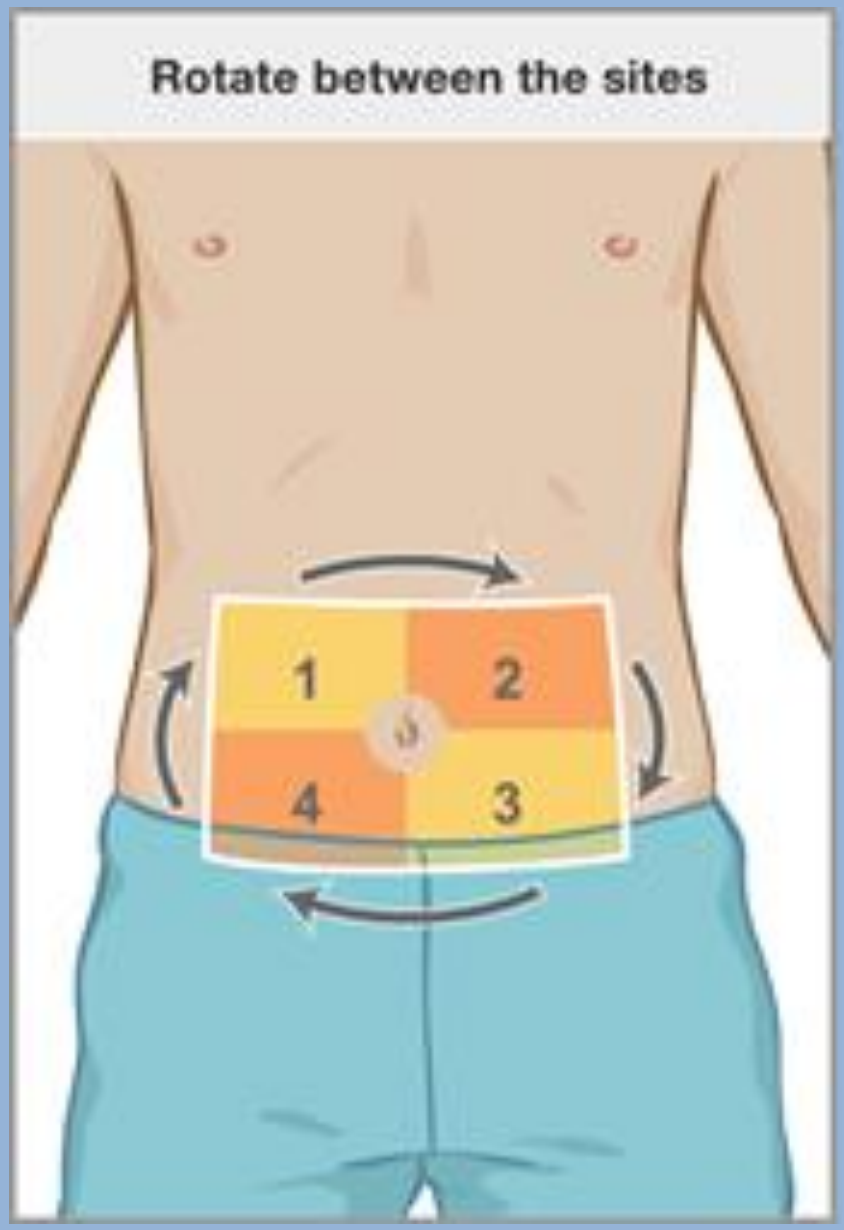

Cloudy
NPH
REGULAR
Clear
healthwise

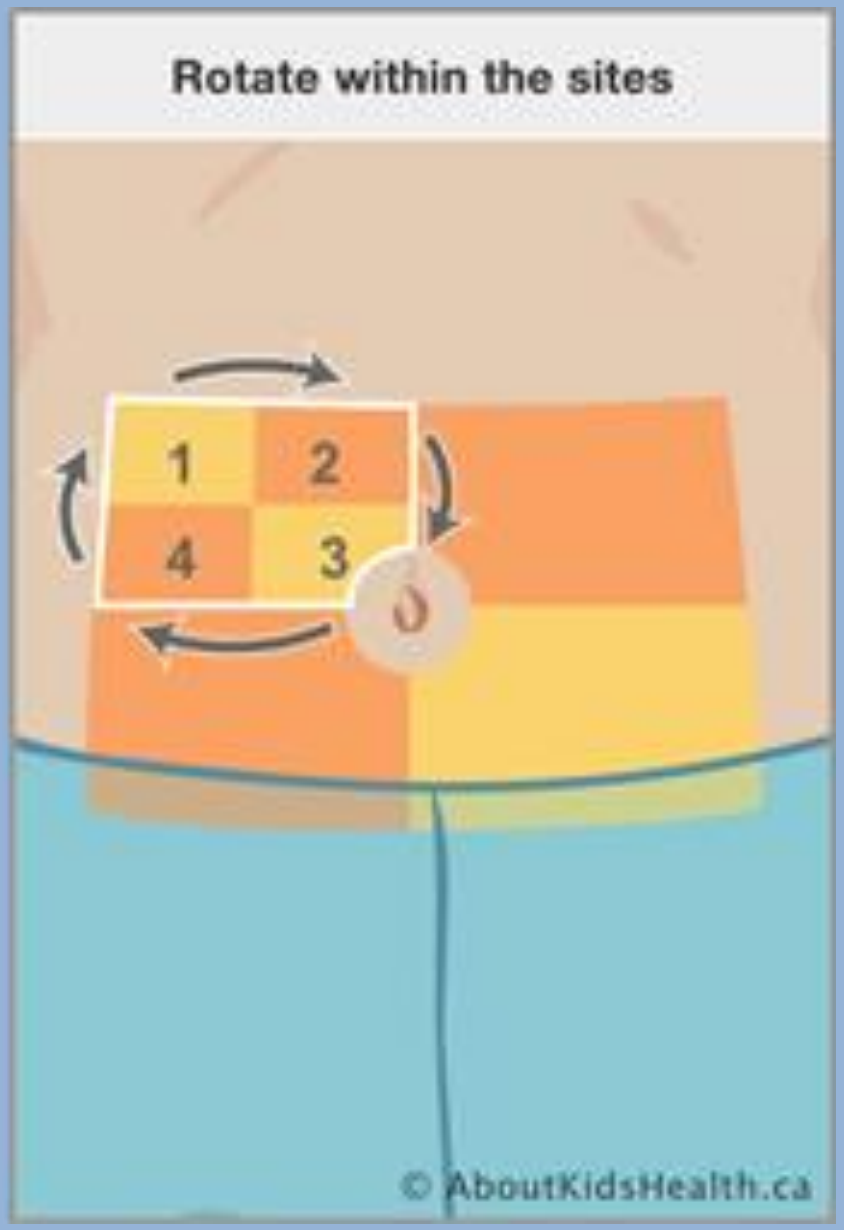

30 units air injected
NPH Vial A
Step 1
12 units air injected
Regular Vial B
Step 2
12 units regular insulin withdrawn
Step 3
30 units NPH insulin withdrawn
Step 4
A
B
C


50
45
40
35
30
25
20
15
10

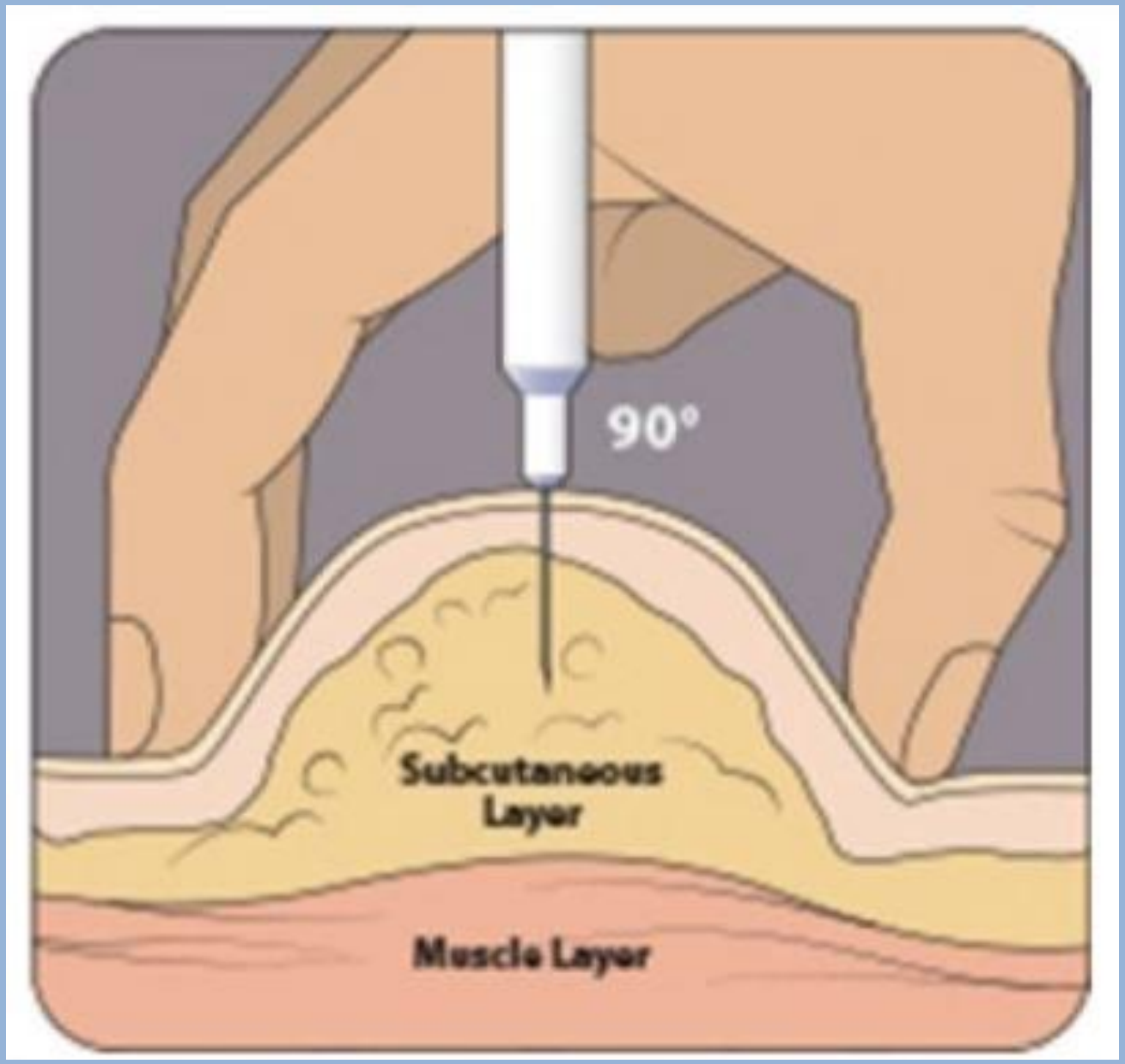

2
4
pre-filled pen


Insulin Injection Sites
Upper outer arms
Abdomen
Buttocks
Upper outer thighs





To avoid lipohypertrophy


90°
Subcutaneous Layer
Muscle Layer

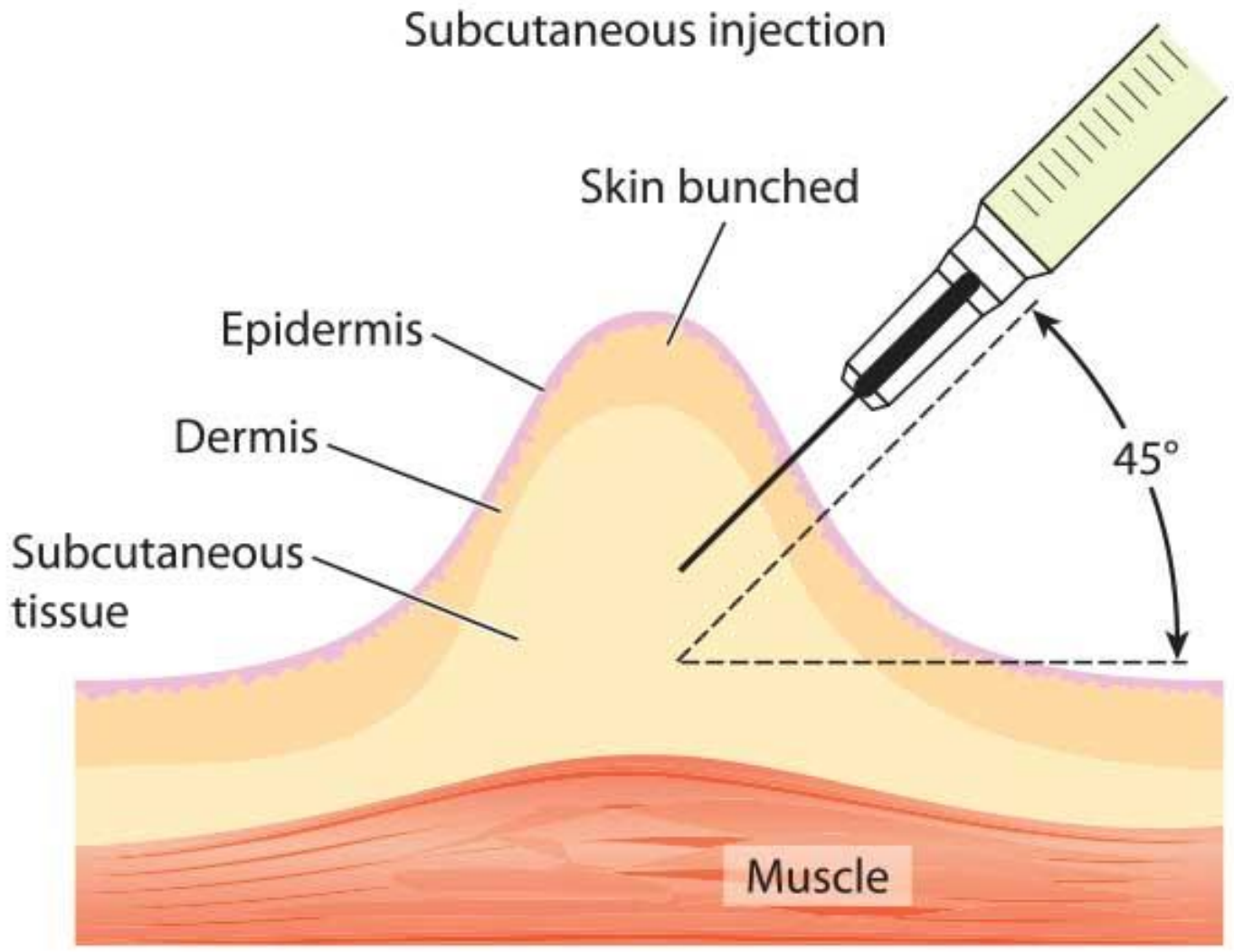
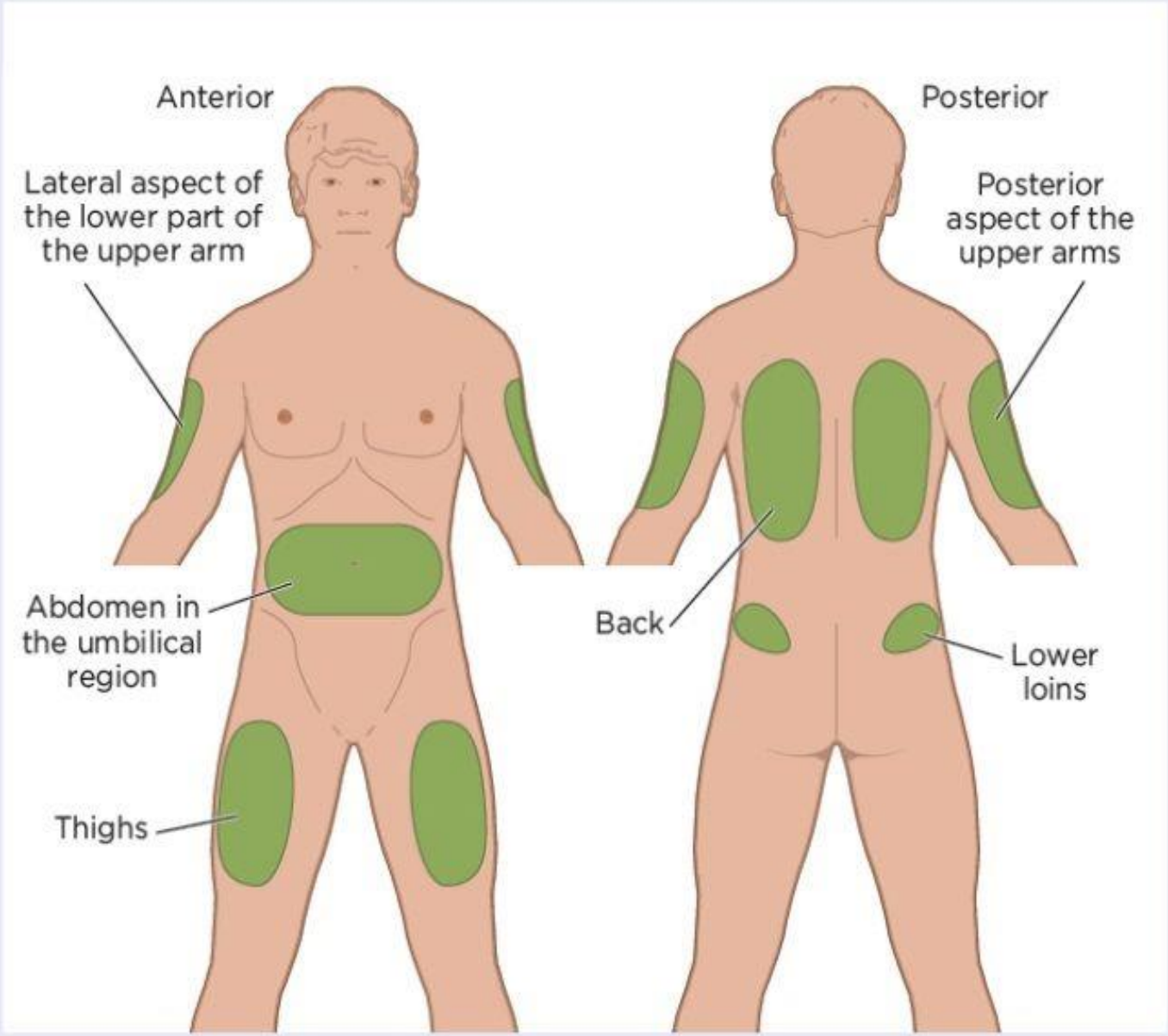
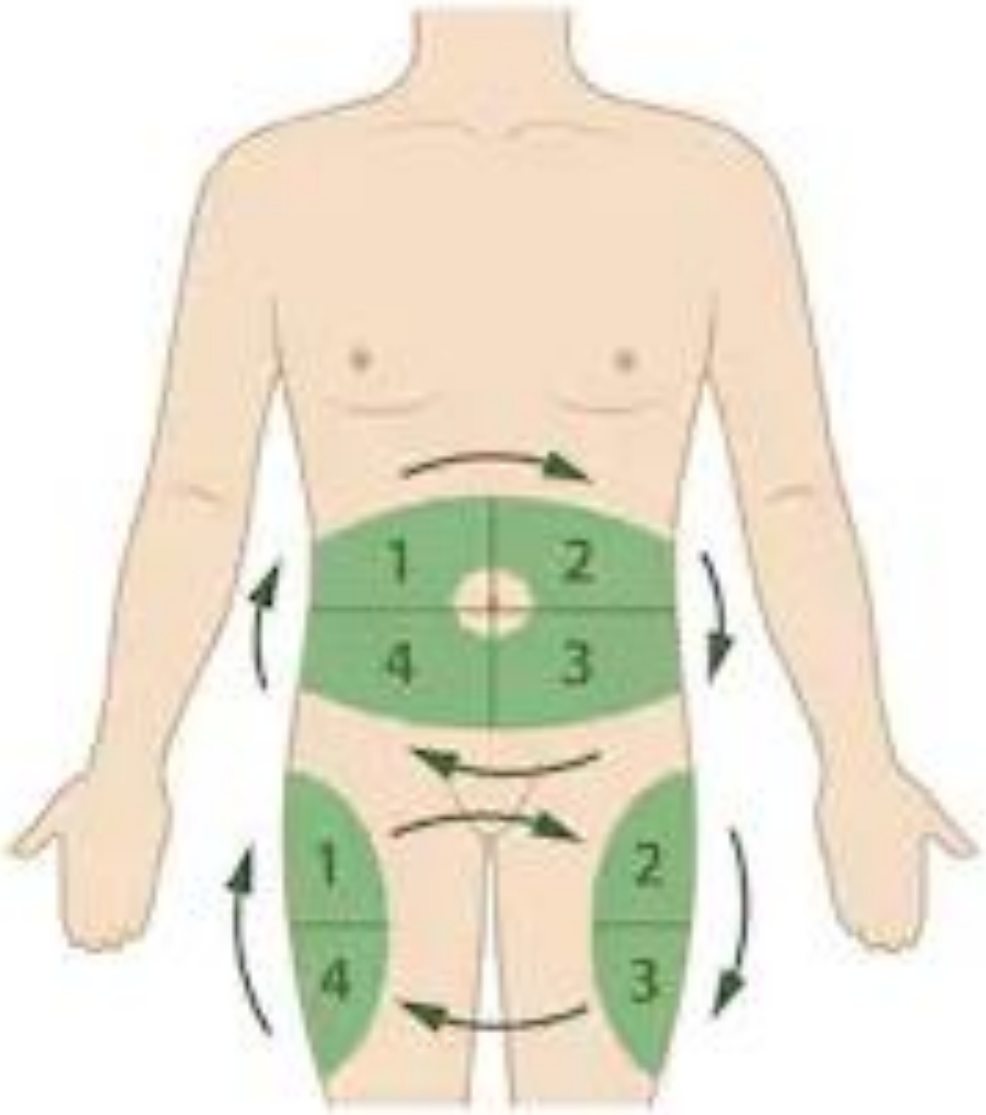
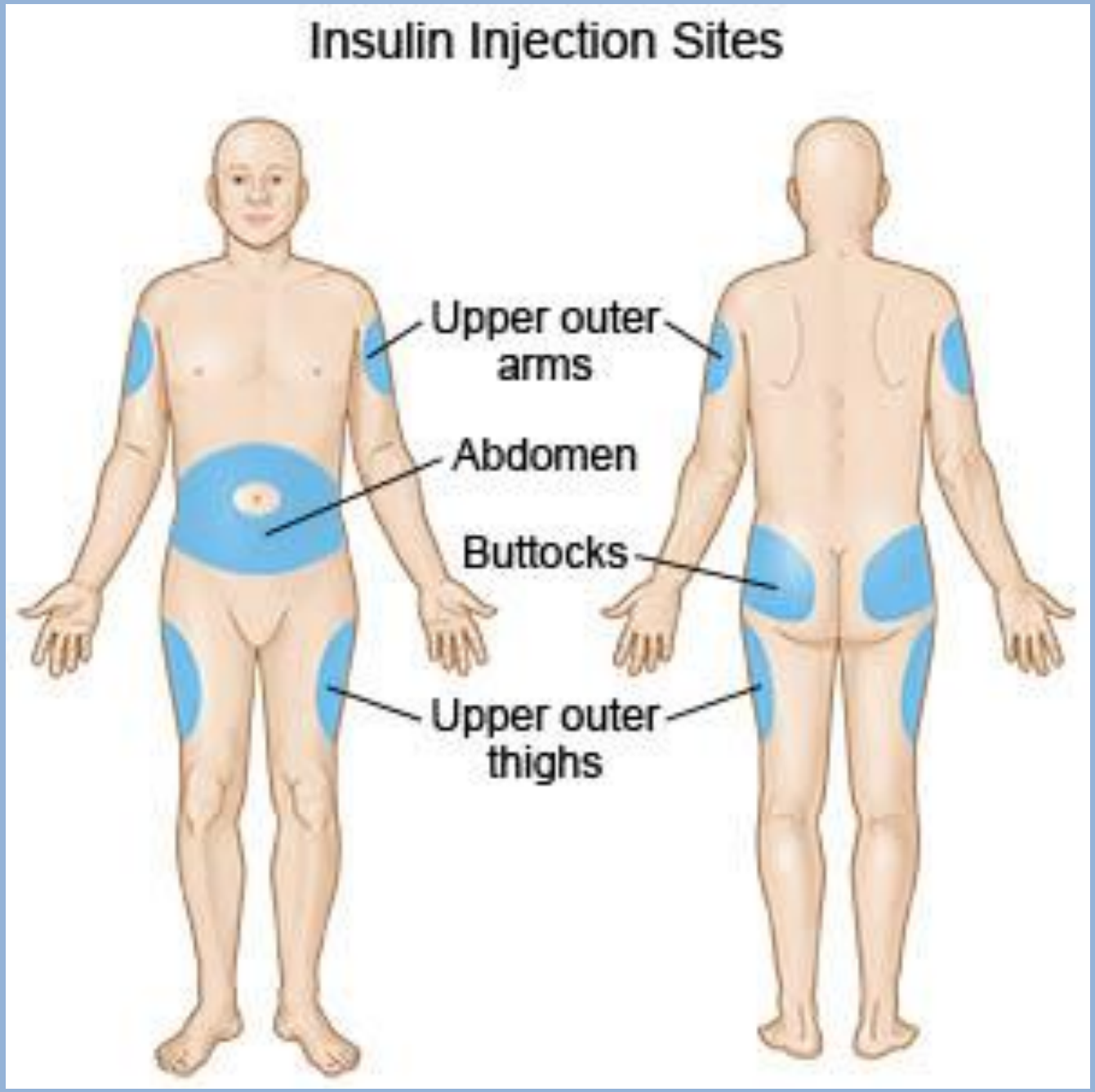

Subcutaneous injection
Skin bunched
Epidermis
Dermis
Subcutaneous tissue
45°
Muscle

Fig 2. **Subcutaneous injection sites**

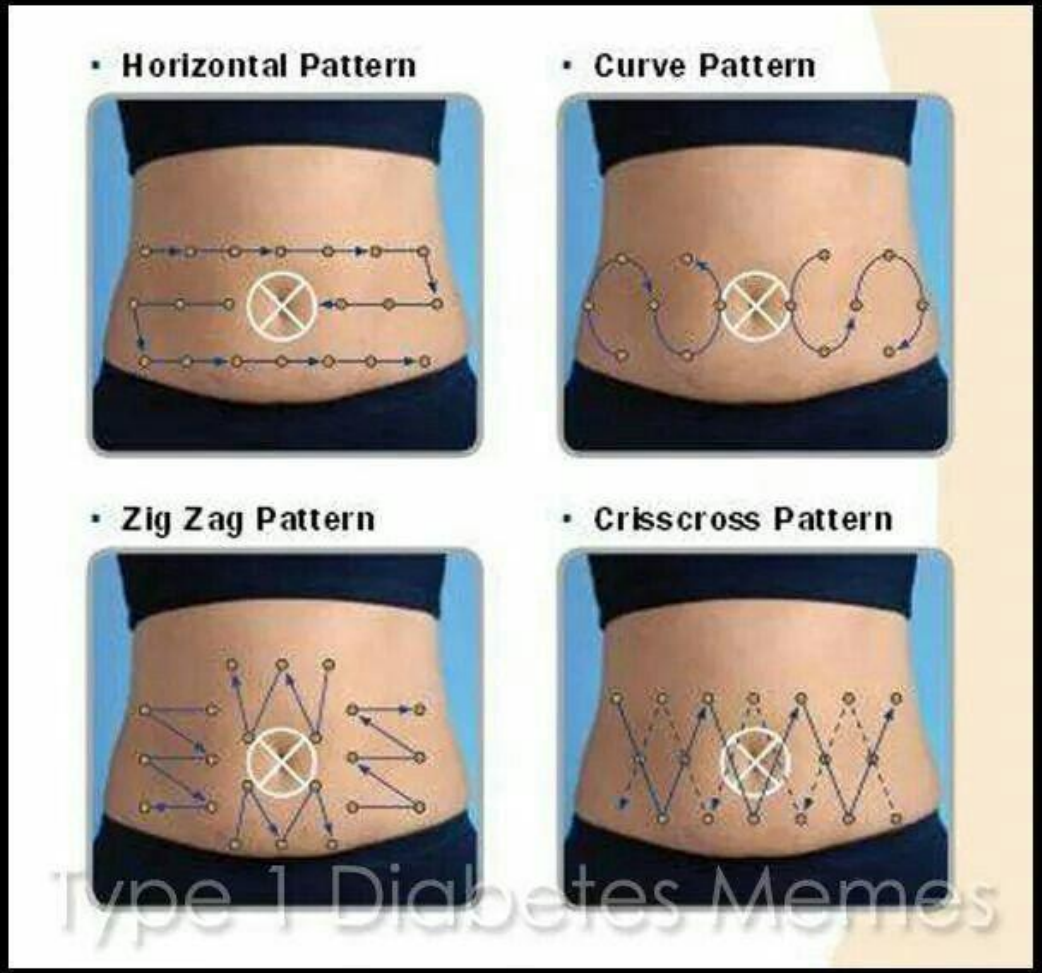


Rotating injection sites

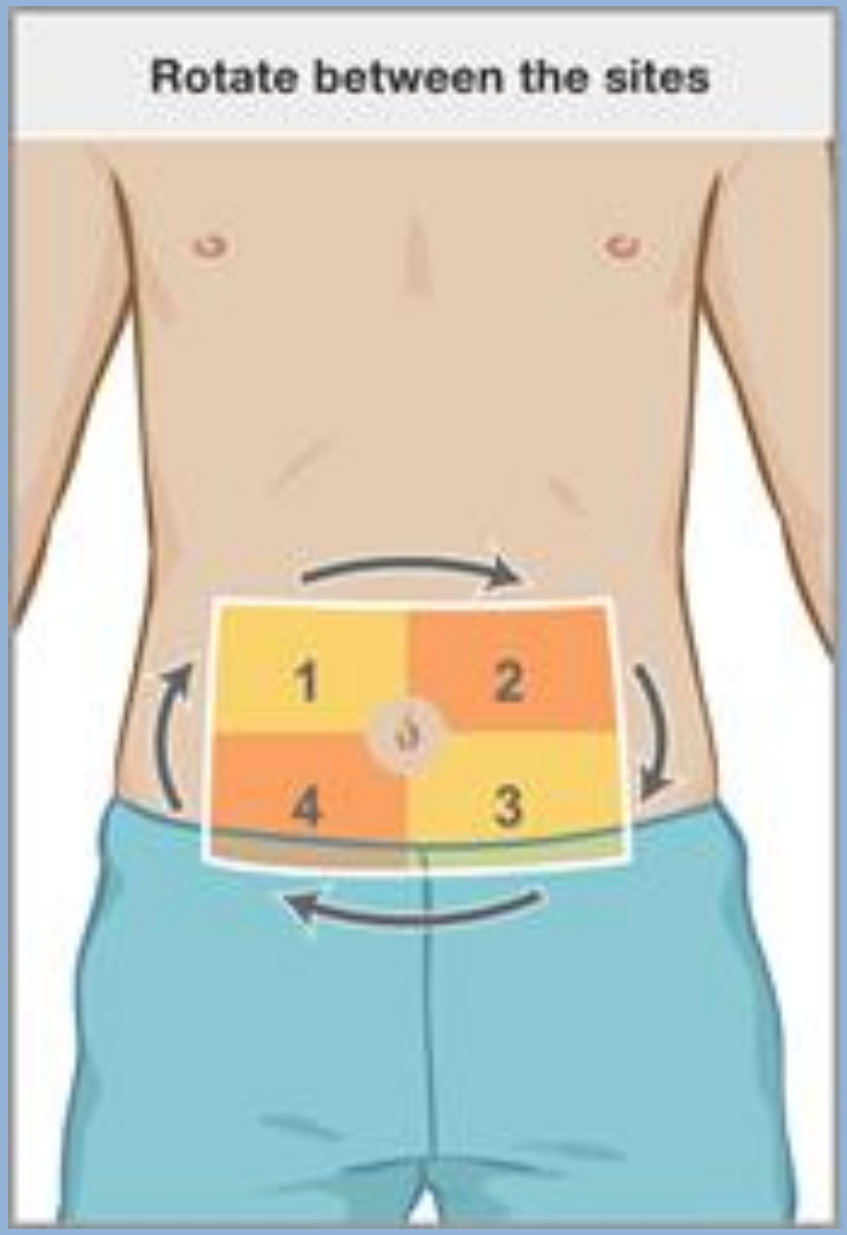


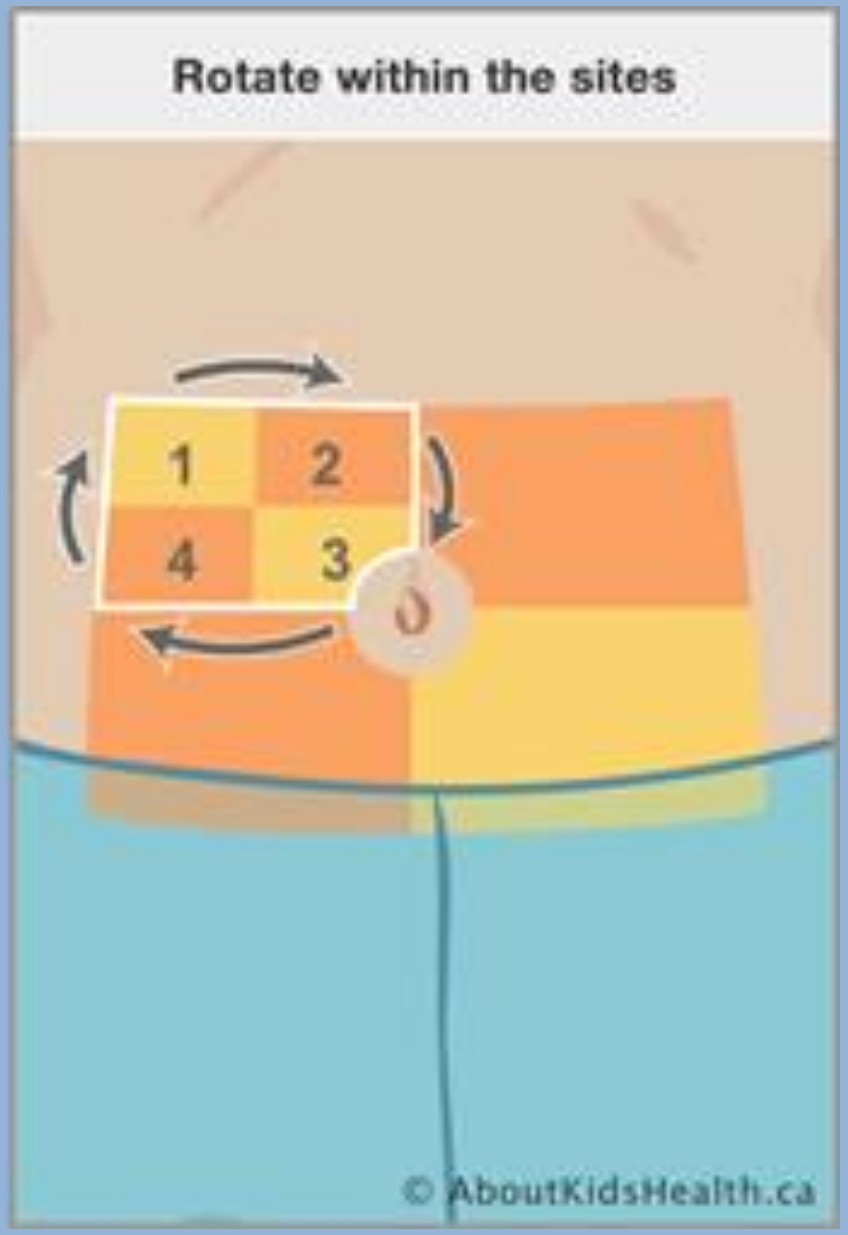

Insulin Injection Sites
Upper outer arms
Abdomen
Buttocks
Upper outer thighs

Planning out the pattern of your track marks..



Just diabetic things

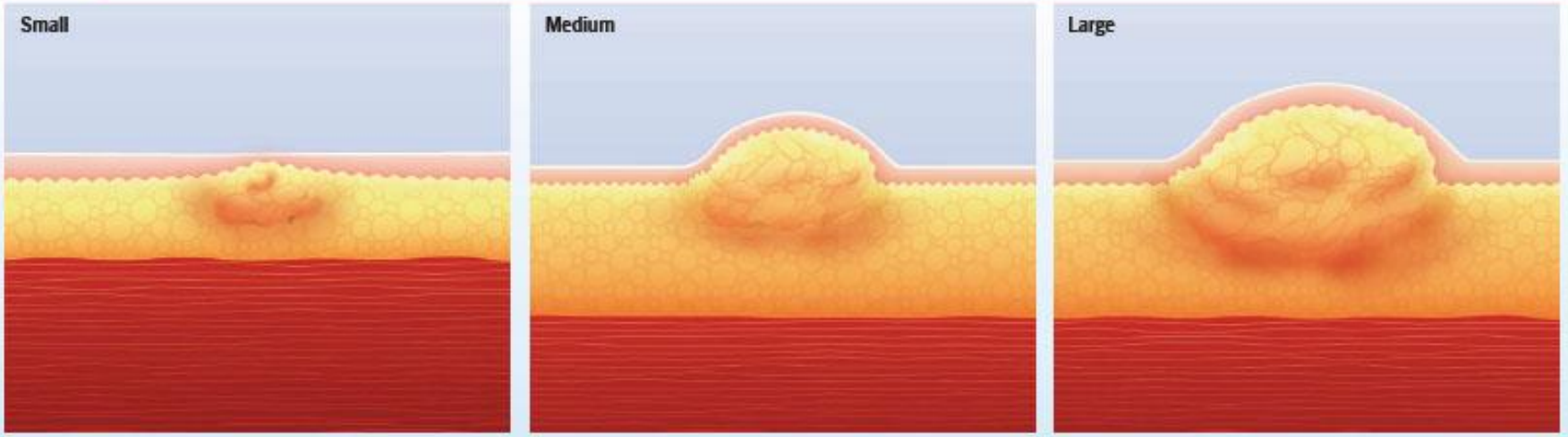




To avoid lipohypertrophy

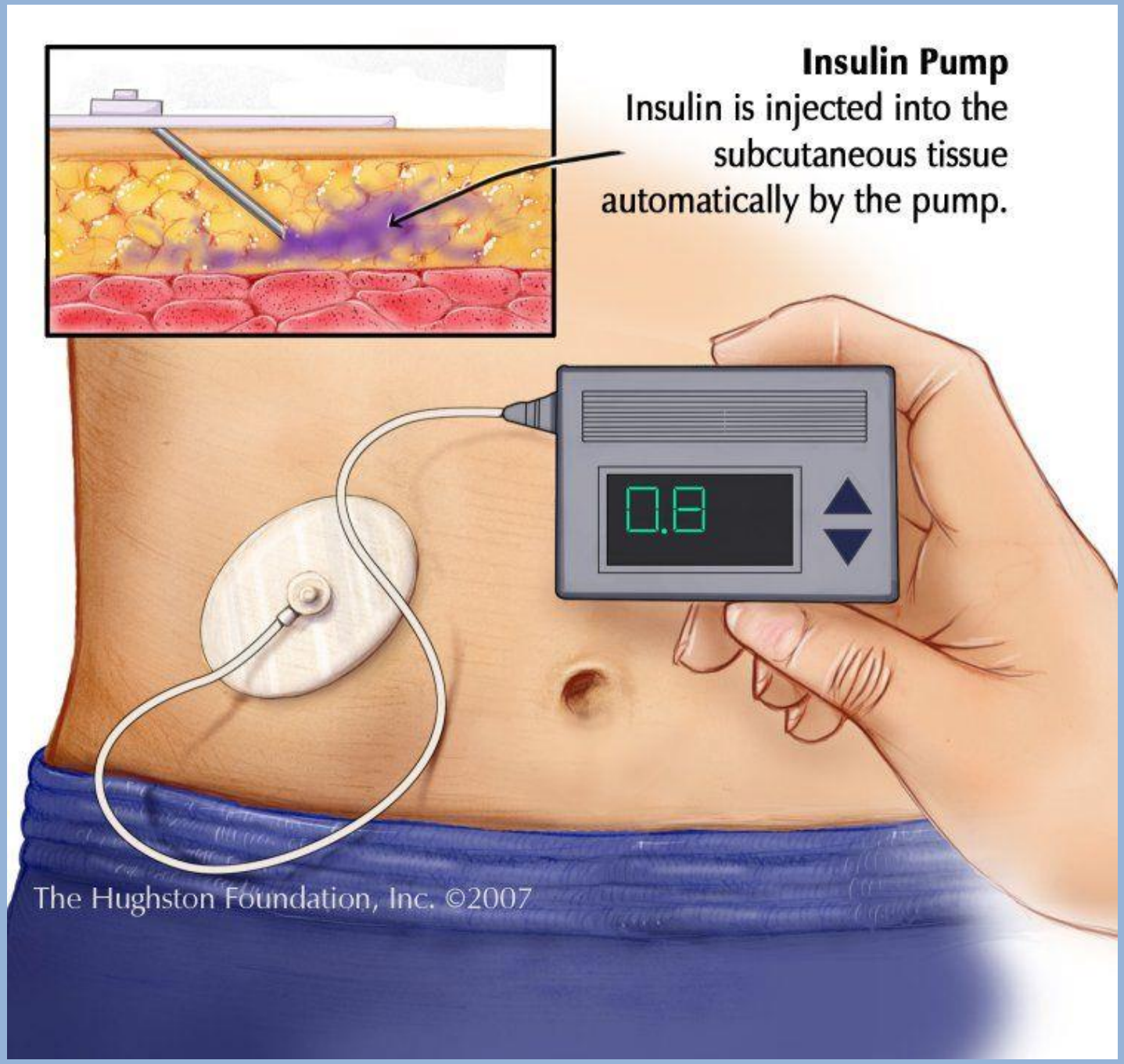
Lipohypertrophy (LH)

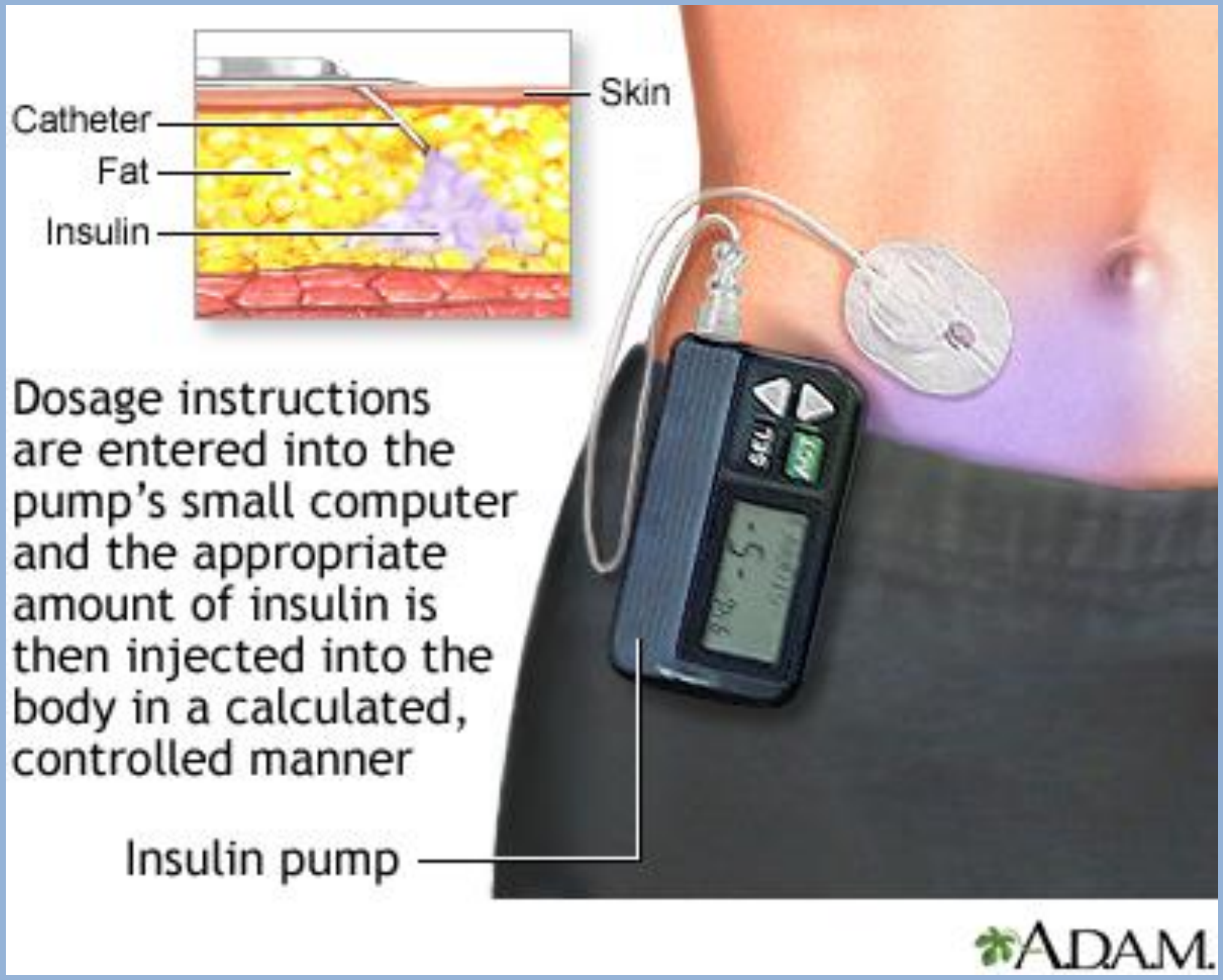
Dense tissue formed in an area repeatedly injected with insulin, due to the anabolic effect of insulin causing local fat cells to enlarge and proliferate.

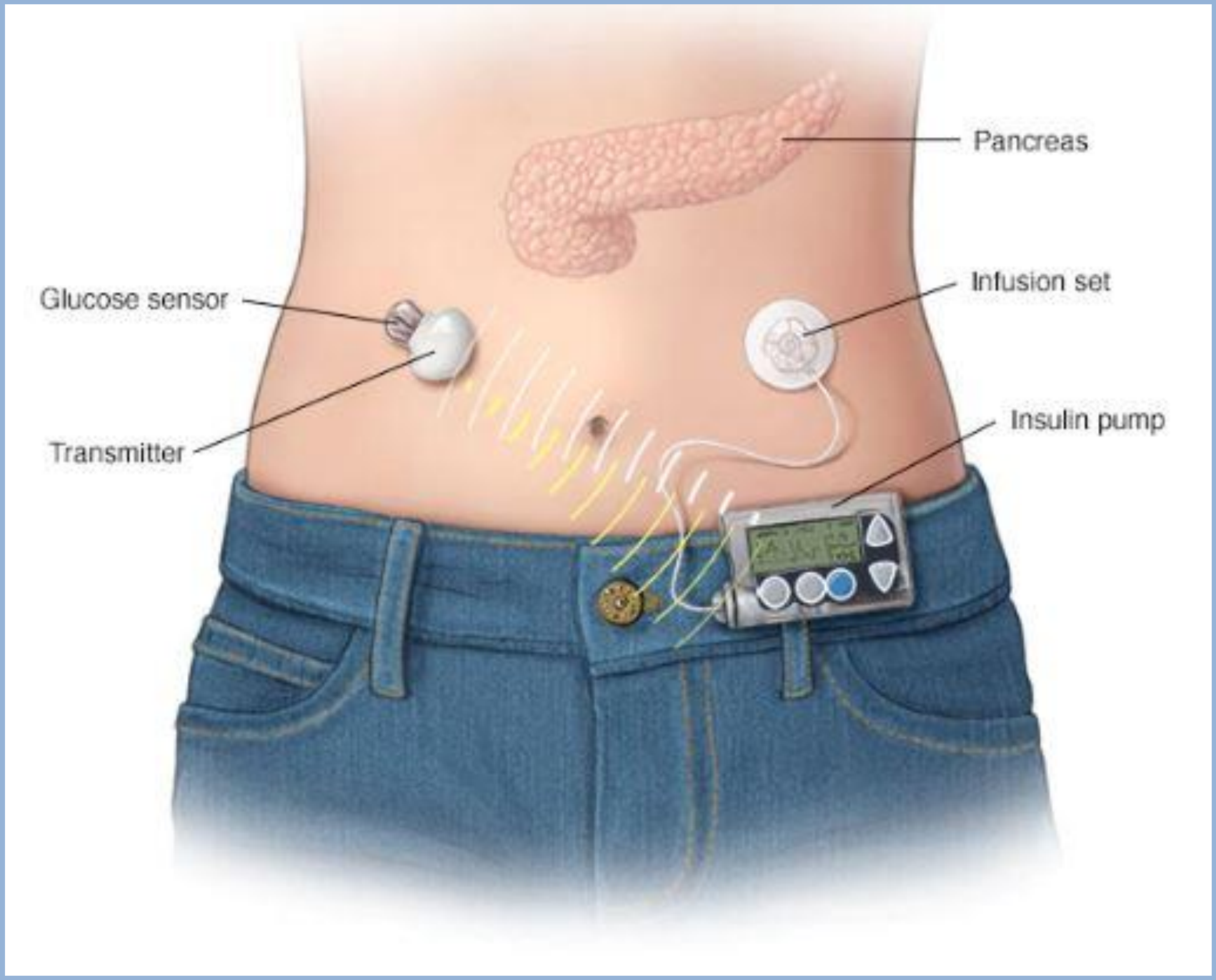


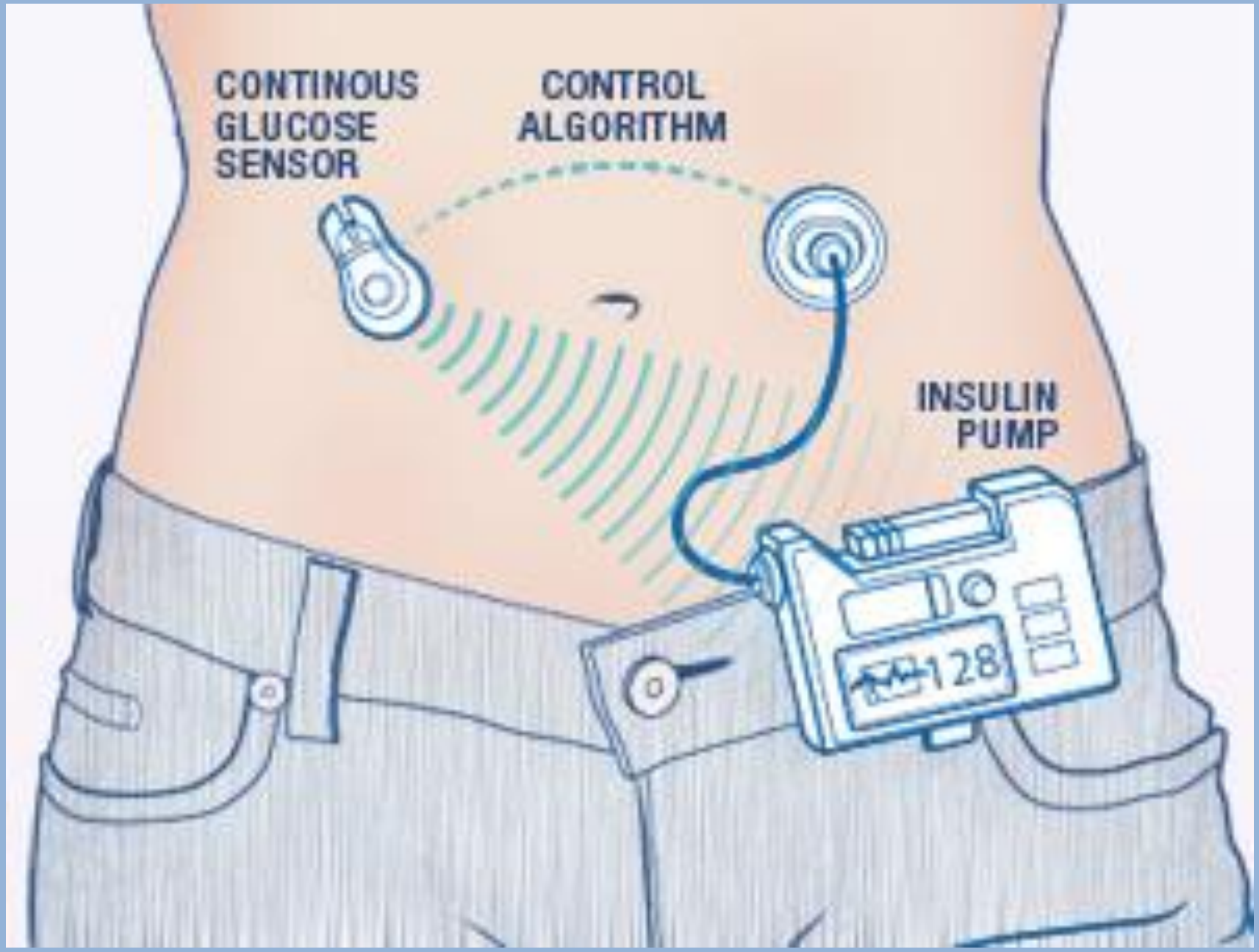
(Becton, Dickinson and Company 2015)

Insulin pumps


Insulin Pump
Insulin is injected into the subcutaneous tissue automatically by the pump.
0.8
The Hughston Foundation, Inc. ©2007


Skin
Catheter
Fat
Insulin
Dosage instructions are entered into the pump's small computer and the appropriate amount of insulin is then injected into the body in a calculated, controlled manner
Insulin pump
A.D.A.M.


Pancreas
Glucose sensor
Infusion set
Transmitter
Insulin pump


CONTINOUS
GLUCOSE
SENSOR
CONTROL
ALGORITHM
INSULIN
PUMP
128

Complications

DM Complications

- Acute
  - Hypoglycemia
  - HHNC
  - DKA
- Long-term
  - Blindness
  - Kidney disease
  - Heart disease
  - Poor circulation

STROKE

Diabetes may damage blood vessels in the brain, which may lead to stroke.

What to do:

- Go to the hospital immediately

HEART ATTACK

Diabetes may cause damage and blockages to the blood vessels of the heart, which could lead to a heart attack.

What to do:

- See a doctor if you have chest pains

REDUCED BLOOD CIRCULATION

Diabetes can reduce or block blood flow to your legs, which might lead to gangrene (tissue death due to loss of blood supply) and even amputation.

What to do:

See a doctor immediately if you experience:

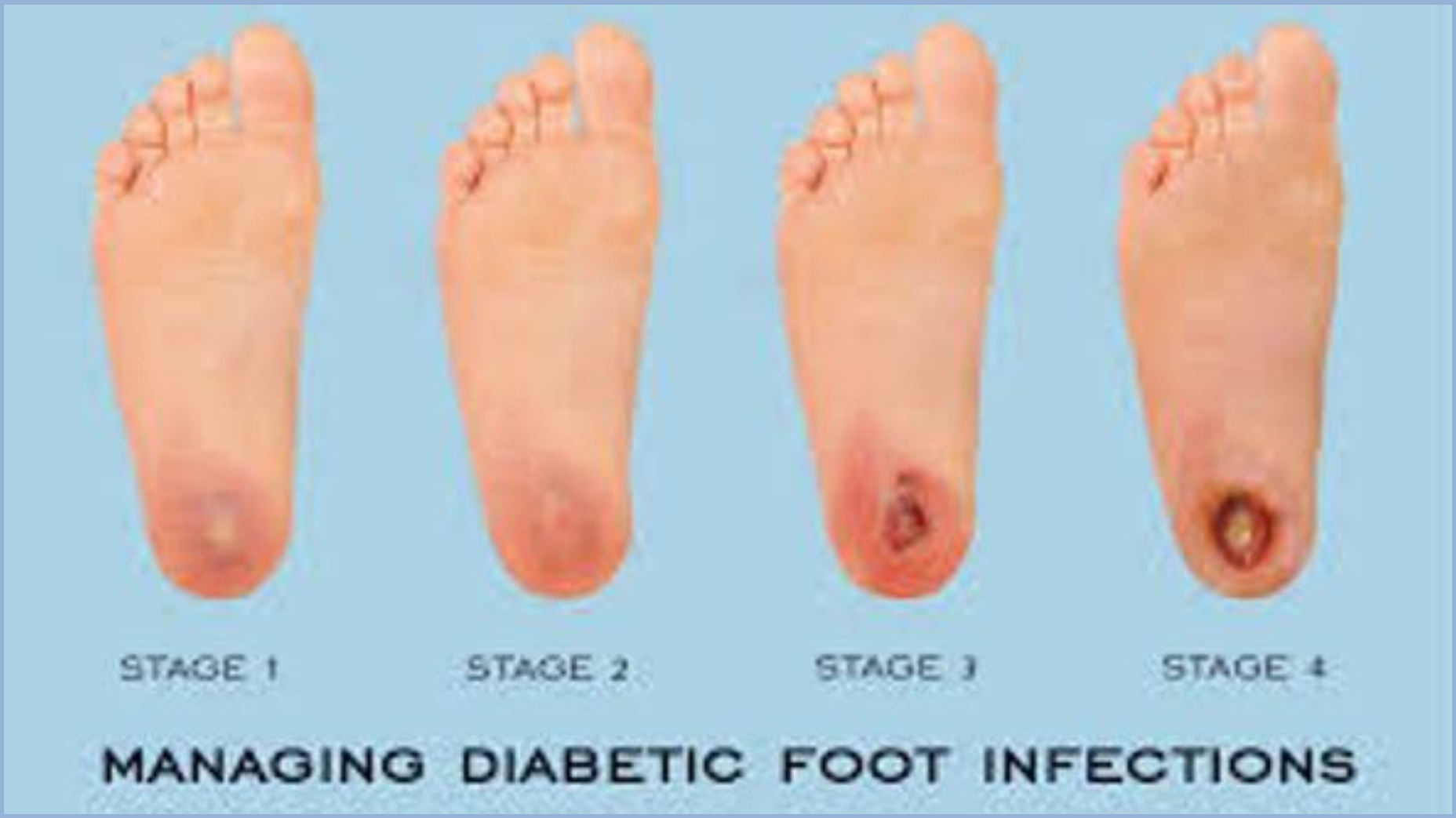
- pain in the leg brought on by walking that is relieved with rest, or
- skin turning a darker colour (e.g. brown, purplish-blue, black)

DIABETES COMPLICATIONS

Macrovascular

Diabetes might cause medium and large vessel (macrovascular) complications like heart attack and stroke. Here are some common complications and what to do.

Prevent complications by exercising, losing excess weight, and quitting smoking.


STAGE 1
STAGE 2
STAGE 3
STAGE 4
MANAGING DIABETIC FOOT INFECTIONS


Tips for Preventing Diabetic Foot Ulcers
• Keep blood sugar levels in check
• Exercise regularly
• Stop smoking
• Lose weight
• Wash feet regularly and inspect them daily
• Avoid walking barefoot and shak
shoes out before wearing them
well

DIABETES COMPLICATIONS

Microvascular

Diabetes might cause complications like nerve damage and kidney failure. To detect common microvascular (small vessel) diseases early, go for regular screening.

NERVE DAMAGE

Diabetes might lead to nerve damage and loss of feeling in the feet. This means your feet can be injured without you feeling it, which increases risk for ulcers and infections.

What to do:

- Foot Screening

RETINOPATHY

Diabetes might lead to retinopathy — damage to blood vessels in the eye — which could lead to blindness.

What to do:

- Retinal Photography

KIDNEY FAILURE

Diabetes increases risk for kidney disease. This could lead to kidney failure, which requires dialysis to treat.

What to do:

- Urine Test for Microalbumin/Protein
- Blood Test for Kidney Function

DIABETES MELLITUS

C.J. MILLER

CLASSIFICATION

Type 1 IDDM
- Ø Insulin Produced
- Most Often Before Age 15
- Was Called Juvenile Diabetes
- Auto Immune Disorder
- Familial & Lifelong

Type 2 NIDDM
- Insufficient Insulin Production
- Ketoacidosis Not Common
- Adults p̄ 40 Most Often
- Was Called Adult Onset Diabetes
- Familial
- May Need Insulin

Gestational
- During Pregnancy
- Goes Away p̄ Pregnancy
- May Not Reoccur
- May Have BIG Baby

Mature Onset Diabetes of the Young (MODY)
- Impaired Insulin Production
- Ketoacidosis Not Common
- Strong Family HX of Type 2
- Same Characteristics as Type 2

DX
"↓ or Ø Insulin" Secretion

ASSESSMENT
Type 1 & 2
3-P's
- Polyphagia
- Polydipsia
- Polyuria
- Fatigue
- ↑ UTI's

Type 2
- Wt. ↑
- Eye Problems
- Slow Onset

Type 1
- Wt. ↓
- ↑ Thirst
- Bed Wetting
- Rapid Onset

DX
FBG > 126 mg/dl
Confirmd by repeat testing on another day
or
Casual or random glucose > 200 mg/dl + symptoms
or
Glucose tolerance test > 200 mg/dl

TREATMENT
Insulin
Oral Hypoglycemics
Diet
↓ Insulin Need ← Exercise
↓ Glucose Fluctuation

COMPLICATIONS
Insulin
- Hypoglycemia
- Lipodystrophy
- Somogyi Effect
- Allergic Reaction

Poorly Controlled Diabetes
- Diabetic Ketoacidosis (Type 1)
- Hyperosmolar Hyperglycemia Non-Ketotic Coma (Type 2)
- Fluid & Electrolyte Imbalance

Long Term
- Angiopathy
- Peripheral Vascular Disease
- Retinopathy
- Nephropathy
- Neuropathy
- Infections