

Demystifying Diabetes and Its Treatment

Robin Arends, DNP, CNP, FNP-BC, FAANP

Avera Senior Care

Objectives

- ▶ 1. Identify signs and symptoms of hypo and hyperglycemia
- ▶ 2. Discuss the differences between various types of short and long acting insulin
- ▶ 3. Explain the rationale for blood sugar timing and insulin administration

Type 1 Diabetes

- ▶ Pancreas (beta cells) stop secreting insulin
- ▶ Cause unknown but possibly
 - ▶ Autoimmune
 - ▶ Genetic
 - ▶ Viral

Pathophysiology Type 2 Diabetes

- ▶ Pancreas continues to produce insulin but is insufficient or poorly utilized by the body
- ▶ Three metabolic abnormalities
 - ▶ Insulin Resistance
 - ▶ Pancreas begins to decrease its ability to produce insulin
 - ▶ Inappropriate glucose production by liver

Risk Factors Type 2

- ▶ Family History
- ▶ Obesity
- ▶ Race/ethnicity
- ▶ Age > 45 years
- ▶ Hypertension
- ▶ HDL <35 mg and/or triglycerides >250 mg
- ▶ Hx of GDM or delivery of baby over 9 lbs.

Hyperglycemia Signs and Symptoms

- Polyphagia
- Polydipsia
- Polyuria

Signs & Symptoms

Here's what may happen when your blood sugar is high:



Very thirsty



Needing to pass urine more often than usual



Dry skin



Very hungry



Sleepy



Blurry vision



Infections or injuries heal more slowly than usual

Complications

- ▶ Neuropathy
 - ▶ Decreased feeling of hands and feet
- ▶ Recurrent infections
- ▶ Cardiovascular
 - ▶ Atherosclerosis, Stroke, MI
- ▶ Eye complications
 - ▶ Retinal hemorrhage
 - ▶ Blindness
- ▶ Renal Disease
- ▶ Dental Disease

Major Complications of Diabetes

Microvascular

Eye

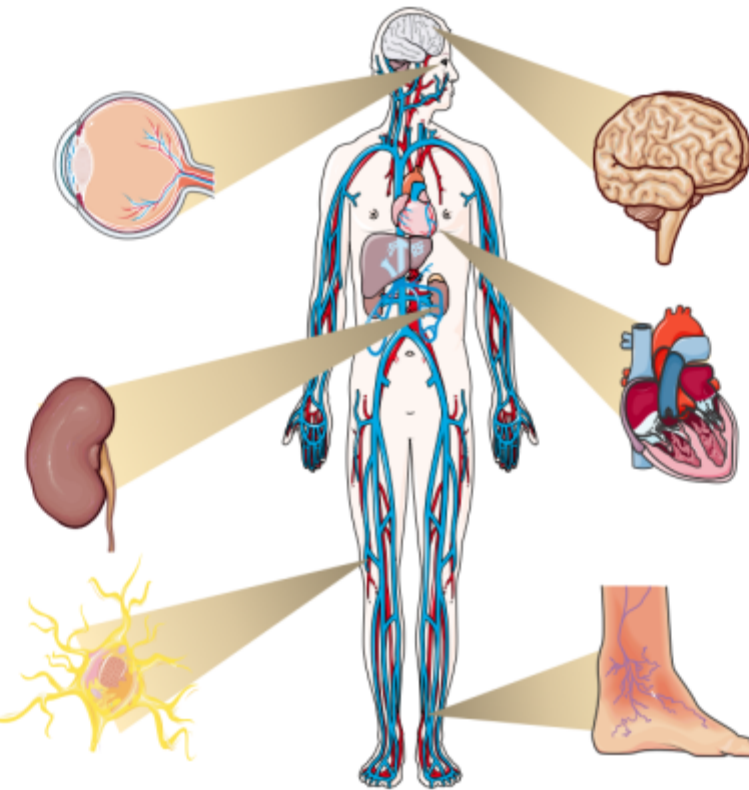
High blood glucose and high blood pressure can damage eye blood vessels, causing retinopathy, cataracts and glaucoma

Kidney

High blood pressure damages small blood vessels and excess blood glucose overworks the kidneys, resulting in nephropathy.

Neuropathy

Hyperglycemia damages nerves in the peripheral nervous system. This may result in pain and/or numbness. Feet wounds may go undetected, get infected and lead to gangrene.



Macrovascular

Brain

Increased risk of stroke and cerebrovascular disease, including transient ischemic attack, cognitive impairment, etc.

Heart

High blood pressure and insulin resistance increase risk of coronary heart disease

Extremities

Peripheral vascular disease results from narrowing of blood vessels increasing the risk for reduced or lack of blood flow in legs. Feet wounds are likely to heal slowly contributing to gangrene and other complications.

Treatment Overview

▶ Type 1

- ▶ Diet
- ▶ Exercise
- ▶ Insulin
- ▶ HTN management
- ▶ Lipid management

▶ Type 2

- ▶ Diet
- ▶ Exercise
- ▶ Oral or injectable medication
- ▶ Insulin
- ▶ HTN management
- ▶ Lipid management

Insulin

- ▶ Cannot be administered orally
 - ▶ Insulin is destroyed by the GI secretions
- ▶ Administered sub Q at 45-90 degrees
 - ▶ No longer rotate insulin injections from site to site-just within sites
- ▶ Required for type 1 diabetes
- ▶ Prescribed for patient with type 2 diabetes who cannot control blood glucose by other means

Insulin

- ▶ Types of insulin
 - ▶ Insulins differ in regard to onset, peak action, and duration
 - ▶ Characterized as rapid-acting, short-acting, intermediate-acting, long-acting
 - ▶ Different types of insulin may be used for combination therapy
- ▶ Regimen that closely mimics endogenous insulin production is basal-bolus
 - ▶ Long-acting (basal) once a day
 - ▶ Rapid/short-acting (bolus) before meals

Insulin

- ▶ Types of insulin
 - ▶ Rapid-acting: Lispro (Humalog), Aspart (Novolog), and glulisine (Apidra),
 - ▶ Short-acting: Regular (Humalin R, Novolin R)
 - ▶ Intermediate-acting: NPH (Humulin N, Novolin N) , detemir (Levemir)
 - ▶ Long-acting: Glargine (Lantus)

Insulin Action Profile

	ONSET	PEAK	DURATION
▶ Humalog sub-Q	5 min	30-60"	2-4 hr
▶ Regular sub-Q	0.5-1 hr	2-4 hr	6-8 hr
▶ 70/30 Sub-Q	30 min	4-8 hr	up to 24 hr
▶ NPH Sub-Q	1- 2 hr	6-12 hr	18-24 hr
▶ Lantus	Unknown		24 hr

Insulin

- ▶ Insulin preparations
 - ▶ Rapid-acting (bolus)
 - ▶ Aspart, Humalog, Novolog
 - ▶ Injected 0 to 15 minutes before meal
 - ▶ Onset of action 15 minutes
 - ▶ Short-acting (bolus)
 - ▶ Regular
 - ▶ Injected 30 to 45 minutes before meal
 - ▶ Onset of action 30 to 60 minutes

Drug Therapy

- ▶ Long-acting (basal)
 - ▶ Injected once a day at bedtime or in the morning
 - ▶ Released steadily and continuously
 - ▶ No peak action
 - ▶ Cannot be mixed with any other insulin or solution

A patient is prescribed insulin glargine (Lantus). Which statement should the nurse include in the discharge instructions?

- A. The insulin will have a cloudy appearance in the vial.
- B. The insulin should be injected twice daily (before breakfast and dinner).
- C. The patient should mix Lantus with the intermediate-acting insulin.
- D. The patient will have less risk of hypoglycemic reactions with this insulin.

Insulin Preparations

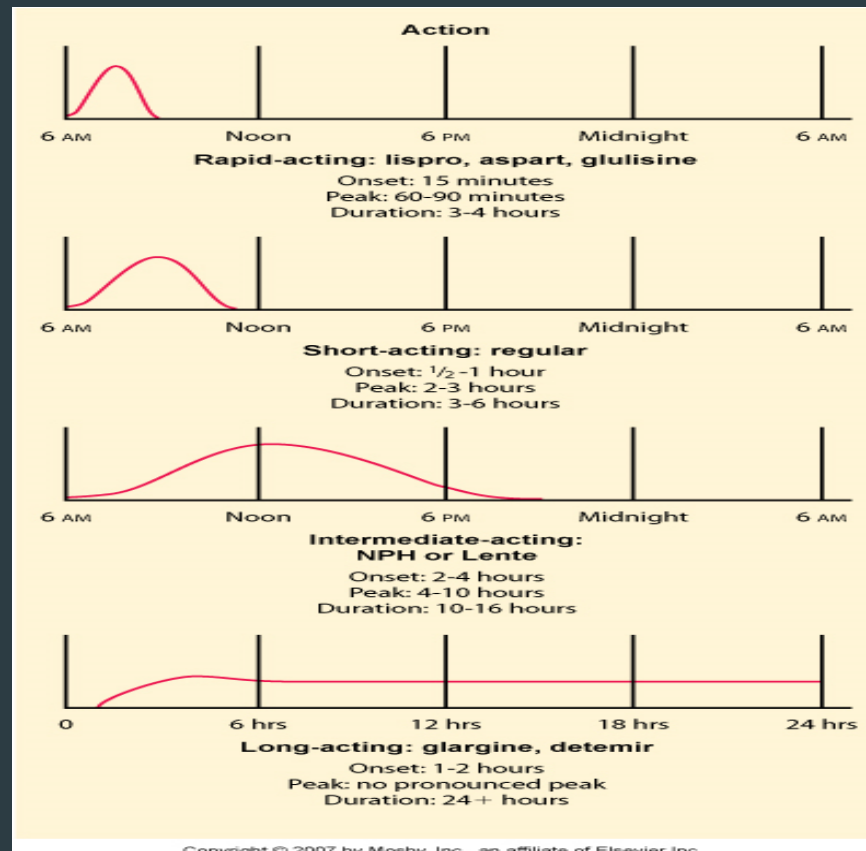


Fig. 49-4

Insulin

- ▶ Storage of insulin
 - ▶ Do not heat/freeze
 - ▶ In-use vials may be left at room temperature up to 4 weeks
 - ▶ Extra insulin should be refrigerated
 - ▶ Avoid exposure to direct sunlight

Administration of insulin

- ▶ Fastest absorption from abdomen, followed by arm, thigh, buttock
 - ▶ Abdomen
 - ▶ Preferred site
 - ▶ Rotate injections within one particular site
 - ▶ Prevent lipohypertrophy
 - ▶ Accumulation of fat that can occur at sites of frequent injection
- ▶ Do not inject in site to be exercised

Subcutaneous Injection Sites

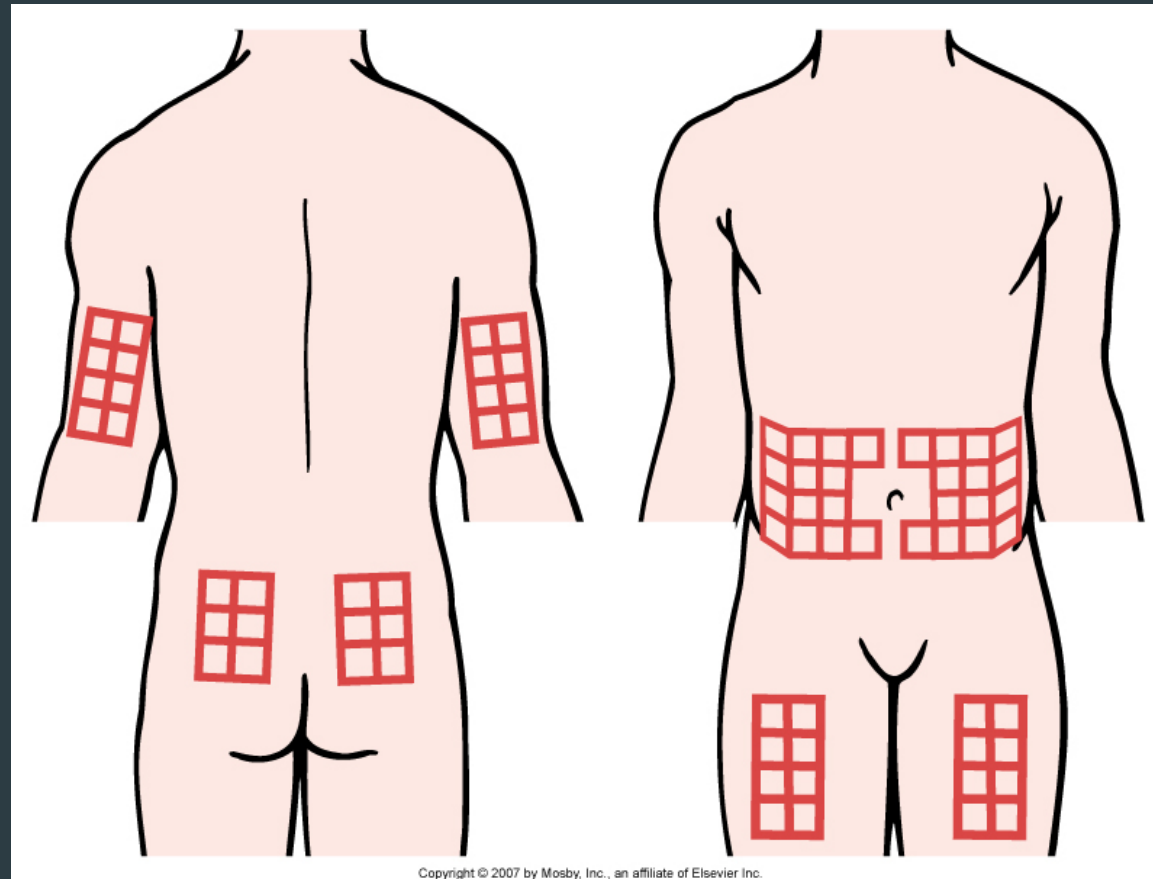


Fig. 49-6

Administration of insulin

- ▶ Usually available as U100
 - ▶ 1 ml contains 100 units of insulin
- ▶ Can mix Regular and NPH insulin
 - ▶ Draw up short acting first, then NPH
 - ▶ Do not mix Long acting insulins
- ▶ Do not recap needle
- ▶ 45- to 90-degree angle depending on fat thickness of patient
- ▶ Insulin pens preloaded with insulin now available

Insulin Pen

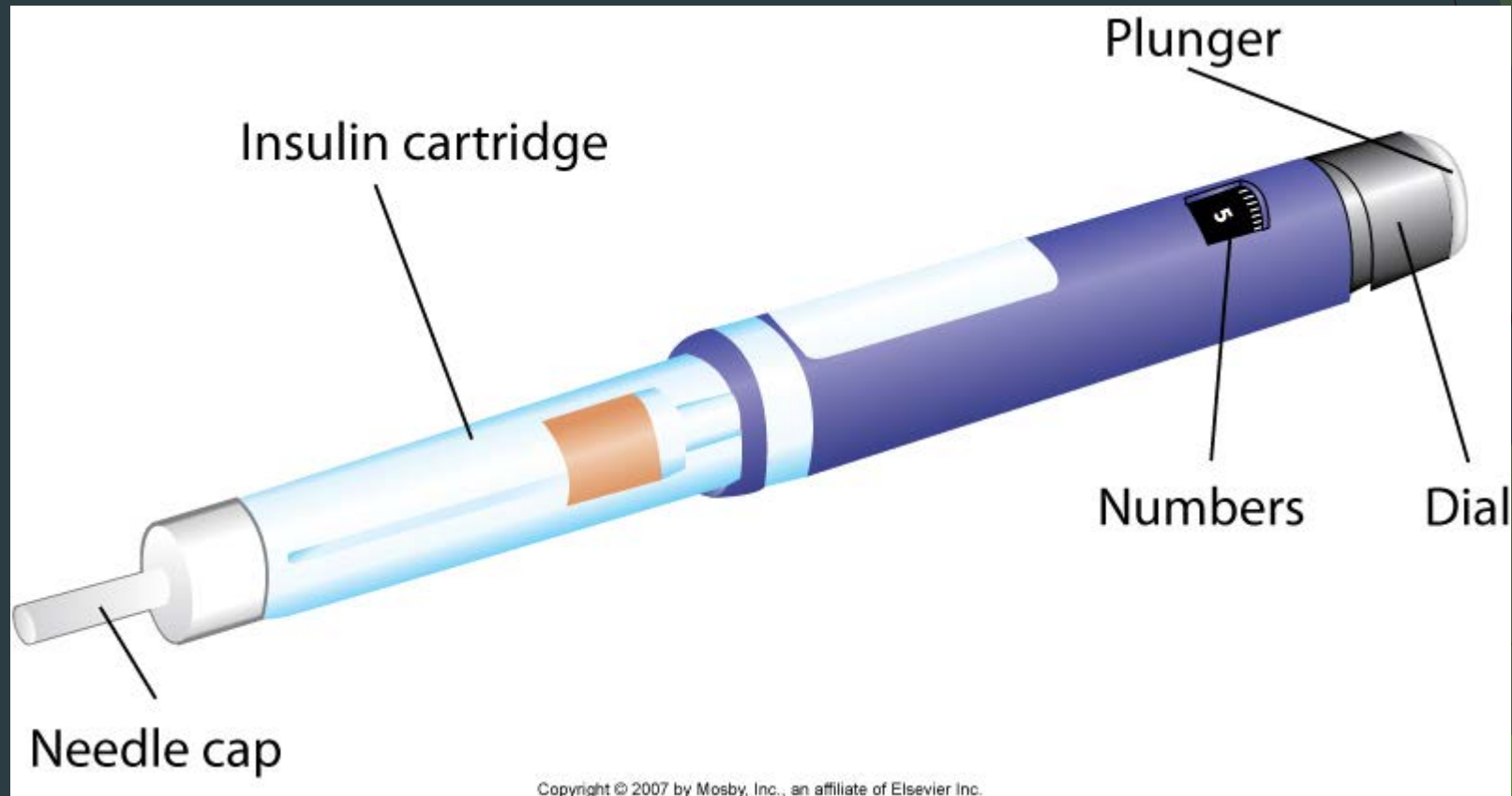


Fig. 49-7

Insulin Pump

- ▶ Continuous subcutaneous infusion
- ▶ Battery operated device
- ▶ Connected via plastic tubing to a catheter inserted into subcutaneous tissue in abdominal wall
- ▶ Potential for tight glucose control

Insulin Pump



Fig. 49-8

Adverse Effects of insulin

- ▶ Hypoglycemia
 - ▶ BS <50
 - ▶ What are signs and symptoms?
 - ▶ Treat with fast acting oral sugar
 - ▶ If unable to swallow, need to give IV
 - ▶ Need to carry carbohydrate with patient
 - ▶ If untreated, can lead to death
- ▶ Hypokalemia
 - ▶ Seen in excessive use of insulin



Timing of Insulin

- ▶ Blood sugars need to be checked prior to eating
- ▶ Treating post prandial blood sugars can lead to hypoglycemia
- ▶ Monitoring trends of blood sugars for adjustments need to have consistent checking of blood sugars prior to eating.
- ▶ When is the most dangerous time for hypoglycemia to occur?

Oral Agents

The background of the slide is composed of several overlapping, semi-transparent triangles in various shades of green and blue. The triangles are arranged in a way that creates a sense of depth and movement, with some triangles pointing towards the top right and others towards the bottom left. The colors range from a deep, dark blue to a bright, lime green.

Biguanides (Metformin)

- Reduces glucose production from liver
- Enhances insulin sensitivity at tissue level and improves glucose transport into cells
- Does not promote weight gain
- Do not use in patients with heart failure, renal insufficiency, or liver failure
- Used to treat prediabetes, PCOS, and Type II Diabetes
 - ▶ Metformin (Glucophage)

Metformin

- ▶ Side Effects
 - ▶ Nausea
 - ▶ Diarrhea
- ▶ Toxicity
 - ▶ Lactic acidosis
 - ▶ Rare
 - ▶ Seen more in patients with decreased renal function
 - ▶ s/s
 - ▶ Hyperventilation
 - ▶ Myalgia
 - ▶ Malaise
 - ▶ Somnolence

Sulfonylureas

- ▶ Increase insulin production from pancreas
 - ▶ Glipizide
 - ▶ Glucotrol
 - ▶ Glyburide
 - ▶ Diabeta
 - ▶ Micronase
 - ▶ Glimepiride
 - ▶ Amaryl
- ▶ Can cause hypoglycemia
 - ▶ Watch patients with liver and kidney problems
 - ▶ Not recommended in patients with severe kidney and/or liver damage
 - ▶ Watch liver enzymes

Meglitinide

- ▶ Increases insulin production from pancreas
 - ▶ Repaglinide (Prandin)
- ▶ Can cause hypoglycemia
- ▶ Take 30 minutes to just before each meal

Alpha-Glucosidase Inhibitor

Starch Blockers (alpha Glucosidase inhibitors)

(Precose, Glyset)

Taken with first bite with each meal

Measure effectiveness by checking blood sugar 2 hours post prandial

Gliptins (Januvia)

- ▶ Enhances actions of the incretin hormones
- ▶ Well tolerated
- ▶ Adverse risks:
 - ▶ URI
 - ▶ Rare adverse effect is pancreatitis
 - ▶ What are s/s?

Combination

- ▶ Glyburide/metformin
 - ▶ glucovance
- ▶ Combinations are with metformin and another drug class
- ▶ Remember to watch for hypoglycemia with sulfonylureas

Exenatide (Byetta)

- ▶ Incretin mimetic
- ▶ Injectable- Sub Q
- ▶ Adverse effects:
 - ▶ Hypoglycemia
 - ▶ Pancreatitis
 - ▶ Renal impairment (low)

Diabetic Ketoacidosis

- ▶ Insulin deficiency
- ▶ S/s
 - ▶ Hyperglycemia
 - ▶ Production of ketones
 - ▶ Acidosis
 - ▶ Coma
- ▶ Life threatening
- ▶ Treat with:
 - ▶ IV fluids
 - ▶ Electrolyte replacement
 - ▶ IV Insulin
 - ▶ Glucose levels reduced by 50 mg/dL/hr

Case Study

Jane Smith, a Type 1 diabetic, has a new order for 25u Regular Insulin and 17 U NPH insulin sub-Q at 7 AM every morning. She asks when she would be at greatest risk for developing an insulin reaction.

What patient teaching would you provide?

Would your answer change if Jane was a Type 2 Diabetic? Why or why not?

Case Study

Jane's insulin has been changed to Lispro 18 u with meals and Lantus 28 U at bedtime.

1. Can Lantus and Lispro insulin be mixed?
2. When would Jane be at greatest risk for an insulin reaction(s)?
3. Would Jane be at risk for an insulin reaction during the night? Why or why not?
4. Jane is planning a 2 week cruise in the Caribbean and tells you she on doing "lots of dining and dancing". Jane wants to know if she can take her Lispro in her cabin before she goes to dinner. What would you tell her?
5. Jane is concerned about needing to refrigerate her insulin during her cruise. What would you tell her?
6. Jane also takes Metoprolol for high blood pressure. What patient teaching would you include that is specific to diabetes?