

Endocrine System: Diabetes Mellitus

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NUR 142

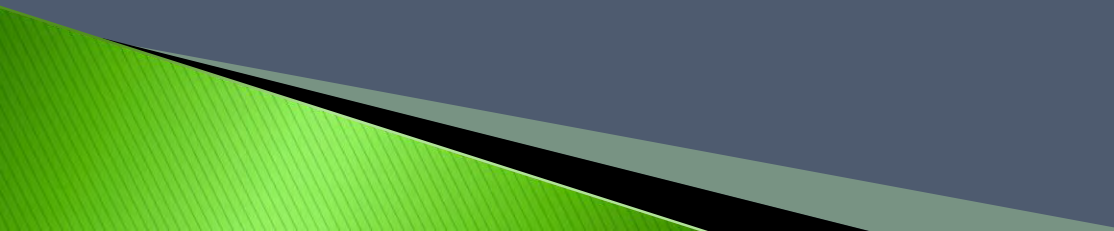
TABLE 48.1 HEALTH HISTORY QUESTIONS RELATED TO ENDOCRINE DISORDERS

General Demographics	Gender, Age
Present illness	Gradual or sudden onset of symptoms Changes in child's lifestyle, physical appearance, sleep patterns, appetite, thirst, vision, bowel and urinary habits, or nausea and vomiting Recent increases or decreases in weight and height, muscle weakness, cramps, twitching, or headaches
Past medical history	Birth: any neonatal screening done and results, trauma during birth, birth size, feeding difficulties Prenatal history: maternal factors that may affect growth and development such as substance abuse, use of tobacco or alcohol, Graves' disease Past health: treated for any endocrine problem in the past, recent gastroenteritis or viral syndrome Current immunization status
Allergies	History of allergies to medications, foods, milk or formula
Current medications	Prescribed, over-the-counter, or home remedies
Family history	Any endocrine disorders or growth and development difficulties
Environmental exposure	Exposure to exogenous steroids or gonadotropins
Social history	Normal daily activities; activity level; family resources such as insurance and support systems to maintain long-term treatment regimen
Growth and development milestones	History of growth patterns Presence of learning disabilities, cognitive delays, early or late development of secondary sexual characteristics

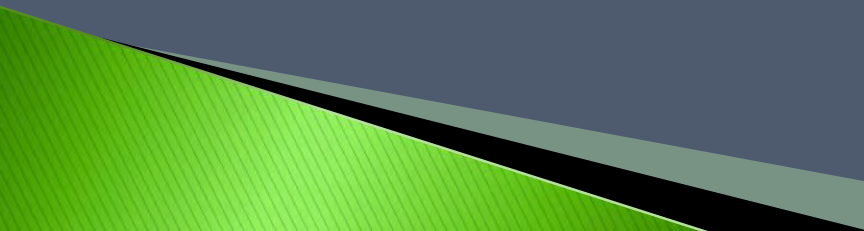
TABLE 48.2 KEY PHYSICAL EXAMINATION FINDINGS RELATED TO ENDOCRINE PROBLEMS

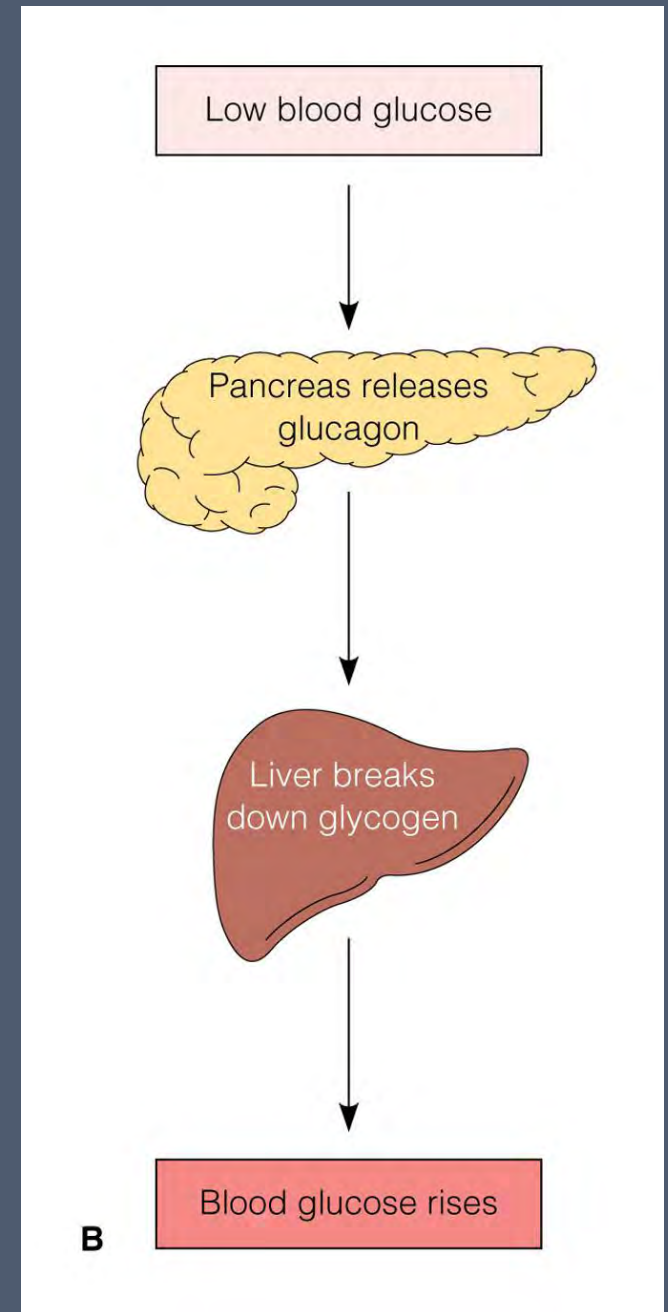
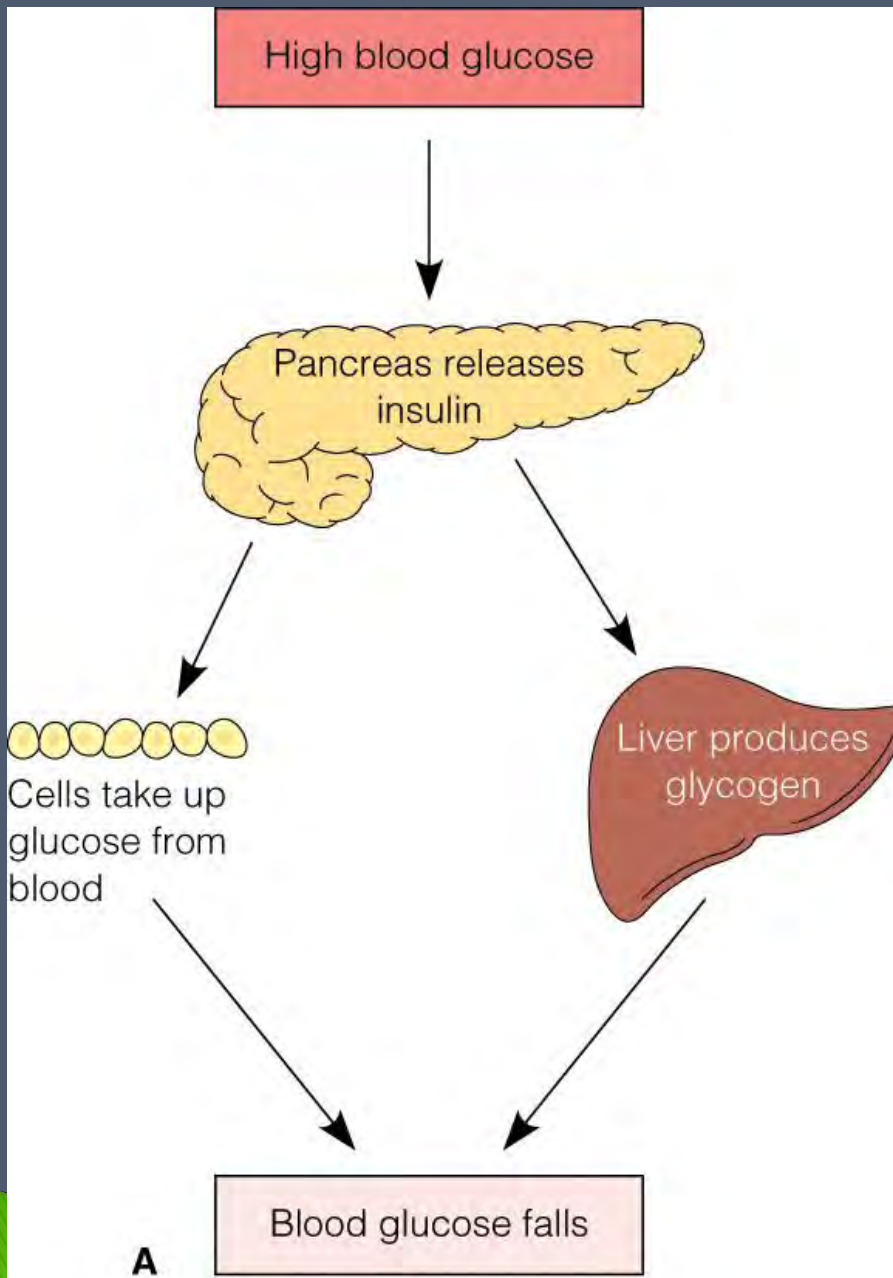
Height and weight	Below third percentile or above 90th percentile (pituitary, thyroid, adrenal, or diabetes mellitus)
Hair	Coarse, brittle, excessive (hypothyroidism) Abnormal distribution (adrenal disorders)
Face	Round with hair growth (Cushing's syndrome) Deformities or abnormal features (hypoparathyroidism)
Eyes	Blurred or changes in vision (diabetes mellitus, pituitary tumors, precocious puberty)
Mouth	Delayed dentition (hypocalcemia, hypopituitarism) Fruity breath (ketoacidosis)
Neck	Goiter (hyperthyroidism)
Skin	Cool to touch, dry (hypothyroidism) Changes in color or texture (pituitary disorders) Easy bruising, striae (Cushing's syndrome)
Chest	Tachycardia (hyperthyroidism) Palpitations, sweating (thyroid disorders) Deep, labored breathing (ketoacidosis) Hypertension (Cushing's syndrome)
Abdomen	Extreme weight loss (diabetes mellitus) Extreme fat (Cushing's syndrome) Changes in bowel habits (SIADH, diabetes insipidus, diabetes mellitus)
Fingers	Trembling (hyperthyroidism, parathyroid disorders)
Genitals	Excessive growth (adrenogenital syndrome) Early growth (precocious puberty) Delayed growth (hypopituitarism)

Diabetes Mellitus

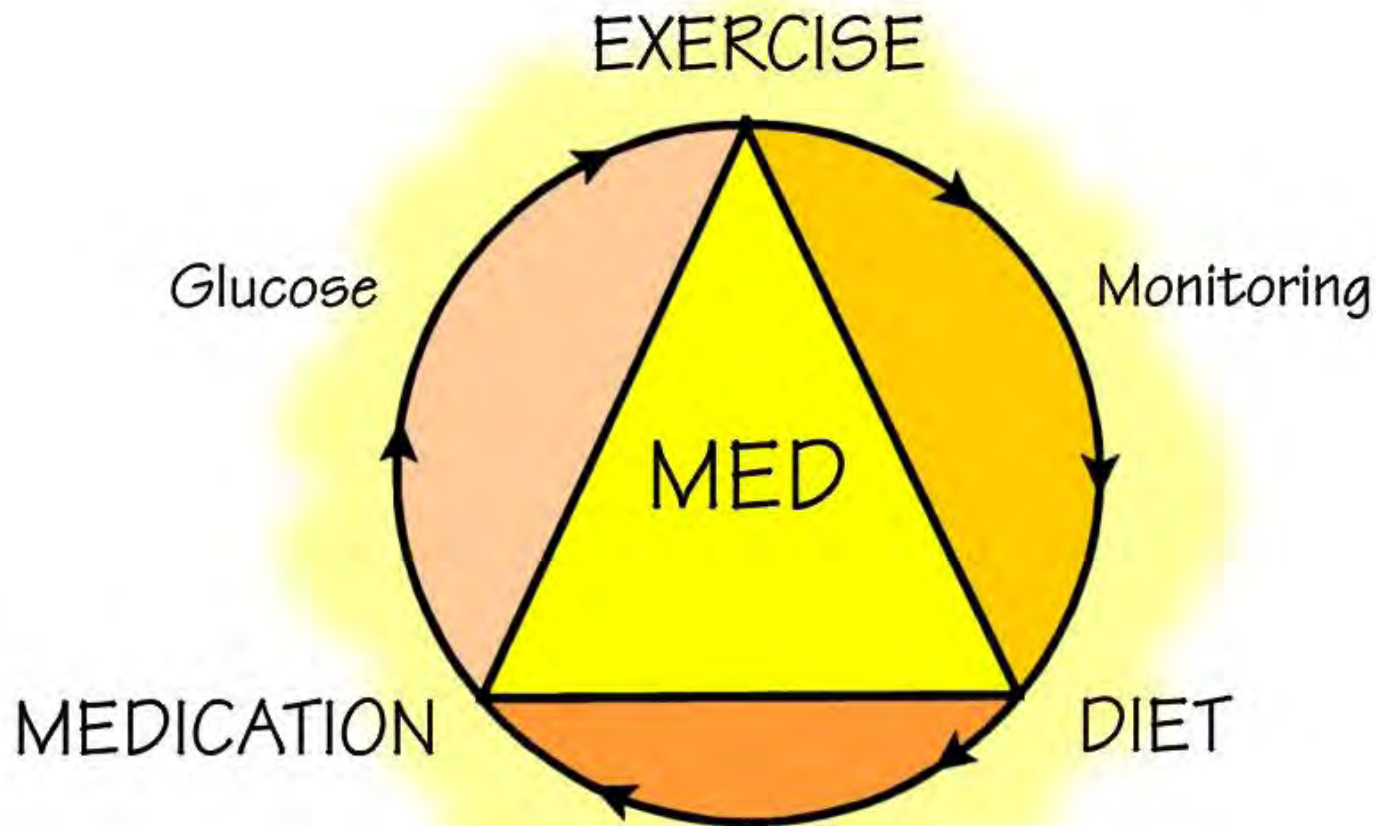
- ▶ A group of diseases characterized by hyperglycemia due to defects in insulin secretion, insulin action, or both
 - ▶ Affects nearly 21 million people in the United States
 - ▶ Almost 1/3 of cases are undiagnosed
 - ▶ Prevalence is increasing
 - ▶ Minority populations and the elderly are disproportionately affected
- 

Functions of Insulin

- ▶ Transports and metabolizes glucose for energy
 - ▶ Stimulates storage of glucose in the liver and muscle as glycogen
 - ▶ Signals the liver to stop the release of glucose
 - ▶ Enhances the storage of dietary fat in adipose tissue
 - ▶ Accelerates transport of amino acids into cells
 - ▶ Inhibits the breakdown of stored glucose, protein, and fat
- 



TRIANGLE OF DIABETES MANAGEMENT



Diabetes Is...

Common



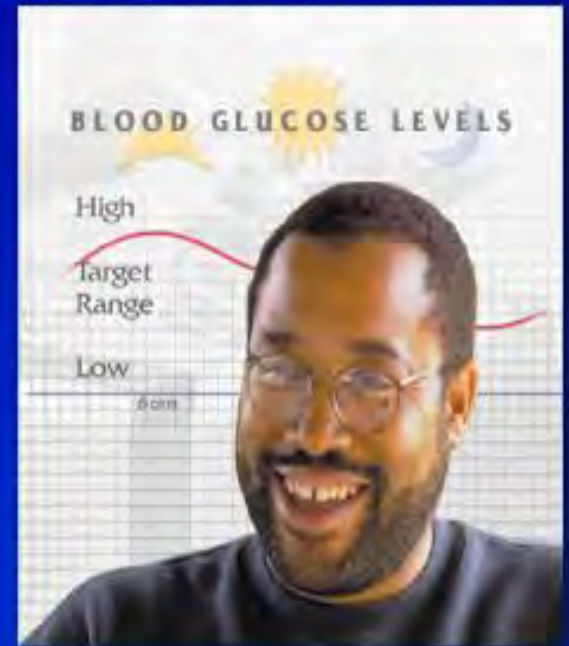
Affects 1 in every
16 people

Chronic



A lifelong condition

Controllable



Good management
depends on YOU!

What Happens When We Eat?

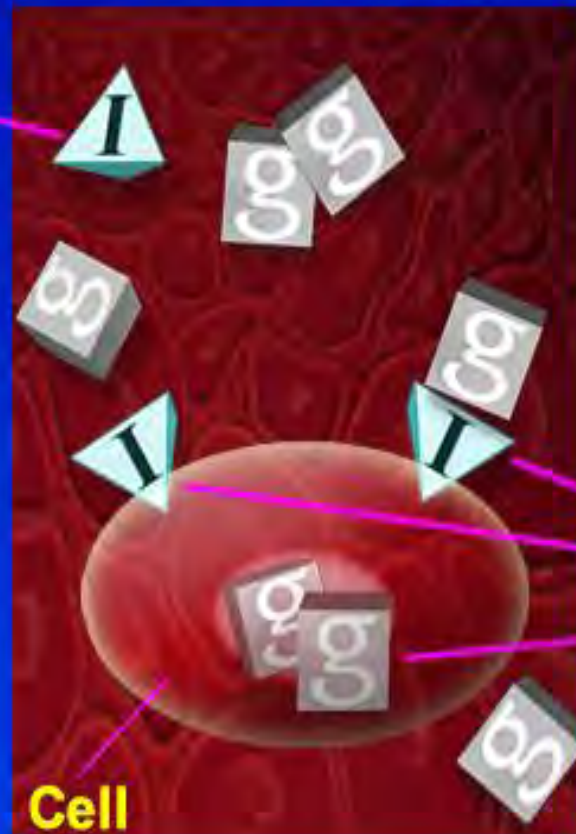


After eating, most food is turned into **blood glucose**, the body's main source of energy

Normal Blood Glucose Control

In people without diabetes,
glucose stays in a healthy range because...

Insulin
is released
at the right times
and in the
right amounts



Insulin helps
glucose enter cells

Cell

High Blood Glucose (Hyperglycemia)

In diabetes, blood glucose builds up for several possible reasons...

Too little insulin is made

Cells can't use insulin well

Liver releases too much glucose



Pre-diabetes or Diabetes?

Fasting Plasma Glucose Test

Less than 110 mg/dL

Normal

110 – 125 mg/dL

Pre-diabetes

126 mg/dL or higher

Diabetes

Oral Glucose Tolerance Test

Less than 140 mg/dL

Normal

140 – 199 mg/dL

Pre-diabetes

200 mg/dL or higher

Diabetes

If you are overweight and over age 45, get tested!

DM Screening and Monitoring Tests

▶ DM Screening Tests

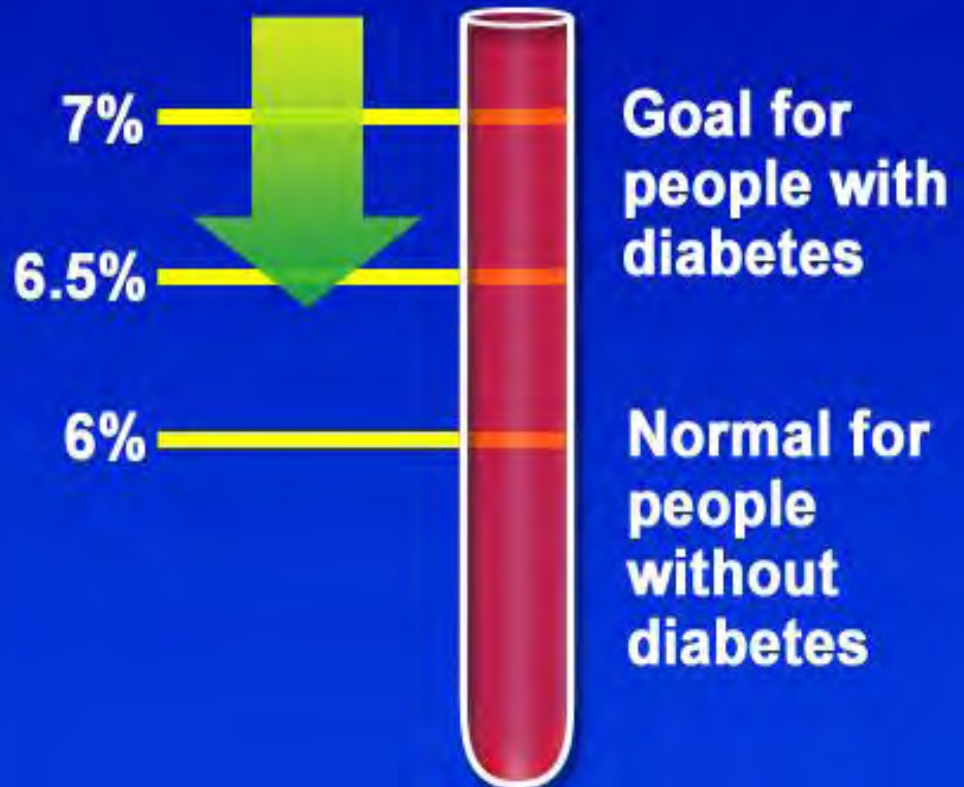
- Casual plasma glucose (PG): (>200 mg/dL) any time of day without regard to time since the last meal
- Fasting plasma glucose (FPG): (> 126 mg/dL) no caloric intake in 8 hours
- Two-hour PG: (>200 mg/dL) during an oral glucose tolerance test

▶ Management of Diabetes

- Fasting blood glucose (FBG): normal range 70-110 mg/dL
- Glycosylated hemoglobin: used to determine the average glucose level over 2–3 months, values above 7%–9% considered elevated
- Urine glucose and ketone levels: not as accurate as monitoring changes in blood glucose levels

A1c Blood Test

This blood test checks the average blood glucose over the past 2 – 3 months



Glucose and A1c Levels

Test

Blood glucose
before meals

Blood glucose
after meals

Bedtime glucose

A1c

Suggested Ranges for People with Diabetes

80 – 120 mg/dL

100 – 180 mg/dL

100 – 140 mg/dL

Less than 7%



Major Types of Diabetes

Two Main Types of Diabetes

Type 1 Diabetes

- ▶ Pancreas makes too little or no insulin

Type 2 Diabetes

- ▶ Cells do not use insulin well (insulin resistance)
- ▶ Ability for pancreas to make insulin decreases over time



Pancreas

Type 1 Diabetes

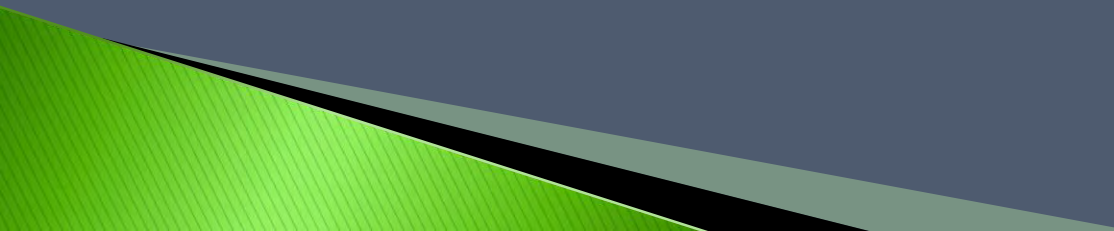
- ▶ 1 in 10 people with diabetes have type 1
- ▶ Most people are under age 20 when diagnosed
- ▶ Body can no longer make insulin



Insulin is **always** needed for treatment



Type 1 Diabetes

- ▶ Insulin producing beta cells in the pancreas are destroyed by an autoimmune process
 - ▶ Requires insulin, as little or no insulin is produced
 - ▶ Onset is acute and usually before 30 years of age
 - ▶ 5–10% of persons with diabetes
- 

DIABETES MELLITUS - TYPE 1

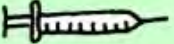
SIGNS & SYMPTOMS:

Polyuria
↑ Urination

Polydipsia
↑ Thirst

Polyphagia
↑ Hunger



- Weight Loss
- Fatigue
- ↑ Frequency of Infections
- Rapid Onset
- Insulin  Dependent
- Familial Tendency
- Peak Incidence From 10 to 15 Years

Symptoms of Type 1 Diabetes

Symptoms usually start suddenly

Weight loss

**Loss of
energy**



**Increased
thirst**

**Frequent
urination**

Hunger

Blurred vision

Managing Type 1 Diabetes



**Healthy
Food
Choices**



**Blood Glucose
Monitoring**



Education

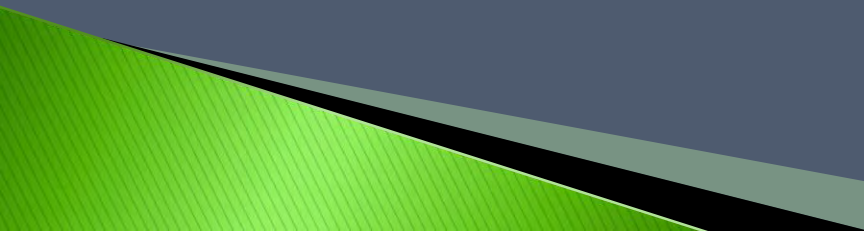


**Physical
Activity**



Insulin

Type 2 Diabetes

- ▶ Decreased sensitivity to insulin (insulin resistance) and impaired beta cell function results in decreased insulin production
 - ▶ 90–95% of person with diabetes
 - ▶ More common in persons over age 30 and in the obese
 - ▶ Slow, progressive glucose intolerance
 - ▶ Treated initially with diet and exercise
 - ▶ Oral hypoglycemic agents and insulin may be used
- 

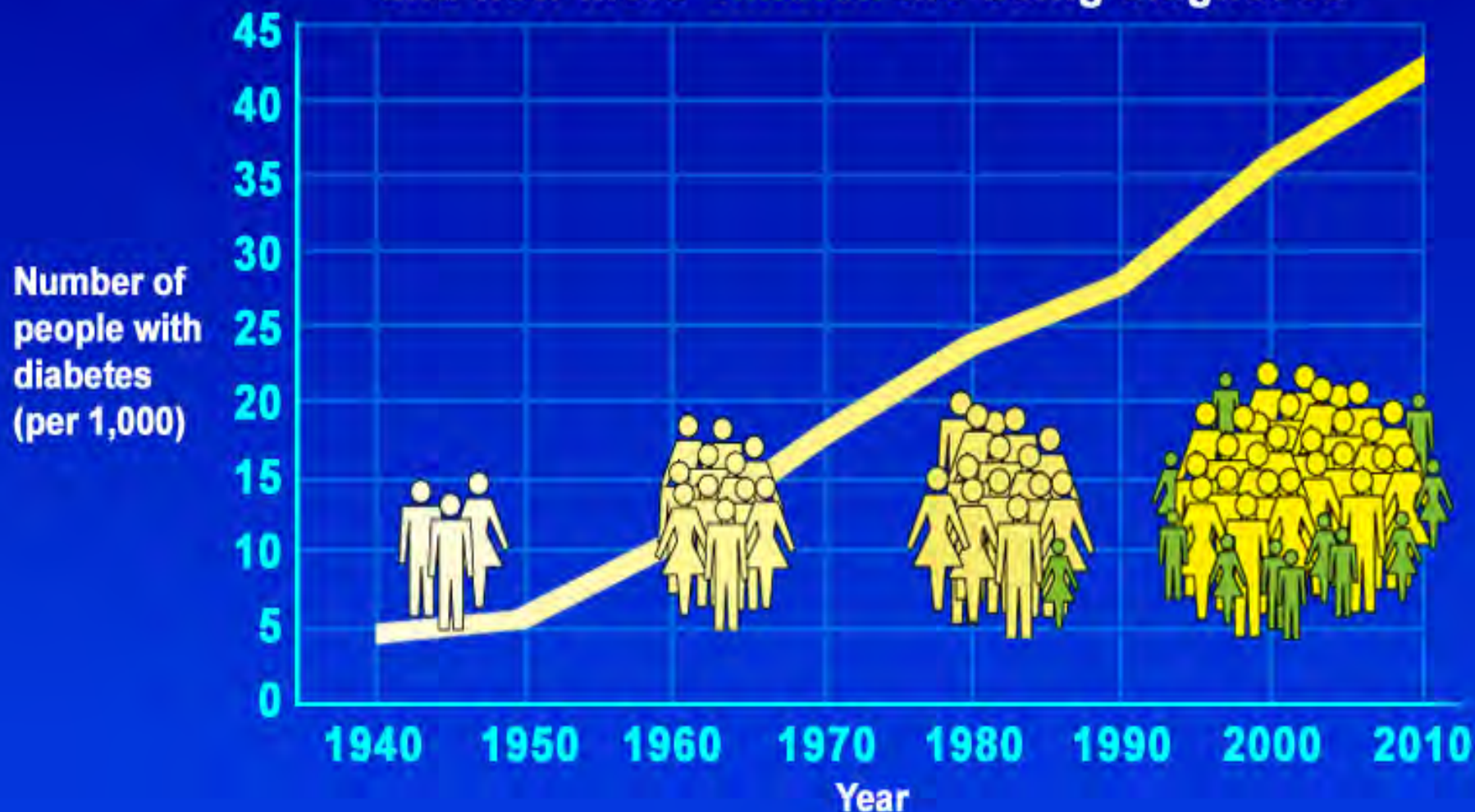
Type 2 Diabetes

- ▶ 9 in 10 people with diabetes have type 2
- ▶ Most people are over age 40 when diagnosed
- ▶ Type 2 is more likely in people who:
 - Are overweight
 - Belong to certain ethnic groups
 - Have a family history of type 2 diabetes



The Type 2 Diabetes Epidemic

Type 2 diabetes occurs mainly in adults — and now more **children** are being diagnosed



Symptoms of Type 2 Diabetes

- ▶ Usually subtle or no symptoms in early stages:
 - Increased thirst
 - Increased urination
 - Feeling tired
 - Blurred vision
 - More frequent infections
- ▶ Symptoms tend to occur gradually



Symptoms may be mistaken for other situations or problems (aging, summer heat)



Treatment for Type 2 Diabetes May Change Over a Lifetime

Always Includes:

Education, Healthy Eating,
Blood Glucose Monitoring,
Physical Activity



May Include:
Oral Medications



May Include:
Insulin



Gestational Diabetes

- Occurs during final trimester of pregnancy
- May be due to weight gain during pregnancy leading to insulin resistance
- Usually mild and controlled with diet
- Occasionally, insulin required
- Client may be asymptomatic, with diabetes found in prenatal screen
- Increases incidence of fetal and peri-natal complications
- Babies of these mothers have higher birth weights
- Client returns to normal blood sugar level post-delivery

Secondary Diabetes

- May result from trauma or disease to the pancreas, such as pancreatitis, pancreatectomy, and cystic fibrosis
- Possible causes
 - Hormonal, including acromegaly, and Cushing's disease
 - Certain drugs, such as Dilantin, birth control pills, and steroids

Risk Factors

- ▶ Type 1: not inherited but a genetic predisposition combined with immunologic and possibly environmental (viral) factors
- ▶ Type 2: family history of diabetes, obesity, race/ethnicity, age greater than 45 years, previous identified impaired fasting glucose or impaired glucose tolerance, hypertension $\geq 140/90$, HDL ≤ 35 and/or triglycerides ≥ 250 , history of gestational diabetes or babies over 9 pounds

Clinical Manifestations

- ▶ “Three Ps”
 - Polyuria
 - Polydypsia
 - Polyphagia
- ▶ Fatigue, weakness, vision changes, tingling or numbness in hands or feet, dry skin, skin lesions or wounds that are slow to heal, recurrent infections
- ▶ Type 1 may have sudden weight loss, nausea, vomiting, and abdominal pain if DKA has developed

Symptoms of Hyperglycemia



- ▶ Increased thirst
- ▶ Increased urination
- ▶ Blurry vision
- ▶ Feeling tired
- ▶ Slow healing of cuts or wounds
- ▶ More frequent infections
- ▶ Weight loss
- ▶ Nausea, vomiting, and abdominal pain

Causes of Hyperglycemia (High Blood Glucose)



**Not enough
medication**



**Too much
carbohydrate**



**Illness or
stress**

Blood Glucose Monitoring

- ▶ Provides the client with current blood glucose levels
- ▶ Results provide the client with information to maintain good glycemic control
- ▶ More accurate than urine testing
- ▶ Requires clients to “prick” themselves several times a day as prescribed
- ▶ Must be used with caution with clients with diabetic retinopathy and neuropathy
- ▶ Instruct clients in the proper procedure for obtaining blood glucose level

BLOOD SUGAR MNEMONIC

HOT & DRY = SUGAR HIGH



COLD & CLAMMY =
NEED SOME CANDY

Urine Testing: for Ketones and Glucose

- ▶ Instruct clients in the procedure for testing the urine for Ketones and glucose
- ▶ Teach the client that the second voided urine specimen is most accurate
- ▶ The presence of Ketones may indicate impending ketoacidosis
- ▶ Urine glucose testing is not recommended as a means of monitoring for clients taking insulin because it is a less reliable indicator compared with blood glucose monitoring

Routine Screening

- ▶ Should Be Done If
 - Obese
 - First-degree relative with DM
 - High-risk ethnic population
 - Delivered baby > 9 lb or gestational diabetes history
 - Hypertensive
 - HDL < 35 mg/dL
 - Triglycerides > 250 mg/dL
 - Impaired glucose tolerance or fasting glucose in the past

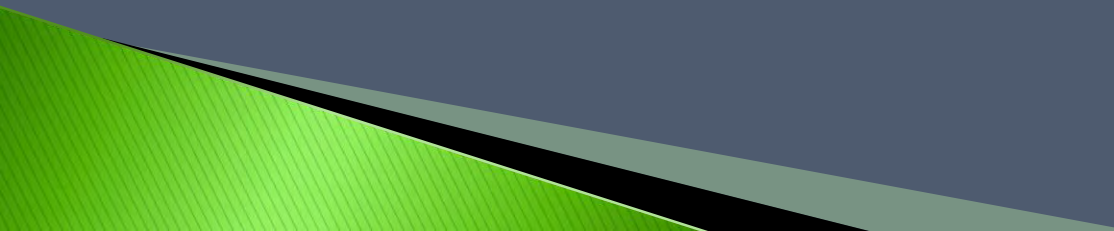
Treatment

- ▶ Medications that can increase blood sugar levels:
 - Glucocorticoids
 - Thiazide diuretics
 - Thyroid agents
 - Oral contraceptives
 - Estrogen
- ▶ Illness, infection, and stress increase the need for insulin; however I
- ▶ Insulin should not be withheld during illness, infection, or stress because:
 - Hyperglycemia and Ketoacidosis can result

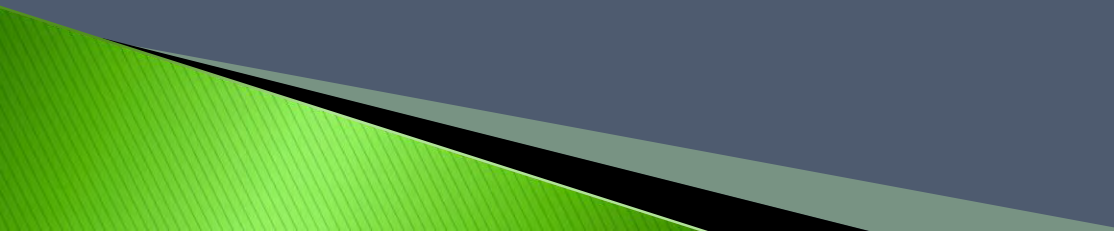
Treatment

- Monitor serum and urine glucose and ketone levels and for signs of hypoglycemia and hyperglycemia.
- Note that stress, fever, trauma, and infection may increase insulin requirements or necessitate switching from an oral hypoglycemic agent to insulin.
- Note that IV glucose or Glucagon may be used to treat severe hypoglycemia.
- Inform the client that antidiabetic agents control but do not cure diabetes and emphasize the need for lifelong therapy.

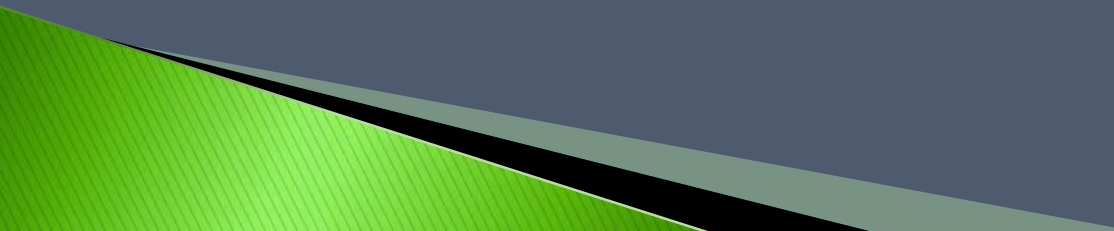
Dietary Management—Goals

- ▶ Provide optimal nutrition; all essential food constituents
 - ▶ Meet energy needs
 - ▶ Achieve and maintain a reasonable weight
 - ▶ Prevent wide fluctuations of blood glucose levels
 - ▶ Decrease serum lipids, if elevated
- 

Role of the Nurse

- ▶ Be knowledgeable about dietary management
 - ▶ Communicate important information to the dietitian or other management specialists
 - ▶ Reinforce patient understanding
 - ▶ Support dietary and lifestyle changes
- 

Meal Planning

- ▶ Consider food preferences, lifestyle, usual eating times, and cultural/ethnic background
 - ▶ Review diet history and need for weight loss, gain, or maintenance
 - ▶ Caloric requirements and calorie distribution throughout the day
 - ▶ Carbohydrates: 50–60% carbohydrates, emphasize whole grains
 - ▶ Fat: 20–30%, with $>10\%$ from saturated fat and < 300 mg cholesterol
 - ▶ Fiber
 - ▶ Exchange lists
- 

Glycemic Index

- ▶ Describes how much a food increases blood glucose
- ▶ Combine starchy food with protein and fat containing food slows absorption, and glycemic response
- ▶ Raw or whole foods tend to have lower response than cooked, chopped, or pureed foods
- ▶ Eat whole fruits rather than juices; decreases glycemic response due to fiber-slowing absorption
- ▶ Adding food with sugars may produce lower response if eaten with foods that are more slowly absorbed

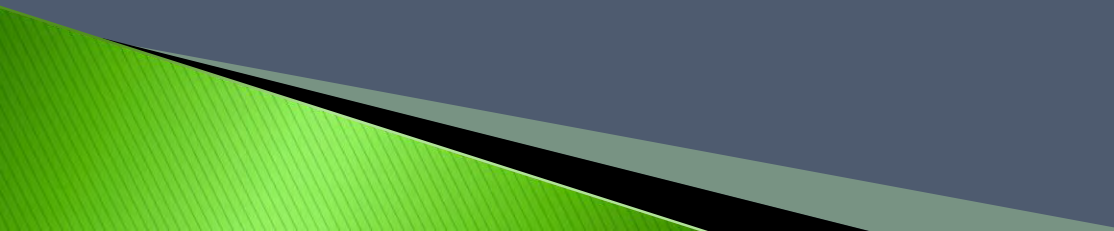
Exercise

- ▶ Decreases cholesterol and triglyceride levels
- ▶ Decreases blood pressure
- ▶ Helps the body to burn excess sugar
- ▶ Improves circulation
- ▶ Encourages weight loss
- ▶ Decreases the body's need for oral hypoglycemic agents or insulin
- ▶ Instruct the client in dietary adjustments when exercising
- ▶ Instruct the client to monitor blood glucose prior to exercising

Exercise Precautions

- ▶ Exercise with elevated blood sugar levels (above 250 mg/dL) and ketones in urine should be avoided
 - ▶ Insulin normally decreases with exercise; patients on exogenous insulin should eat a 15g carbohydrate snack before moderate exercise to prevent hypoglycemia
 - ▶ If exercising to control or reduce weight, insulin must be adjusted
 - ▶ Potential post-exercise hypoglycemia
 - ▶ Need to monitor blood glucose levels
- 

Exercise Recommendations

- ▶ Encourage regular daily exercise
 - ▶ Gradual, slow increase in exercise period is encouraged
 - ▶ Modify exercise regimen to patient needs and presence of diabetic complications or potential cardiovascular problems
 - ▶ Exercise stress test for patients older than age 30 who have 2 or more risk factors is recommended
 - ▶ Gerontologic considerations
- 

BOX 29-2

BENEFITS OF EXERCISE IN DIABETES

- Reduces blood pressure
- Reduces blood sugar
- Increases circulation
- Increases energy
- Increases lung capacity
- Increases self-esteem
- Lowers the amount of medication needed
- Slows resting heart rate
- Strengthens the heart
- Reduces stress
- Aids in weight loss
- Aids in weight maintenance

TABLE 48.4 DEVELOPMENTAL ISSUES RELATED TO DIABETES MELLITUS

Age Group	Child and Family Implications	Nursing Implications
Infants and toddlers	Management falls on parents/caretakers; signs and symptoms are sometimes difficult to assess in infants and young toddlers.	Attempt to achieve consistent dietary intake. Let toddler choose foods. Get toddler to find a word or phrase to use to describe feelings when hypoglycemic. Establish rituals/routines with home management.
Preschoolers	Increased motor maturity; widening social circle, so the child will notice that he or she is "different." Magical thinking presents some issues. Some children can begin to perform blood glucose testing with the newer devices.	Use simple explanations and play therapy when instructing or preparing for a procedure.
School-age children	Can perform finger/blood glucose testing, choose injection sites and give injections, perform ketone testing, recognize need to eat and treat for hypoglycemia. Must incorporate management into school day, and plan for field trips.	Use concise and concrete terms when instructing. Allow child to proceed at his or her own rate. Assist family to incorporate the testing and injections into school day and plan for field trips. Involve the school nurse in helping with the school plan.
Adolescents	Conflicts develop with self-management, body image, and peer group acceptance; must assume more of the care with supervision. Teens do not always foresee the consequences of their activity.	Slowly care is turned over to the adolescent with minor supervision from the family. Watch for depression.

Diabetic Medications

Insulin and Oral Hypoglycemic Medications

- Insulin increases glucose transport into cells and promotes conversion of glucose to glycogen, decreasing serum glucose levels.
- Oral hypoglycemic agents stimulate the pancreas to produce more insulin and increase the sensitivity of peripheral receptors to insulin, thereby decreasing serum glucose levels.

Diabetes Medications

Type 1 Diabetes



Insulin is *always* needed

Type 2 Diabetes



***May need*
Oral medication**

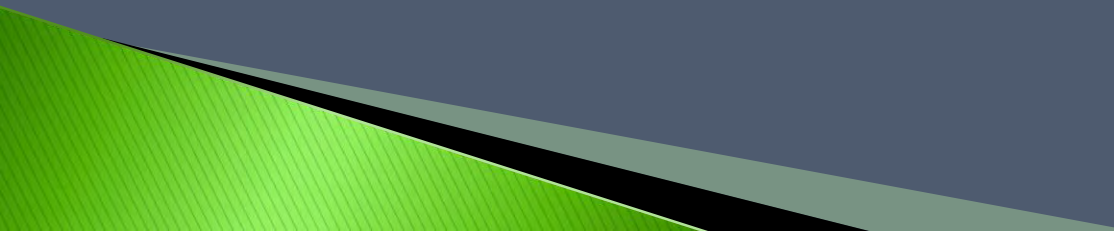
OR

Oral medication plus insulin

OR

Insulin alone

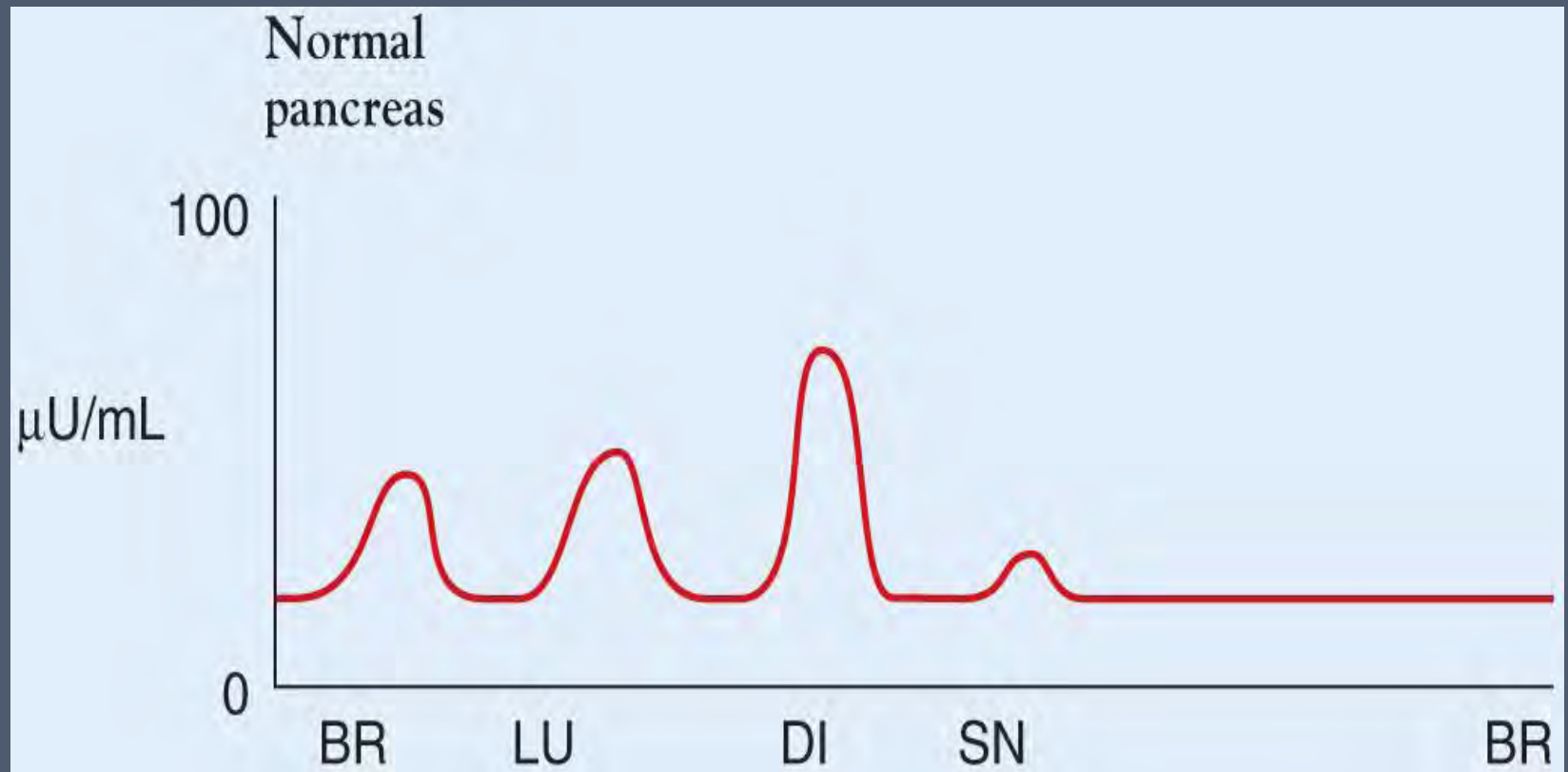
Insulin

- ▶ Role of insulin: Primarily acts in the liver, muscle, and adipose tissue by attaching to receptors on cellular membranes and facilitating the passage of glucose, potassium, and magnesium.
 - ▶ Regular
 - ▶ Intermediate Acting Insulin
 - ▶ Long Acting Insulin
 - ▶ Pre-mixed insulin
- 

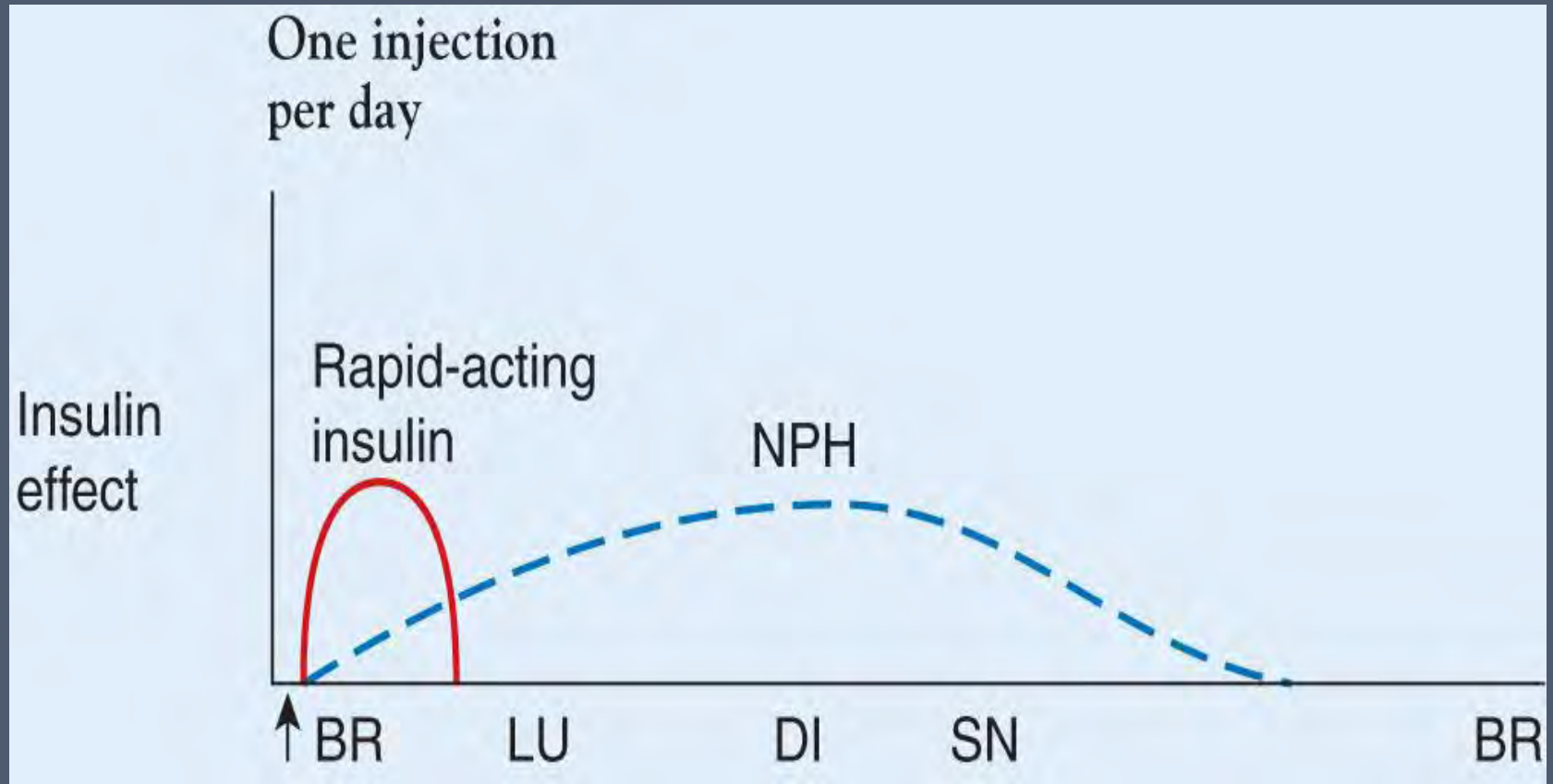
Insulin Therapy

- ▶ Blood glucose monitoring
- ▶ Categories of insulin
 - Rapid-acting
 - Short-acting
 - Intermediate-acting
 - Very long-acting
- ▶ Inhaled insulin

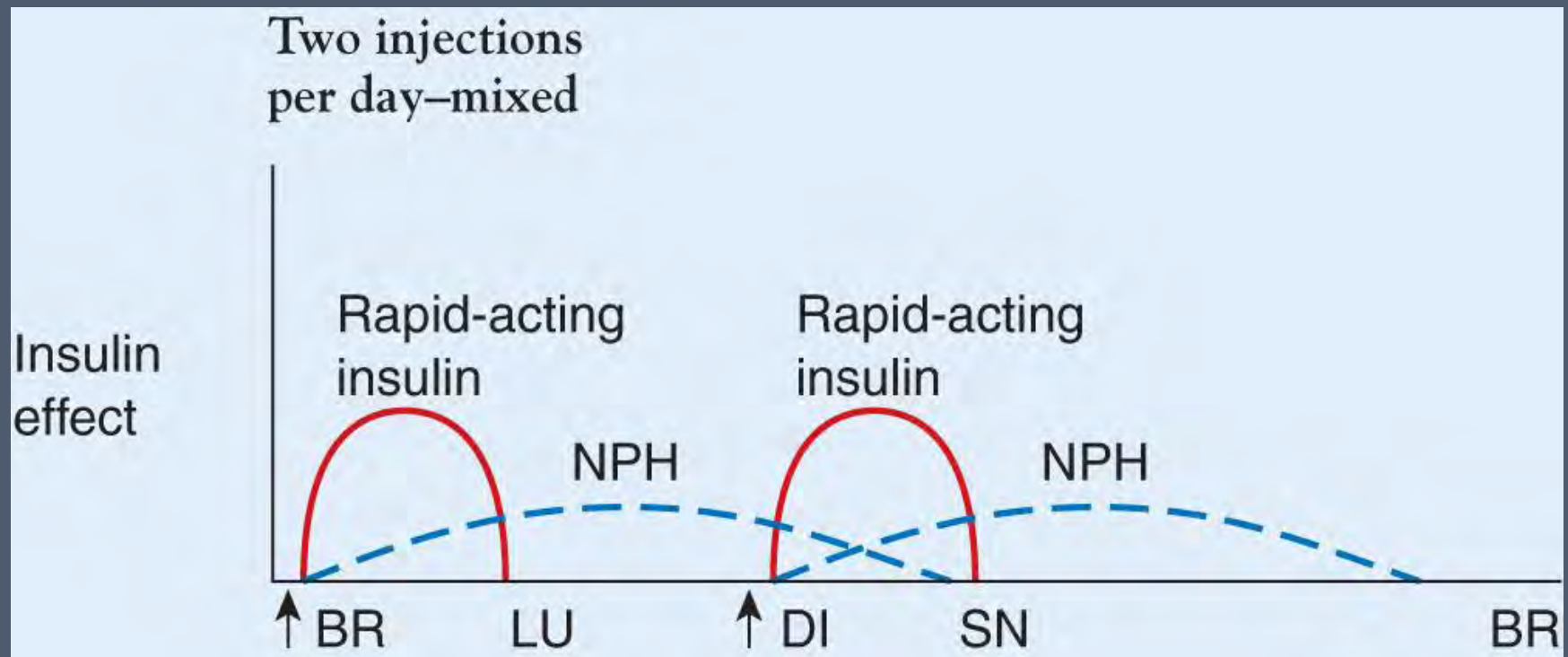
Normal Pancreatic Insulin Release



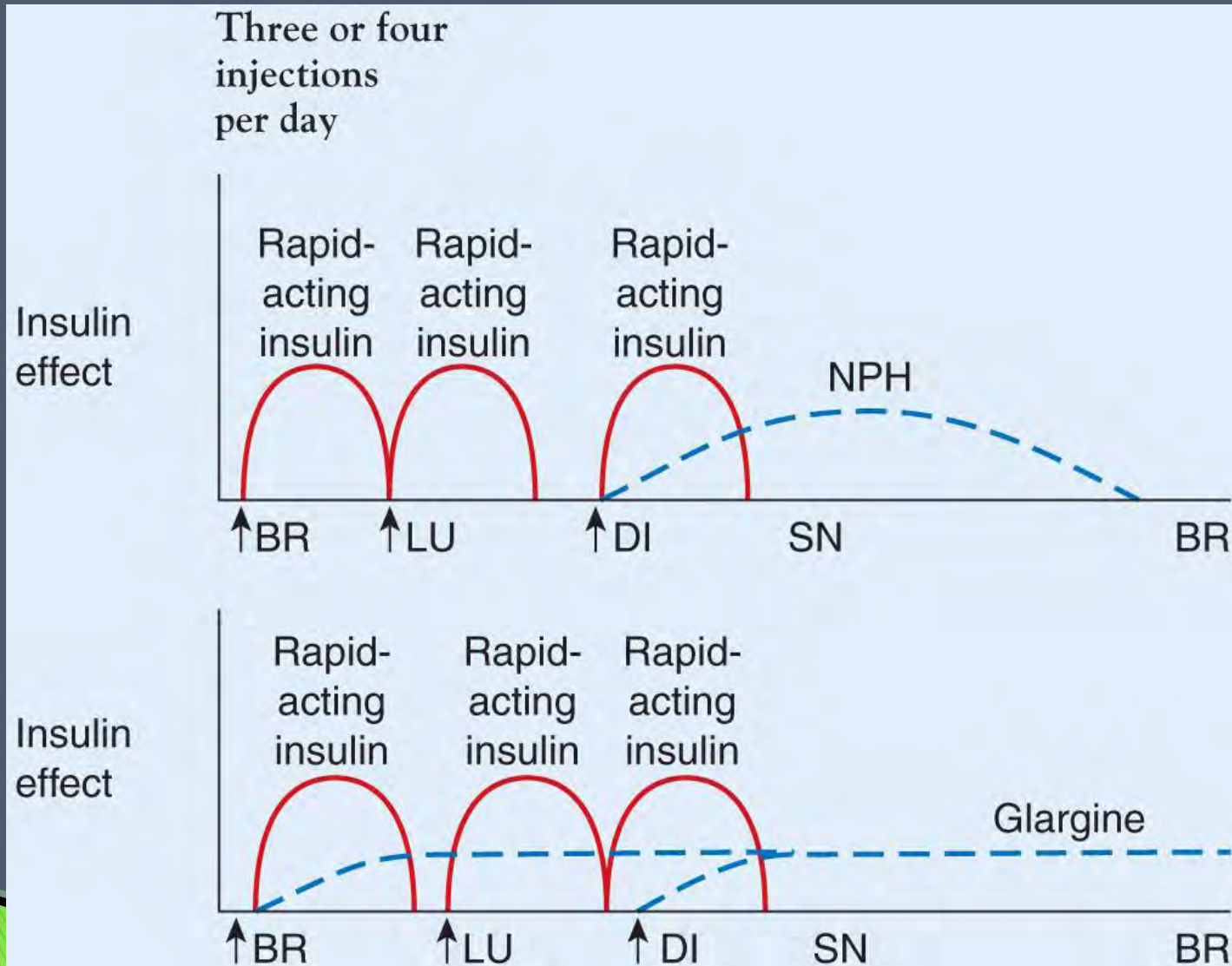
One Injection Per Day



Two Injections Per Day-Mixed



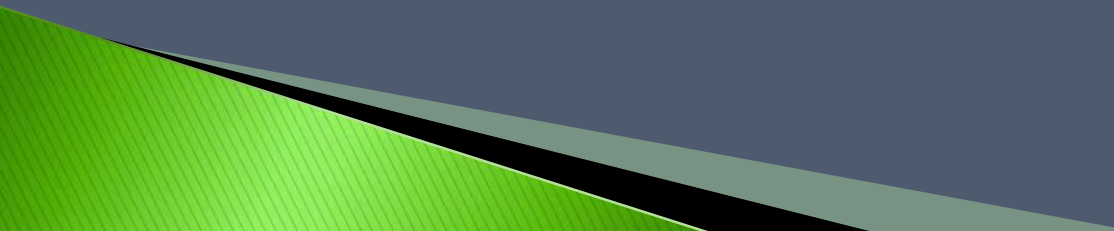
Three or Four Injections Per Day



Administering Insulin

- To prevent dosage errors, be certain that there is a match of the insulin concentration with the calibration of units on the insulin syringe.
- Before use, roll, not shake, the insulin bottle to ensure that the insulin and ingredients are mixed well and to avoid bubbles, causing drawing an inaccurate dose.
- When mixing insulin, inject an amount of air equal to the insulin dose into the longer-acting insulin first.

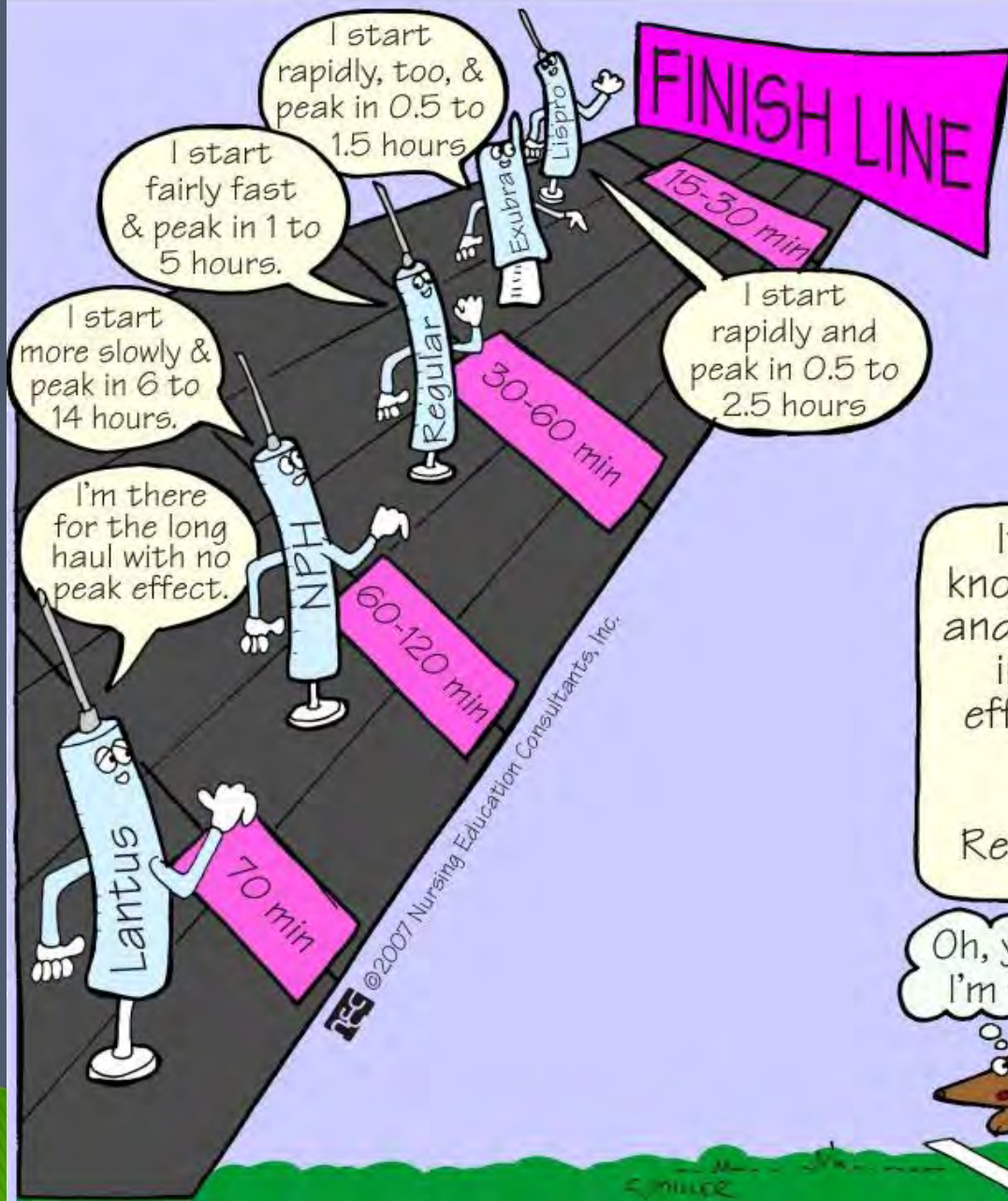
Teaching Patients Insulin Self Management

- ▶ Use and action of insulin
 - ▶ Symptoms of hypoglycemia and hyperglycemia
 - Required actions
 - ▶ Blood glucose monitoring
 - ▶ Self-injection of insulin
 - ▶ Insulin pump use
- 

Types of Insulin

Type	Drug	Begins	Peaks	Duration
Short	Humalog	5 – 15 min	30 – 75 min	2 to 3 hours
Short	Regular	30 – 45 min	2 to 3 hours	4 to 6 hours
Basal	Lantus	1 to 2 hours	No peak	24 hours
Basal	Levemir	3 to 4 hours	6 to 8 hours	12 to 24 hours
Combo	Novolog 70/30	10 - 20 min	1 to 8 hours	Up to 18 hours
Combo	Humalog 75/25	5 to 15 min	1 to 12 hours	Up to 18 hours

INSULIN: Types, Onset, & Peaks



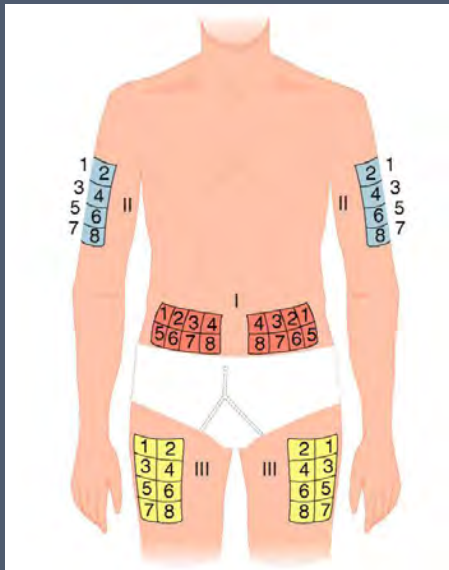
It's important to know the onset, peak, and duration of these insulins for safe, effective treatment of diabetes... Okay, Buddy... Ready, set... GO!!

Oh, yeah... I'm fast!



Insulin injection Sites

- Injection into scar tissue may delay absorption of insulin.

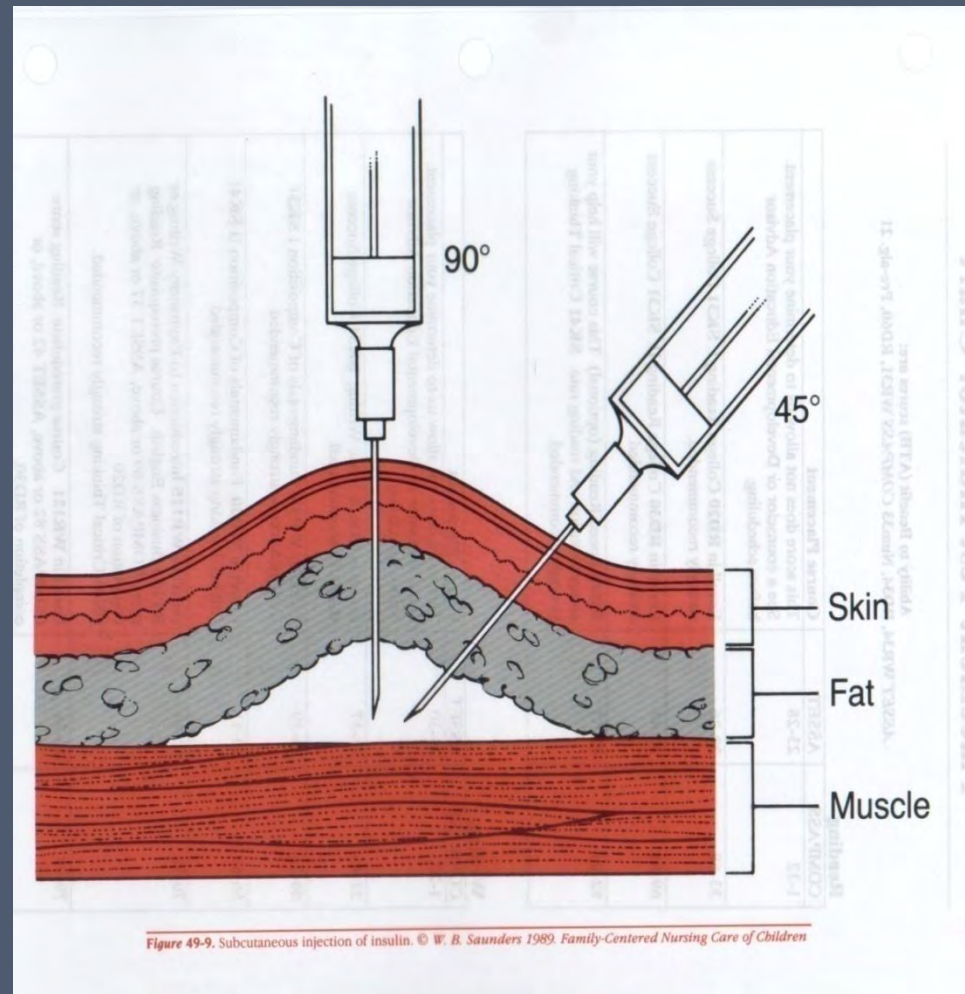


- Insulin injected into the abdomen may absorb more evenly and rapidly than other sites.
- Insulin administered SC has a slower absorption rate than if administered IM.
- Heat, massage, and exercise of the injected area can increase absorption rates.

Insulin Injection Sites

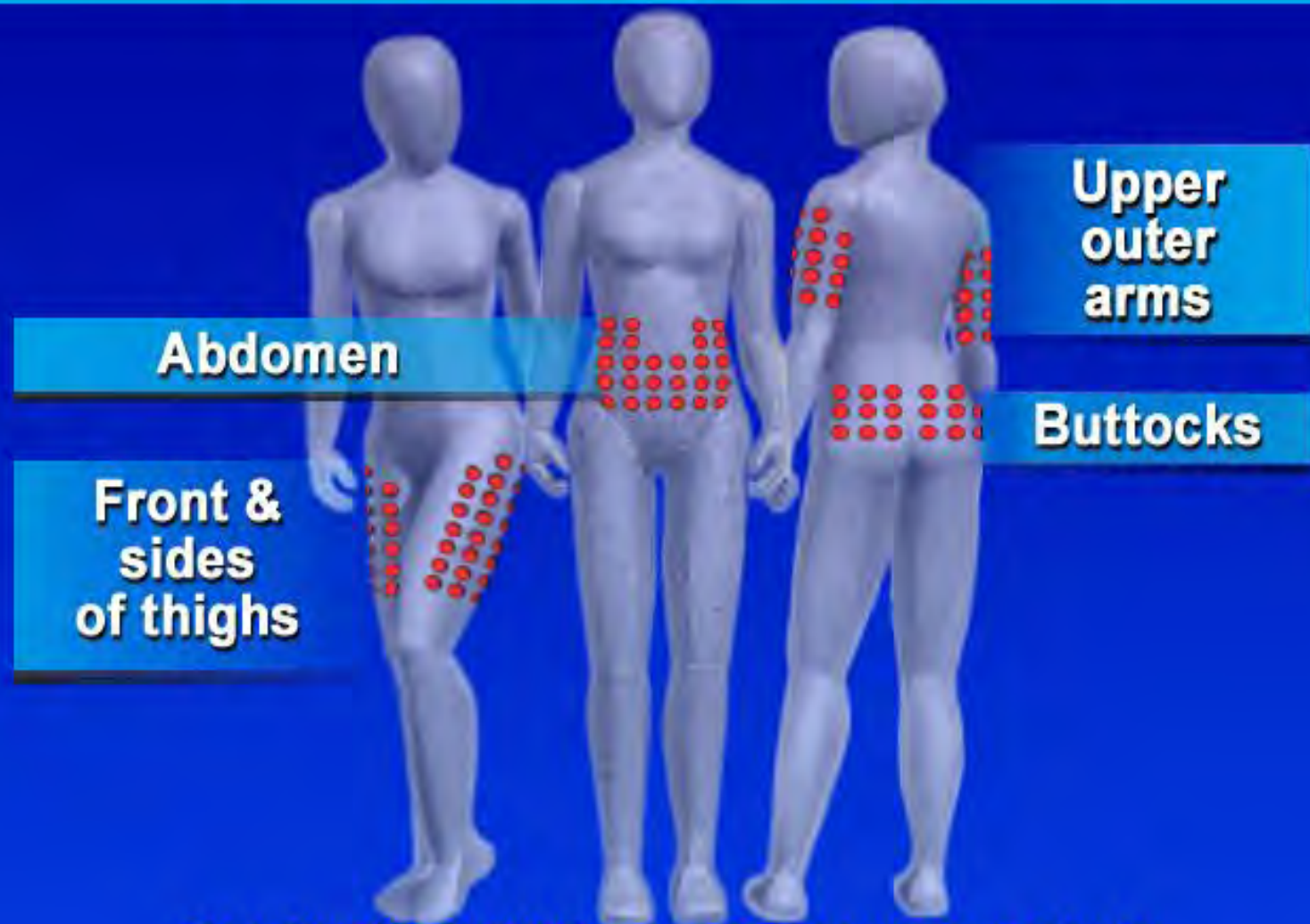
- Insulin injection sites should be rotated to prevent:
- Hypertrophic lipodystrophy
 - a spongy swelling at or around the injection site, which can interfere with insulin absorption.
- Lipoatrophic lipodystrophy
 - a loss of fat at the injection site, is most often due to the use of animal insulin.

Injection Technique

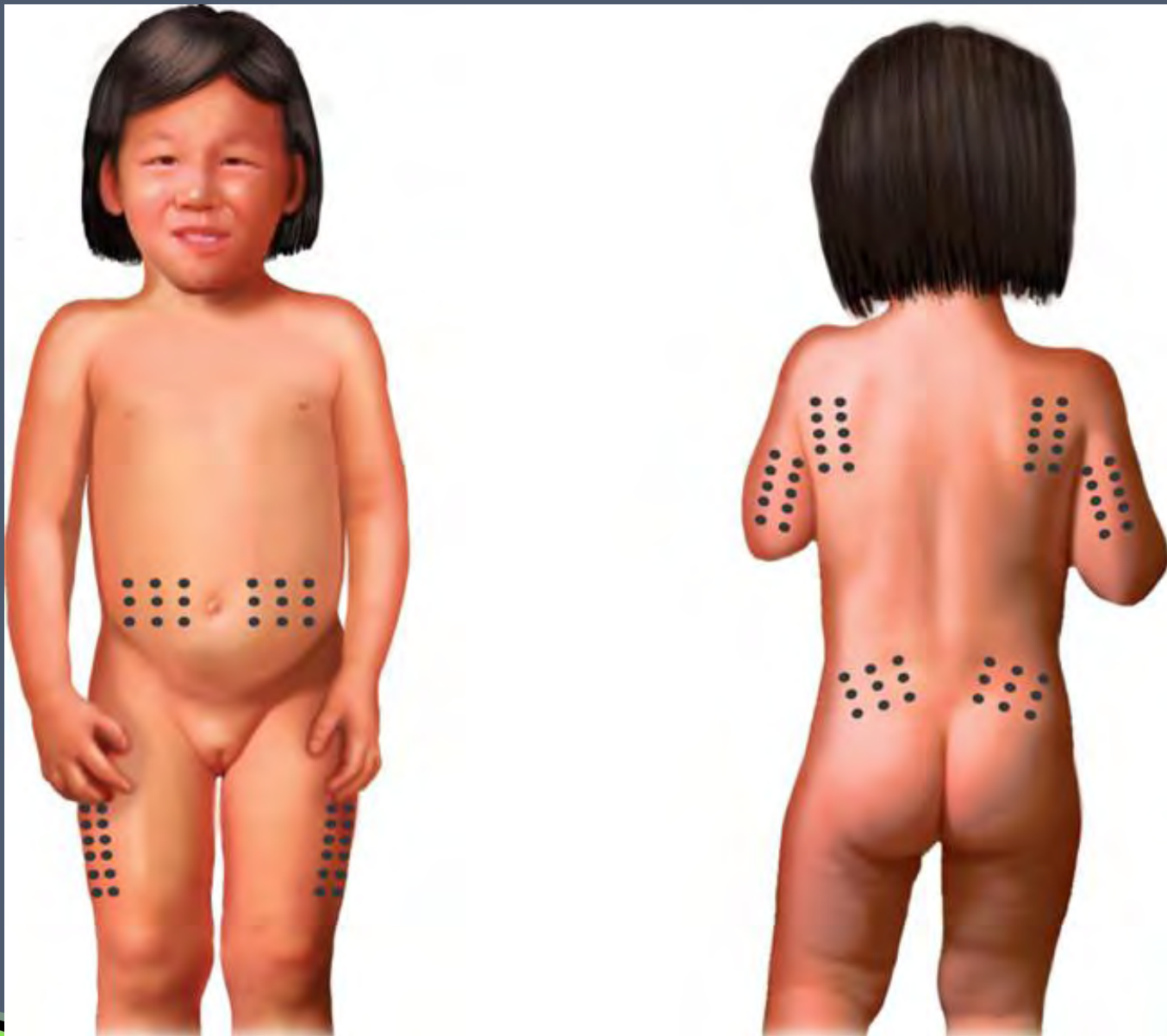




Insulin Injection Sites



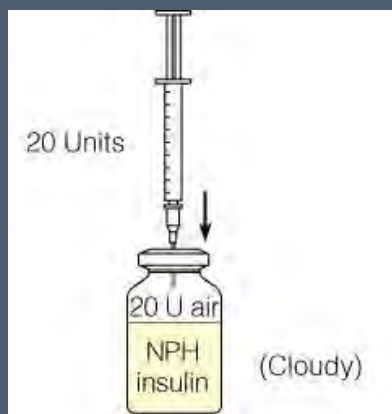
Rotate sites within chosen areas regularly



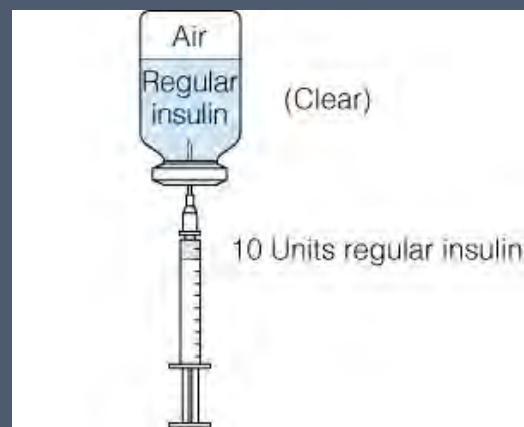
Techniques to Minimize Painful Injections

- ☒ Inject Insulin at room temperature.
- ☒ Make sure no air bubbles remain in the syringe before injection.
- ☒ Wait until alcohol on the skin dries completely before injection.
- ☒ Teach client to relax muscles in the injection area.
- ☒ Penetrate the skin with the needle quickly.
- ☒ Don't change the direction of the needle during insertion or withdrawal.
- ☒ Don't reuse needles.

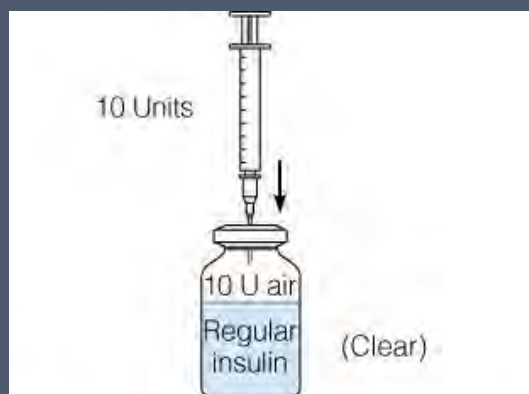
Source: American Diabetes Association. (2004). Insulin administration. *Diabetes Care*, 27(Suppl. 1), S106–S107.



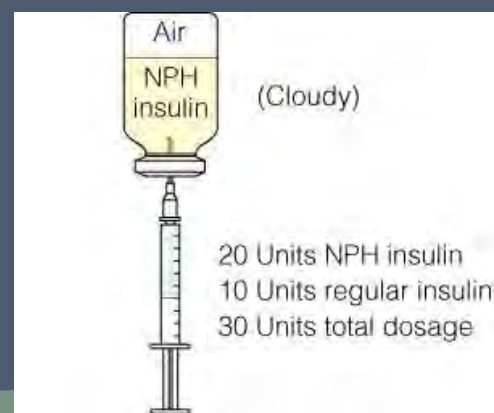
A Injecting air into the NPH vial.



C Withdrawing regular insulin.



B Injecting air into the regular insulin vial.

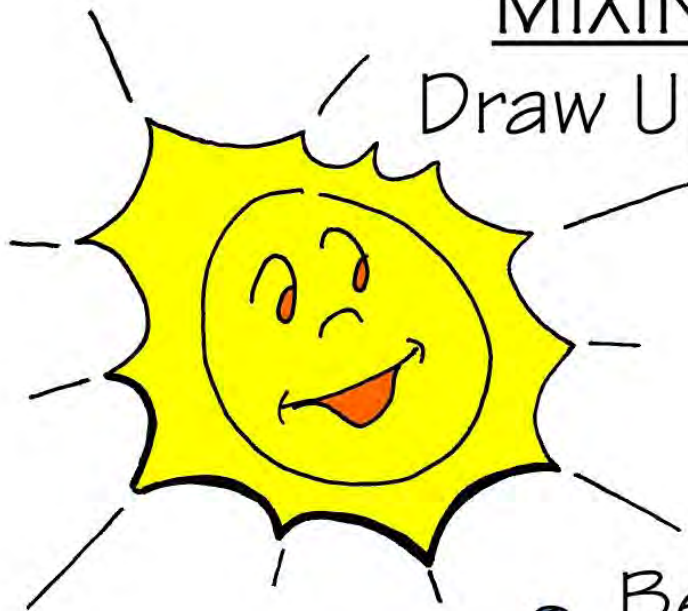


D Withdrawing NPH insulin.

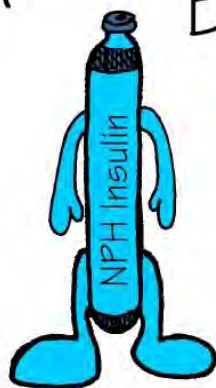
MIXING INSULIN:

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"



BOX 29-3

SLIDING SCALE EXAMPLE

Accu-Chek AC/HS

0700–1130–1730–2100

Blood glucose under 50 or over 450, call MD

Order Stat Lab B.G.

Sliding Scale Humulin Regular Insulin subqu as follows:

BG 0–150 mg: no insulin

BG 151–200 mg: 2 units Humulin R

BG 201–250 mg: 4 units Humulin R

BG 251–300 mg: 6 units Humulin R

BG 301–350 mg: 8 units Humulin R

BG 351–400 mg: 10 units Humulin R

BG 401–450 mg: 12 units Humulin R

Insulin Regimen

- ▶ Individualized
- ▶ Mix short and longer acting
- ▶ Timing depends on feed, exercise, glucose level, type of insulin
- ▶ Tight glucose control results in fewer long-term complications
 - Oral Anti-diabetic Agents

Insulin Dosing - BASAL

- ▶ Lantus or Levemir often given once daily at HS
- ▶ Doseage is adjusted by the patient's Fasting Blood Glucose
- ▶ Occ. see either Lantus and Levemir given BID
 - Some pts don't get a true 24 hour effect
 - Some pts need high enough doses that need two shots
 - Generally this is equal doses given 12 hours apart

Example: The patient with a fasting BG is 345 after getting HS Lantus probably needs more basal insulin.

Insulin Dosing - MEALTIME

- ▶ Rapid acting insulin (Regular not ideal choice)
- ▶ Ordered for 15 min before or after meal
 - Usually given after
- ▶ Dose calculated by Carb to Insulin Ratio
 - Doc orders intensity of dosing
- ▶ Could order a set mealtime dose

Example: Pt has 1 unit per 10 grams of carb ordered, eats 30 grams for lunch, gets 3 units of insulin after meal.

Insulin Dosing - CORRECTION

- ▶ Looks a lot like a traditional sliding scale
- ▶ Corrects the pre-meal BG back to goal of 80 – 140.
- ▶ Scaled by doc based on insulin resistance and how quickly the pt needs to get into range
- ▶ Give with the **MEALTIME** dose after the meal.

Example: On moderate scale, pts BG is 325 pt gets 11 units of insulin for correction.

Insulin Dosing Summary

- ▶ BASAL (Lantus or Levemir)
 - Lowers all the BG
 - Adjust by fasting BG
- ▶ **MEALTIME**
 - Mimics the body's normal response to carbs
 - Adjusted by carb to insulin ratio
- ▶ **CORRECTION**
 - Corrects the premeal BG to goal

Table 17-3**Nursing Implications for Administering Insulin and Client Teaching**

NURSING IMPLICATIONS	CLIENT/FAMILY TEACHING
■ Discard vials of insulin whose expiration date has passed. ■ Discard any vial that is discolored or contains clumps, granules, or solid deposits on the sides. ■ Check client's blood glucose level 30 minutes before giving an insulin injection. ■ When drawing up insulin dose, always check type and dose with another nurse. ■ If a client's meal is delayed, hold administration of rapid-acting insulin. ■ Monitor and maintain a record of blood glucose readings before each meal and at bedtime or as ordered. ■ Monitor food intake; notify physician when client eats an inadequate diet. ■ Inspect injection sites for signs of lipodystrophy. ■ Monitor for signs and symptoms of hypoglycemia or hyperglycemia and take appropriate action.	■ Know the manifestations of diabetes mellitus. ■ Store opened insulin vials in a cool place for up to 4 weeks; avoid exposure to extreme temperatures (36° to 46°F) or sunlight. ■ Refrigerate unopened extra insulin vials; do not freeze them. ■ Refrigerated insulin should be brought to room temperature before using it. ■ Demonstrate self-administration of insulin (review procedure checklist in Box 17-3). ■ Know how to mix two types of insulin. ■ Discard outdated or discolored insulin. ■ Keep a regular insulin vial available for emergencies. ■ Check blood glucose before meals, at bedtime, and as prescribed. ■ If breakfast is delayed, also delay giving rapid-acting insulin. ■ Know the signs of hypoglycemia and hyperglycemia. ■ Keep candy or sugar source available to treat hypoglycemia. ■ Avoid alcoholic beverages to prevent hypoglycemia. ■ Observe injection site for hardness, dimpling, or sunken areas; develop a plan for rotating injection sites.

Types of Insulin

Insulin Type

- Lispro
- Aspart

- Regular Insulin

- NPH
- Lente

- Ultralente
- Insulin glargine

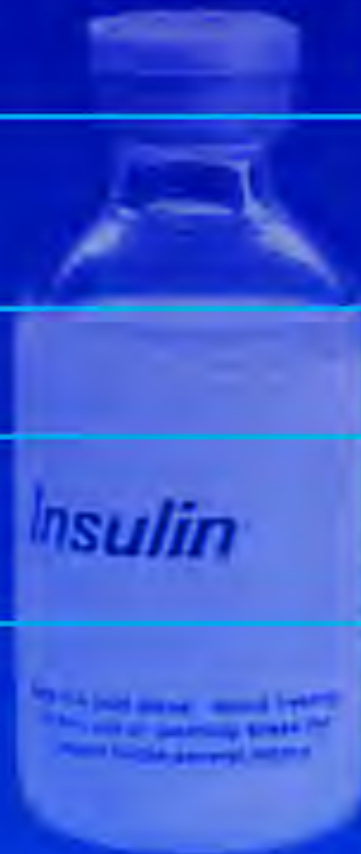
Speed of Action

Rapid

Short

Intermediate

Long



Rapid-Acting Insulins



Lispro (Humalog) and aspart (NovoLog):

- ▶ Should be taken **immediately** before eating
- ▶ Reduce blood glucose after eating

Short-Acting Insulins



Regular insulin (Humulin R and Novolin R):

- ▶ Should be taken 30 – 60 minutes before eating
- ▶ Reduces blood glucose after eating

Intermediate-Acting Insulins



NPH (Humulin N, Novolin N) and Lente (Humulin L, Novolin L):

- ▶ Usually taken before breakfast, dinner, or bedtime
- ▶ Usually used with rapid- or short-acting insulins

Long-Acting Insulins



Continuous Subcutaneous Infusion of Insulin



- ▶ Administered by an externally worn pump containing a syringe and reservoir with Regular Insulin connected to the client by an infusion set.
- ▶ Continuous infusion of a basal dose of insulin with meal-associated increases in insulin seems to be more effective than a multiple injection protocol in providing metabolic control.
- ▶ Buffered insulin is used to prevent the precipitation of insulin crystals within the catheter.
- ▶ Instruct the client to adjust the amount of insulin received by regulating the pump settings on the basis of blood glucose monitoring.

Insulin Pump

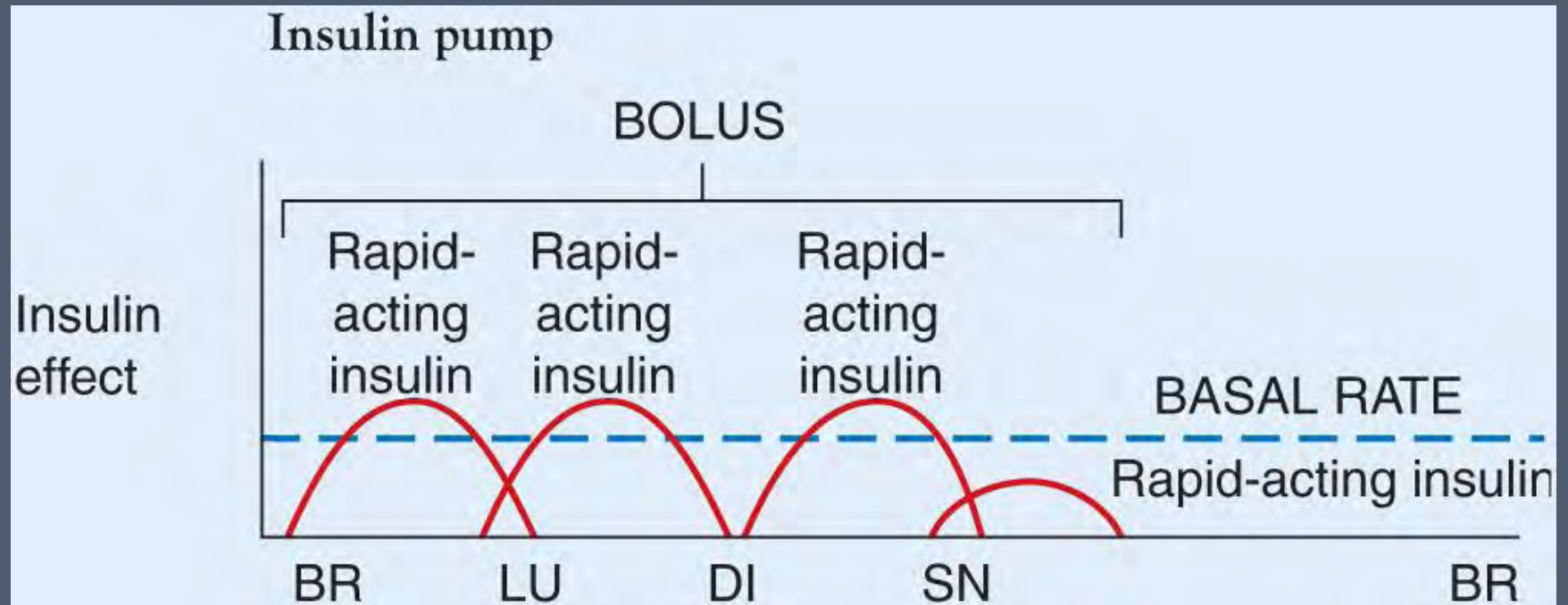


TABLE 48.3 INSULIN TYPE, ACTION, AND DURATION

Type	Onset	Peak	Duration
Lispro: ultra-short-acting	15–30 minutes	60–90 minutes	3–4 hours
Regular: short-acting	30 minutes	2–3 hours	3–6 hours
NPH or Lente: intermediate-acting	Lente: 1–2.5 hours	7–15 hours	12–24 hours
	NPH: 1–1.5 hours	6–10 hours	10–18 hours
Ultralente: long-acting	4–8 hours	Variable; 10–16 hours	24–36 hours
Lantus	1–2 hours	Does not truly peak; offers continual steady coverage	20–24 hours

Complications of Insulin Therapy

Dawn Phenomenon

- Results from a nocturnal release of growth hormone secretion that may cause blood glucose elevations about 5 to 6 a.m.
- Treatment includes administering an evening dose of intermediate acting insulin at 10 p.m.

Somogyi's Phenomenon

- A rebound phenomenon occurring in diabetes mellitus.
- Occurs when a rapid decrease in blood glucose causes the release of glucose-elevating hormones
 - (epinephrine, cortisol and glucagon)
- Occurs during the initial period of serum glucose control; develops at peak insulin times and during the night.

Depression in Diabetes Is Common

Talk to a health care provider if any of these symptoms last 2 weeks or more:

- ▶ **Loss of energy, interest, and enjoyment**
- ▶ **Changes in sleep or appetite**
- ▶ **Difficulty concentrating, fuzzy thinking**
- ▶ **Feeling sad, hopeless, or anxious**
- ▶ **Repeated thoughts about death and suicide**



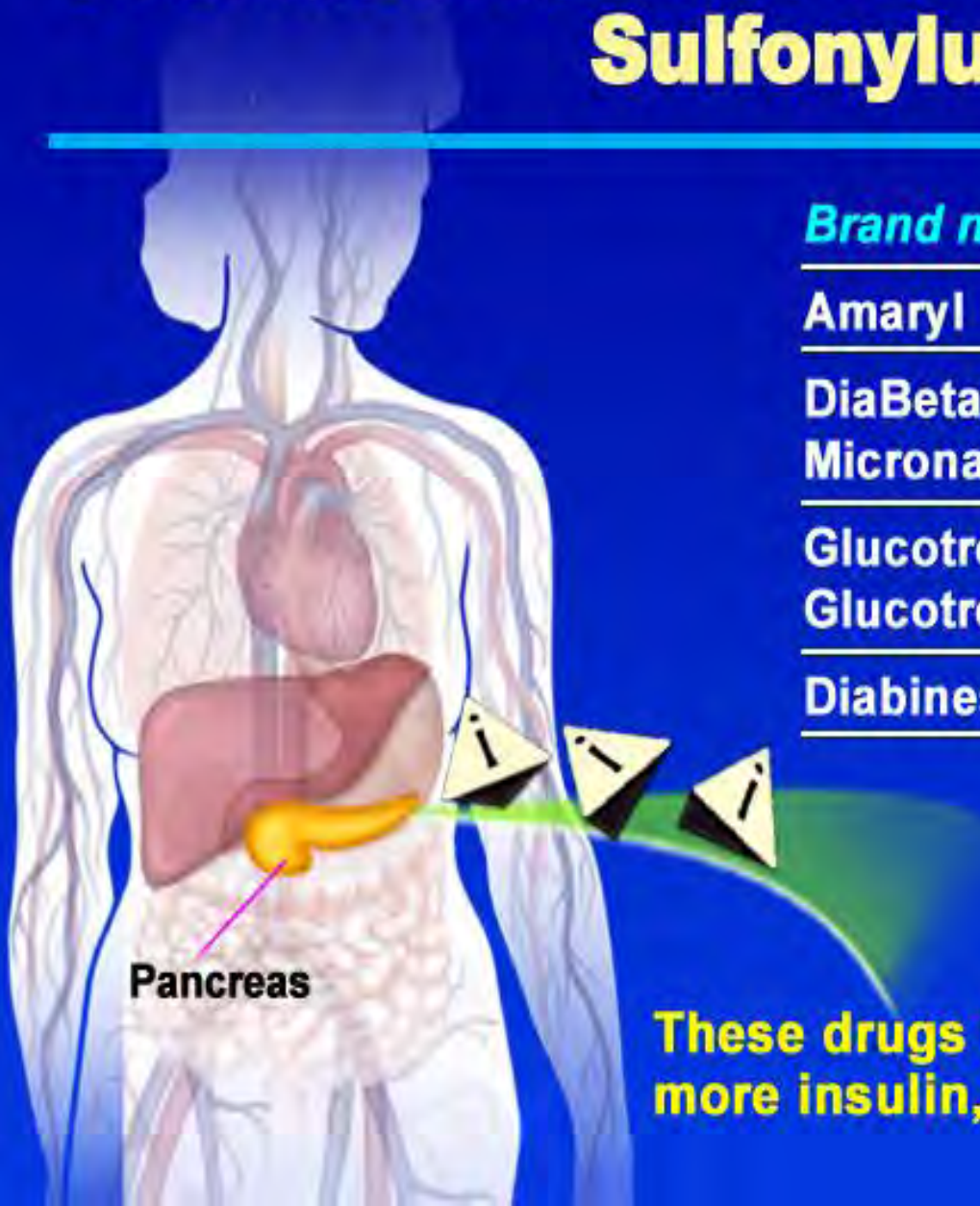
Oral Hypoglycemic Medications

- ▶ Prescribed for clients with
 - Diabetes Mellitus Type II
- ▶ Assess the client's knowledge of diabetes and the use of oral antidiabetic agents.
- ▶ Monitor vital signs and blood glucose levels.
- ▶ Assess the medications that the client is currently taking.
- ▶ Instruct the client to recognize symptoms of hypoglycemia and hyperglycemia.

TABLE 29-3**Common Oral Hypoglycemics**

TRADE/GENERIC	DOSAGE (MG)	DURATION (HOUR)
<i>Sulfonylureas</i>		
Diabinese/chlorpropamide	100–250	36+
Tolinase/tolazamide	100–500	12–24
Orinase/tolbutamide	250–500	6–12
Micronase/DiaBeta/glyburide	1.25–5	24
Glucotrol/glipizide	5–10	40
<i>Biguanides</i>		
Glucophage/metformin	500–1,000	6
<i>Thiazolidinediones</i>		
Avandia/rosiglitazone	2–8	12–24
Actos/pioglitazone	15–45	24
<i>Alpha-Glucosidase Inhibitors</i>		
Precose/acarbose	25–100	2
<i>Meglitinides</i>		
Prandin/repaglinide	0.5–2	1.4

Oral Medications for Type 2 Diabetes: Sulfonylureas

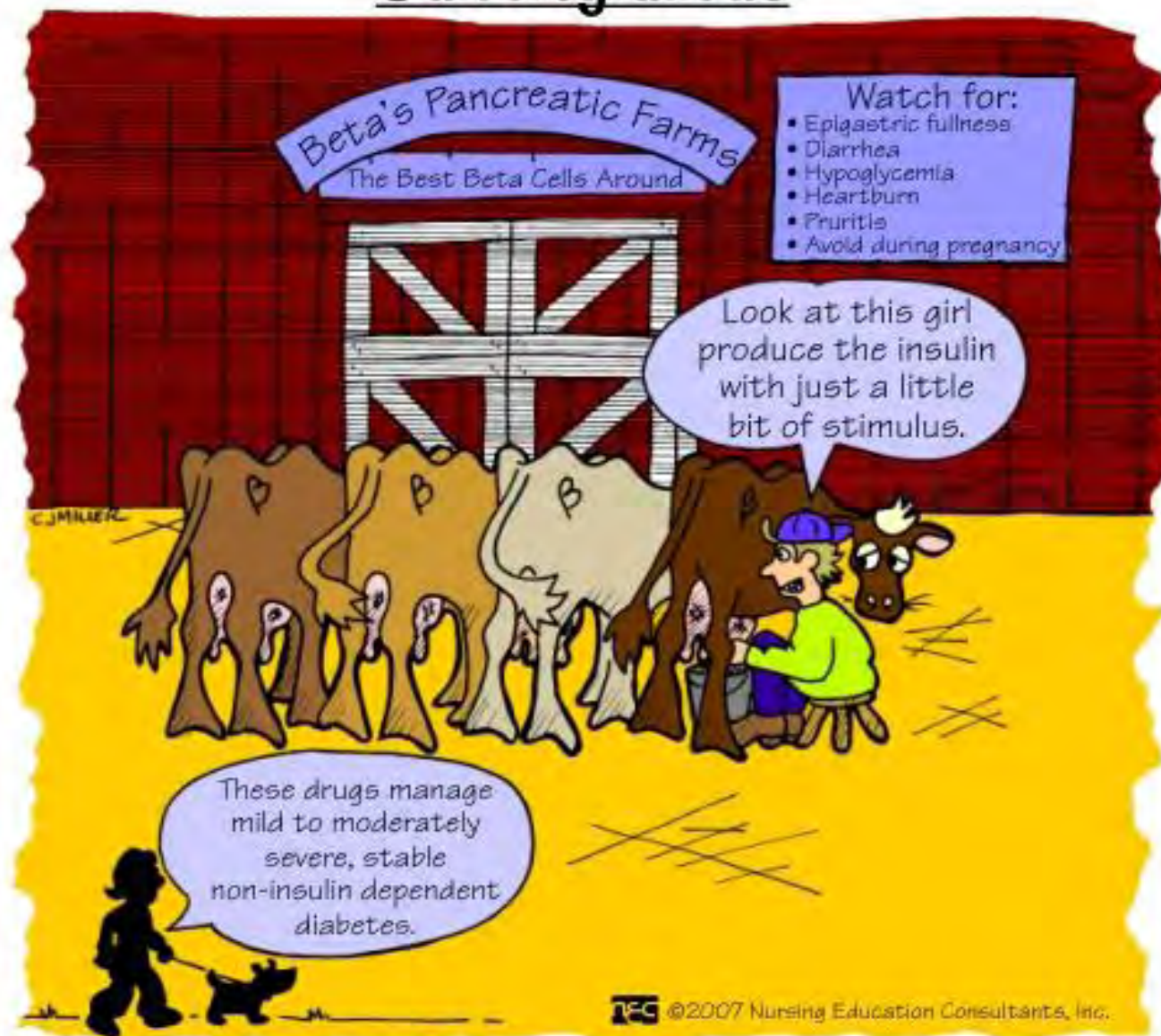


<i>Brand name</i>	<i>Generic name</i>
Amaryl	Glimepiride
DiaBeta, Glynase, Micronase	Glyburide
Glucotrol, Glucotrol XL	Glipizide
Diabinese	Chlorpropamide

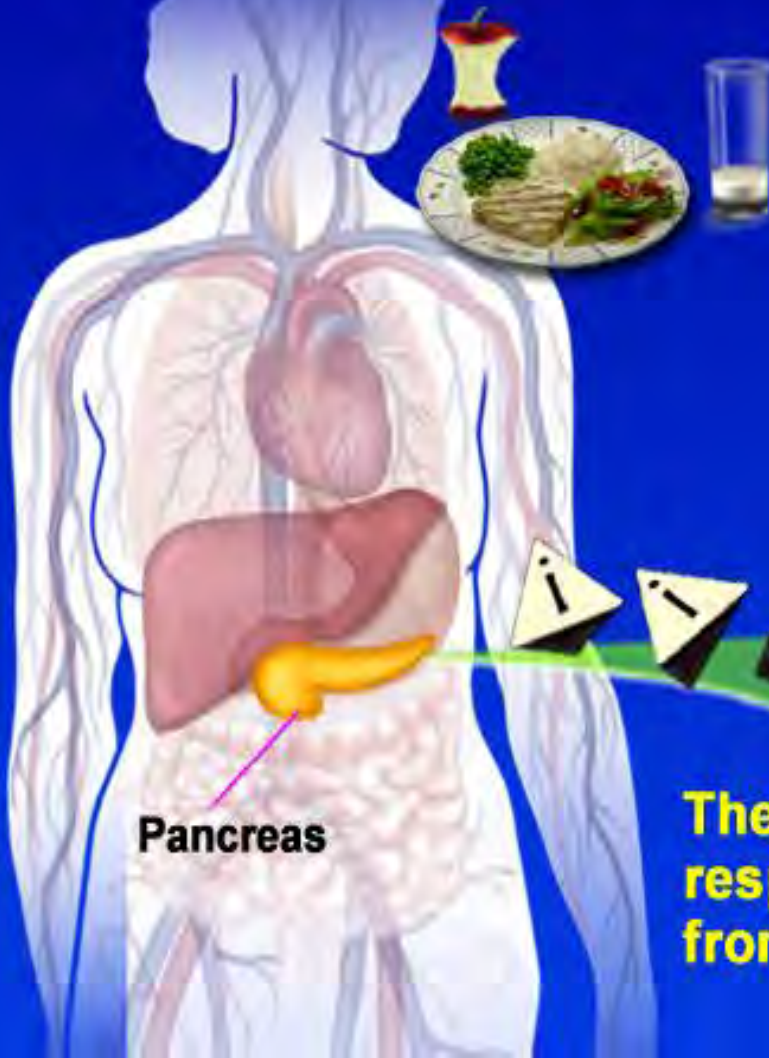
Pancreas

These drugs help the pancreas release more insulin, which lowers blood glucose

Sulfonylureas



Oral Medications for Type 2 Diabetes: Meglitinides



Brand name

Generic name

Prandin

Repaglinide

Starlix

Nateglinide

Pancreas

These drugs increase insulin release in response to food, keeping blood glucose from rising too high after meals

Glimepride (Amaryl) & Glipizide (Glucotrol)

"Amaryl and Glucotrol - Releasing Insulin from the Beta Cells."

The Pancreatic
Beta Cell
Detention Center
for Type 2 Diabetics.

I'm here to
release insulin from
the beta cells... The body
needs help!

When Amaryl and
Glucotrol come to release the
insulin, watch for altered taste,
dizziness, drowsiness, weight
gain and constipation.



It makes sense to
check blood glucose levels
before dosing... and watch
for signs of hypoglycemia
while using these drugs.

Oral Medications for Type 2 Diabetes: Insulin Sensitizers

Brand name

Generic name

Avandia

Rosiglitazone

Actos

Pioglitazone



These drugs improve insulin sensitivity, helping cells use blood glucose for energy

Oral Medications for Type 2 Diabetes: Biguanides

Brand name

Generic name

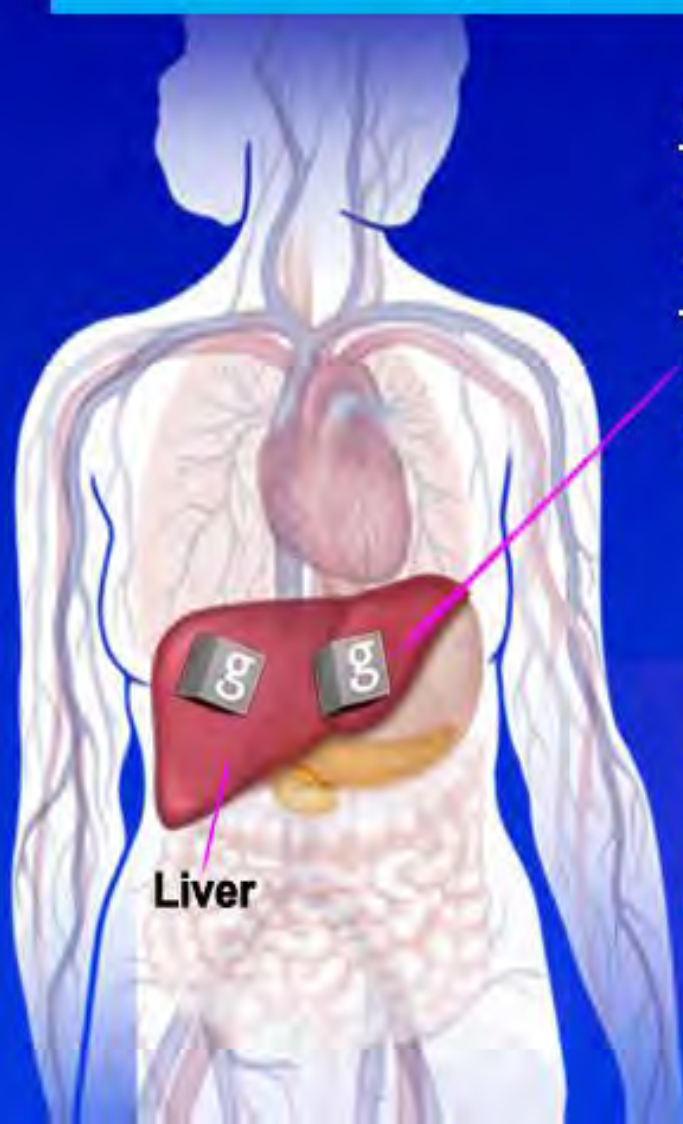
Glucophage,
Glucophage XR

Metformin

Metformin keeps the liver from releasing too much glucose

Combination pills using metformin are also available:

- ▶ Glucovance is metformin and glyburide
- ▶ Avandamet is metformin and rosiglitazone



Acarbose (Precose)



Oral Medications for Type 2 Diabetes: Alpha-Glucosidase Inhibitors

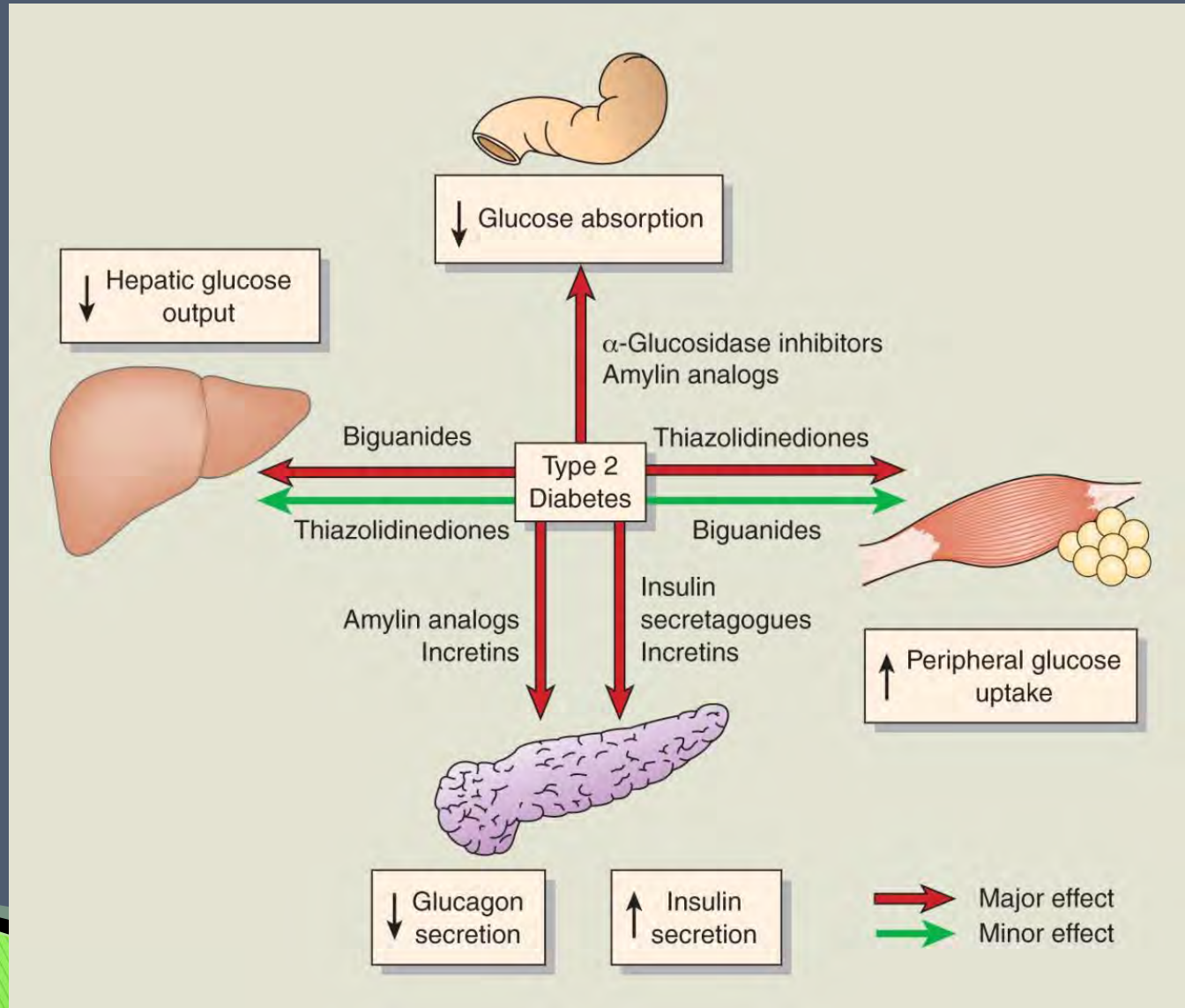


<i>Brand name</i>	<i>Generic name</i>
Precose	Acarbose
Glyset	Miglitol

Small intestine

These drugs slow digestion of carbohydrates, keeping blood glucose from rising too high after meals

Sites of Action of Oral Antidiabetic Agents



Acute Complications of Diabetes Mellitus

Hypoglycemic Reaction

- Causes
 - Taking too much insulin
 - Not eating or skipping a meal or snack
 - Vigorous exercise
 - Side effect of both insulin and oral hypoglycemic medication
- Risk Reduction
 - Careful, frequent monitoring of blood glucose
 - Adhering to the dietary plan
 - Consistent exercise

HYPOGLYCEMIA

T Tachycardia
I Irritability
R Restless
E Excessive Hunger
D Diaphoresis
Depression



Clinical Manifestations

- Pale, Cool or Clammy Skin
- Diaphoresis
- Irritable, nervous, anxious and/or weepy
- Difficulty concentrating, speaking, focusing, and coordinating
- Shaky feeling, tremors, and dizziness
- Hunger
- Headache
- Shallow respirations
- Tachycardia
- Blood glucose below 50 mg/dL
- Nausea
- Hypotension

Symptoms of Hypoglycemia



- ▶ Weakness
- ▶ Cold sweat, clammy feeling
- ▶ Shakiness
- ▶ Hunger
- ▶ Irritability
- ▶ Headache
- ▶ Dizziness
- ▶ Trouble concentrating
- ▶ Light-headedness

Interventions

- Listen to a client who reports a reaction.
- Treat with simple sugars such as orange, apple, or grape juice and avoid adding extra sugar.
- When symptoms of hypoglycemia subside, client should eat a complex carbohydrate (e.g., a sandwich).

Hypoglycemia Policy- “Rule of 15”

- **Check swallow**

- ▶ Is pt able to swallow?

- Give 15 – 20 gm of quick acting carbohydrate
 - Examples:
 - 4-6 oz fruit juice
 - 4-6 oz Regular soda pop
 - 4 glucose tablets
 - 8 oz of non-fat milk

- ▶ Is the pt unable to swallow?

- Patent IV
 - Give 25ml of D50 over 2 minutes
 - No IV
 - Give 1mg Glucagon IM or SubQ

- **Recheck BG in 15 min**

- **Repeat treatment if pt remains symptomatic and BG <70**

BOX 17-6

MANIFESTATIONS OF HYPOGLYCEMIA

CAUSED BY RESPONSES OF THE AUTONOMIC NERVOUS SYSTEM

Hunger	Shakiness
Nausea	Irritability
Anxiety	Rapid pulse
Pale, cool skin	Hypotension
Sweating	

CAUSED BY IMPAIRED CEREBRAL FUNCTION

Strange or unusual feelings	Blurred vision
Headache	Decreasing levels of consciousness
Difficulty in thinking	Seizures
Inability to concentrate	Coma
Change in emotional behavior	
Slurred speech	

LABORATORY FINDINGS

Blood glucose	<50 mg/dL
Blood and urine ketones	Negative
Plasma pH	Normal
Serum osmolality	Normal

Treatment

- Monitor vital signs
- Monitor neurological status
- Monitor blood glucose
- Mild Hypoglycemia
 - A capillary blood glucose level of 40 to 60 mg/dL.
 - Provide 10 to 15 g of carbohydrate and repeat the treatment in 10 to 15 minutes
 - If symptoms do not subside; instruct the client to eat additional food or the next scheduled meal in 15 to 30 minutes.

Treatment

- Moderate Hypoglycemia
 - A capillary blood glucose level of 20 to 40 mg/dL.
 - Provide 15 to 30 g of carbohydrate and repeat the treatment in 10 to 15 minutes if symptoms do not subside.
 - Instruct the client to eat additional food such as low-fat milk or cheese after 15 to 30 minutes.

Treatment

- Severe Hypoglycemia
 - The client who is unconscious or experiencing seizures.
 - Prepare for the administration of IM or SC Glucagon or 50% dextrose IV as prescribed.
 - Administer a second dose if the client remains unconscious.
 - Provide a small meal when the client wakes up and is no longer nauseated
 - Instruct the family on the administration of Glucagon.

BOX 29-4

FORMS OF FAST SUGARS

- Hard candy (Lifesavers, gumdrops, jelly beans)
- Fruit juices (orange, apple, grape)
- Sugar
- Regular soda
- Honey
- Milk
- Cake decorating gel
- Glucose tablets

Glucagon for Hypoglycemia

- ▶ Used when a person with diabetes has lost consciousness due to hypoglycemia
- ▶ Helps raise blood glucose
- ▶ A family member or caregiver must learn how and when to give glucagon



Glucagon

- A hormone secreted by the alpha cells of the islets of Langerhans in the pancreas.
- Increases blood glucose by stimulating glycogenolysis in the liver.
- Can be administered SC, IM, or IV.
- Used to treat insulin-induced hypoglycemia when the client is semiconscious or unconscious and is unable to ingest liquids.
- The blood glucose level begins to increase within 5 to 20 minutes after administration.

Glucagon

“Glucagon, When the Sugar’s Gone!”

A first aid kit for severe hypoglycemia

When the person is unable to remain conscious, glucagon is given SQ, IM or IV for emergency replacement.

Thanks for the brain candy... But watch for nausea, vomiting and hyperglycemia. The toxic effect can be hypokalemia.

This drug is reconstituted from a powder. Do not use unless solution is clear.

Brain candy, cool!
The brain uses more glucose than any other body system.



Hyperglycemia

- ▶ Described as an elevated blood glucose level
- ▶ Clinical Manifestations:
 - Gradual onset
 - Lethargic, dulled sensorium, and confusion
 - Thirst
 - Weakness
 - Nausea, vomiting, and abdominal pain
 - Flushed
 - Signs of dehydration

Clinical Manifestations

- Dry, crusty mucous membranes
- Deep rapid respirations and weak pulse
- Fruity, acetone breath
- Paresthesia and diminished reflexes
- Acidosis and coma
- Blood glucose as high as 250 mg/dL or more
- Ketones high
- Polyuria (early) to oliguria (late)

Treatment

- Instruct the client to monitor for signs of hyperglycemia
- Instruct clients to notify the physician when blood glucose results are greater than 250 mg/dL
 - Ketonuria is present for more than 24 hours
 - Unable to take food or fluids
 - When illness persists for more than 2 days

Diabetic Ketoacidosis: DKA

- A complication of diabetes mellitus that develops when a severe insulin deficiency occurs.
- DKA is a life-threatening condition.
- Hyperglycemia that progresses to metabolic acidosis occurs.
- Seen in clients with IDDM, undiagnosed diabetics, and those who stop prescribed treatment for diabetes.
- It develops over a period over several hours to days.

Understanding Ketoacidosis

With too much blood glucose and too little insulin, blood **ketones** can build up. Causes include:

Missed insulin dose

Illness, infection, major stress



Ketoacidosis is more common in type 1 diabetes

Clinical Manifestations

- Fatigue and weakness
- Headache
- Sunken eyeballs
- Dry mucous membranes
- Thirst
- Kussmaul Respirations
- Polyuria
- Fruity breath odor
- Warm, dry flushed skin
- Poor turgor
- Weakness/malaise
- Nausea, vomiting, and abdominal pain.
- Dehydration (from hyperglycemia)
- Tachycardia (rapid and weak)
- Drowsiness and stupor.
- Blood glucose above 250
- Urinary glucose and Ketones.
- Potassium imbalances.
- Late signs include:
 - Oliguria
 - Anuria
 - Hypotension

Complications

- Metabolic acidosis (from ketosis)
 - Nausea and vomiting
 - Lethargy
 - Ketone (fruity, alcohol-like) breath odor
 - Coma
- Other manifestations
 - Abdominal pain (cause unknown)
 - Kussmaul respirations (increased rate and depth of respirations, with a longer expiration; a compensatory response to prevent a further decrease in pH)

DKA Treatment

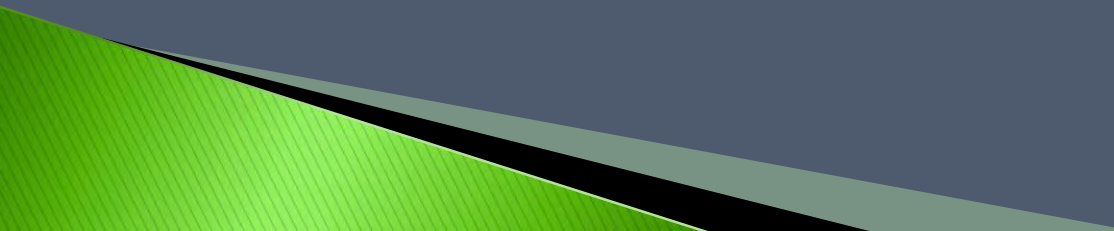
- ▶ Fluid replacement:
 - IV fluids: 0.45% or 0.9% NaCl initially @ 1 liter/hour*
 - Monitor urine output: 30-60 mL/hr
- ▶ Regular Insulin: 10-25 units IVP & IV insulin gtt
@ 0.1 unit/Kg/hr.
 - Insulin gtt mixed 1 unit/ 1 mL or per policy
- ▶ Monitor BS and electrolytes (esp. K+)
- ▶ Replace K+ PRN
- ▶ Consider bicarb if pH < 7.0
- ▶ D5 ½NS when BS 250-300mg%
- ▶ Taper IV insulin, switch to SQ

Preventing Ketoacidosis



- ▶ **Learn when to test blood glucose and urine ketones**
- ▶ **Recognize possible symptoms:**
 - Fruity breath
 - Rapid, hard breathing
 - Nausea, vomiting
 - Dehydration
- ▶ **Know when to contact your health care team**
- ▶ **Take insulin as directed**

Hyperglycemic Hyperosmolar Nonketotic Syndrome

- ▶ Hyperosmolality and hyperglycemia occur due to lack of effective insulin. Ketosis is minimal or absent.
 - ▶ Hyperglycemia causes osmotic diuresis with loss of water and electrolytes; hyponatremia, and increased osmolality occur.
 - ▶ Manifestations include hypotension, profound dehydration, tachycardia, and variable neurologic signs due to cerebral dehydration.
 - ▶ High mortality.
- 

Clinical Manifestations

- Polyuria, Polydipsia, and Polyphagia
- Glycosuria
- Dehydration
- Abdominal discomfort
- Hyperventilation
- Alterations in LOC
- Hypotension
- Blood glucose is extremely high from 600 up to 2400 mg/dL
- Absent Ketones
- Shock and Coma

Treatment

- The most critical element is the choice and rate of fluid replacement
- The initial objective for fluid replacement is to raise the circulating blood volume
- Monitor vital signs, urine output, and mental status closely
- Monitor fluid and electrolyte levels closely
- Monitor potassium levels and glucose levels and for signs of increased intracranial pressure

BOX 17-5**MANIFESTATIONS OF DIABETIC KETOACIDOSIS (DKA) AND HYPEROSMOLAR HYPERGLYCEMIC STATE (HHS)****DKA****DEHYDRATION (FROM HYPERGLYCEMIA)**

Thirst
Warm, dry skin with poor turgor
Dry mucous membranes
Rapid, weak pulse
Hypotension
Soft eyeballs

METABOLIC ACIDOSIS (FROM KETOSIS)

Nausea and vomiting
Lethargy to coma
Acetone (fruity, alcohol-like) breath odor

OTHER MANIFESTATIONS

Abdominal pain
Kussmaul's respirations (rapid, deep respirations; a compensatory response to prevent a further decrease in pH)

LABORATORY FINDINGS**Blood glucose:**

>250 mg/dL

Blood and urine ketones:

Positive

Arterial blood pH:

<7.3

Serum osmolality:

<340 mOsm/L

HHS**DEHYDRATION**

Extreme thirst
Warm, dry skin with poor turgor
Dry mucous membranes
Rapid, weak pulse
Hypotension

NEUROLOGIC MANIFESTATIONS

Depressed level of consciousness to coma
Grand mal seizures

OTHER MANIFESTATIONS

Abdominal discomfort may be present
Rapid, shallow breathing

>600 mg/dL

Negative

Normal (7.35–7.45)

>340 mOsm/L

Complications

- Interdisciplinary Care
 - Maintaining blood glucose
 - Definitions of normal blood glucose levels vary in clinical practice, depending on the laboratory that performs the assay
 - Pharmacologic treatment for diabetes mellitus depends on the type of diabetes
 - Dietary management for adults with diabetes, based on guidelines established by the ADA.
 - The ability to maintain an exercise program is affected by many different factors

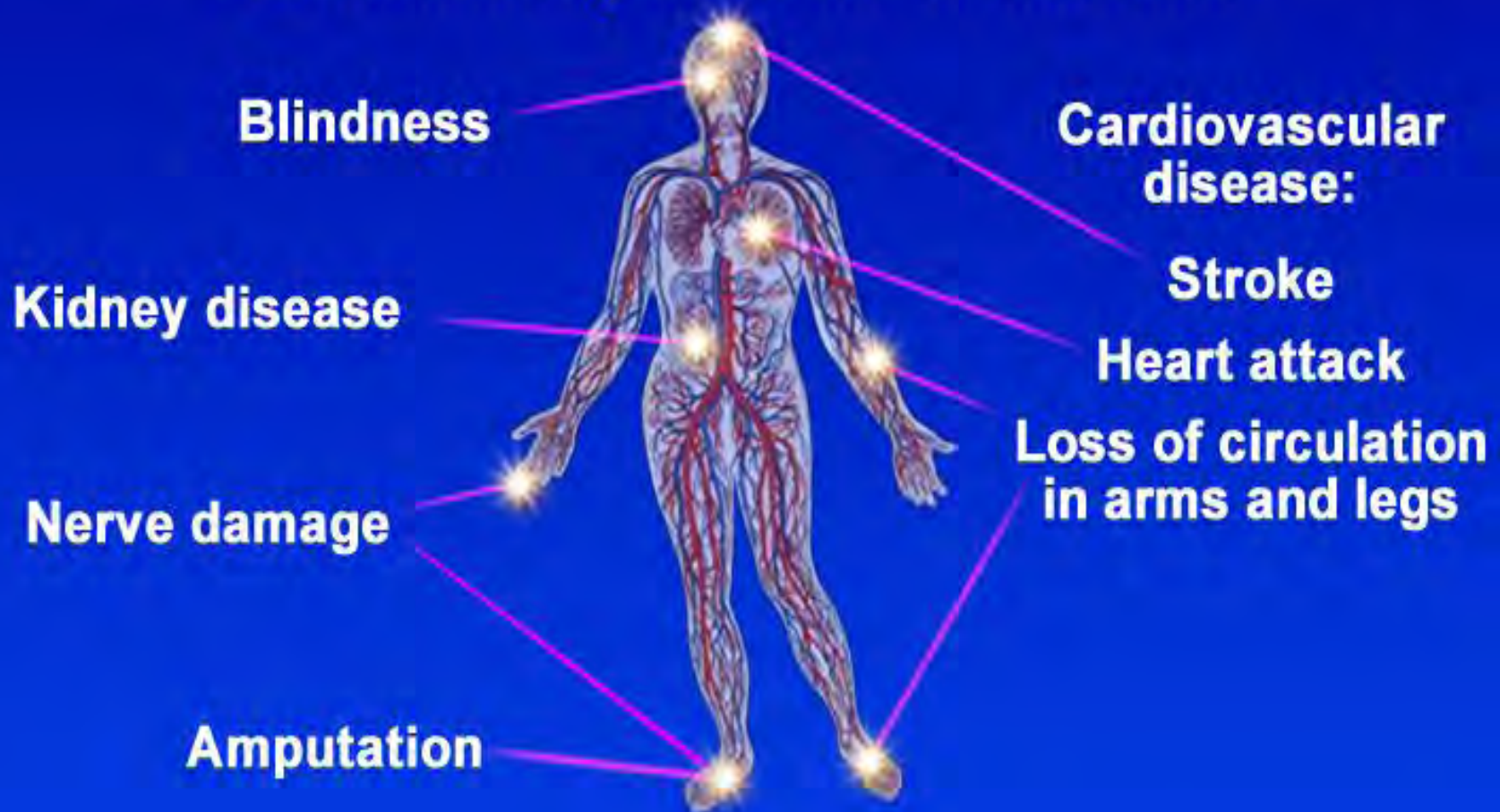
Chronic Complications of Diabetes Mellitus

Long-Term Complications of Diabetes

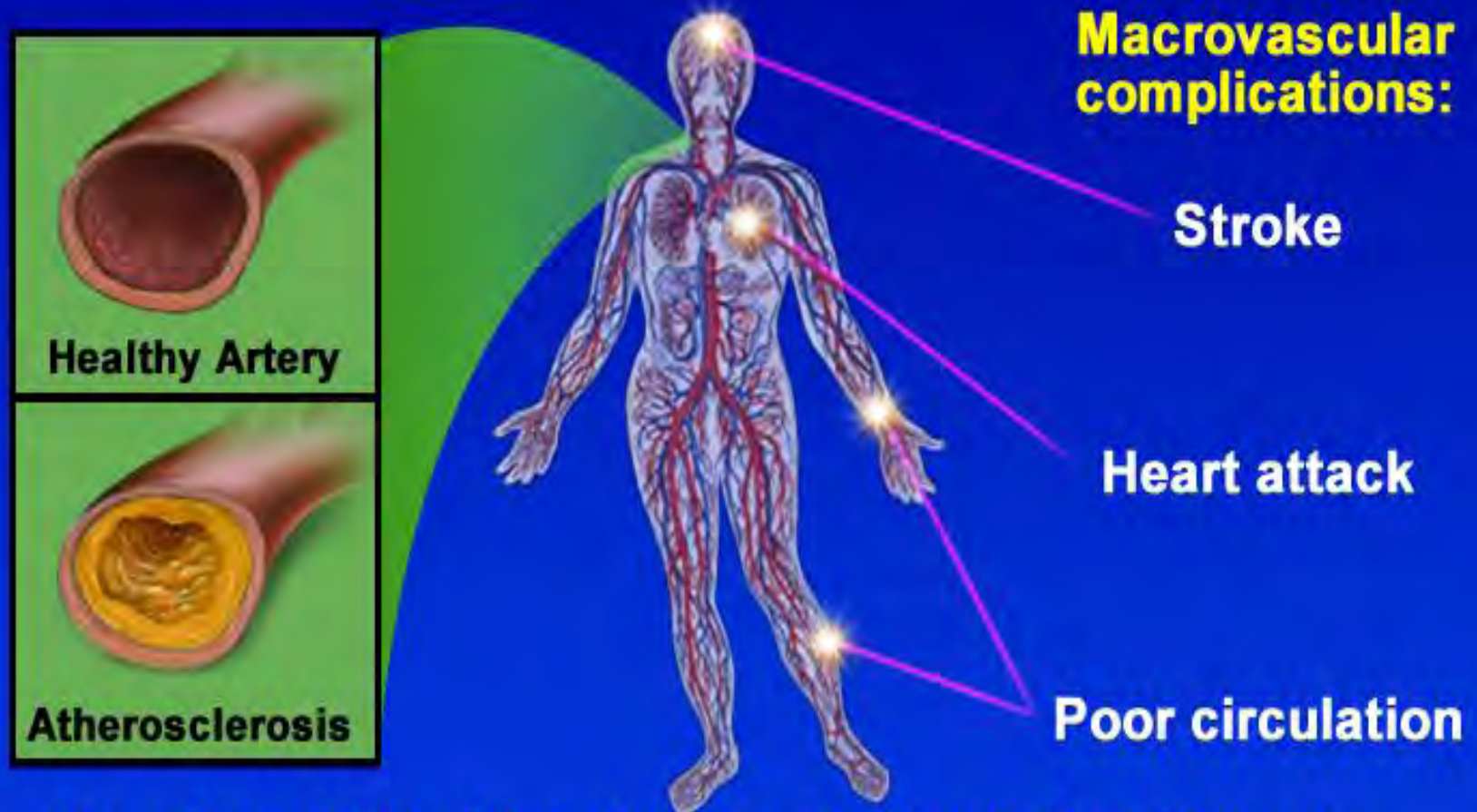
- ▶ Macrovascular complications
 - Accelerated atherosclerotic changes
 - Coronary artery disease, cerebrovascular disease, and peripheral vascular disease
- ▶ Microvascular complications
 - Diabetic retinopathy, nephropathy
- ▶ Neuropathic changes
 - Peripheral neuropathy, autonomic neuropathies, hypoglycemic unawareness, neuropathy, sexual dysfunction

Hyperglycemia Can Cause Serious Long-Term Problems

Chronic complications of diabetes



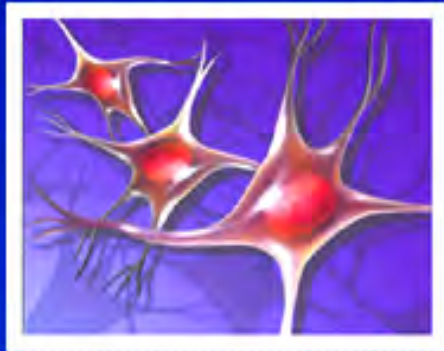
Diabetes Increases the Risk of Large Blood Vessel Damage



Over time, fatty deposits can clog large blood vessels

Diabetes Can Lead to Nerve and Small Blood Vessel Damage

Nerve damage (neuropathy)



Can cause problems in:

- ▶ Feet and hands
- ▶ Heart and circulation
- ▶ Stomach, bladder, and sex organs

Small blood vessel damage (microvascular complications)



Can cause:

- ▶ Blindness
- ▶ Kidney disease

Diabetic Retinopathy

- A chronic and progressive non-inflammatory impairment of the retinal circulation that eventually causes hemorrhage.
- Permanent vision changes and blindness can occur.
- The client has difficulty with carrying out the daily tasks of glucose testing and insulin injections.

Clinical Manifestations

- A change in vision as a result of ruptured vessels.
- Blurred vision due to macular edema
- Sudden loss of vision caused by retinal detachment.
- Cataracts due to lens opacity.

Treatment

- Maintain safety
- Early prevention by the control of hypertension and blood glucose levels
- Photocoagulation (laser therapy) to remove hemorrhagic tissue to decrease scarring
- Vitrectomy: to remove vitreous hemorrhages and thus decrease tension on the retina, preventing detachment

Diabetic Nephropathy

- A progressive decrease in kidney function as a result of the diabetes
- Clinical manifestations
 - Thirst
 - Fatigue
 - Anemia
 - Weight loss
 - Signs of malnutrition
 - Frequent urinary tract infections
 - Signs of a neurogenic bladder

Treatment

- Early prevention by the control of hypertension and blood glucose levels
- Monitor vital signs
- Monitor I&O
- Monitor BUN, creatinine, and for Albuminuria
- Restrict dietary protein, sodium, and potassium as prescribed
- Avoid nephrotoxic medications

Good News for Type 1 Diabetes

Keeping blood glucose in target range reduces:

Kidney disease

as
much as
56%



Nerve damage

as
much as
60%



Eye disease

as
much as
76%



Diabetes Control and Complications Trial

Good News for Type 2 Diabetes

Keeping A1c in target range reduces:

Heart attack

as
much as
16%



Eye damage

as
much as
21%



Kidney disease

as
much as
34%



United Kingdom Prospective Diabetes Study

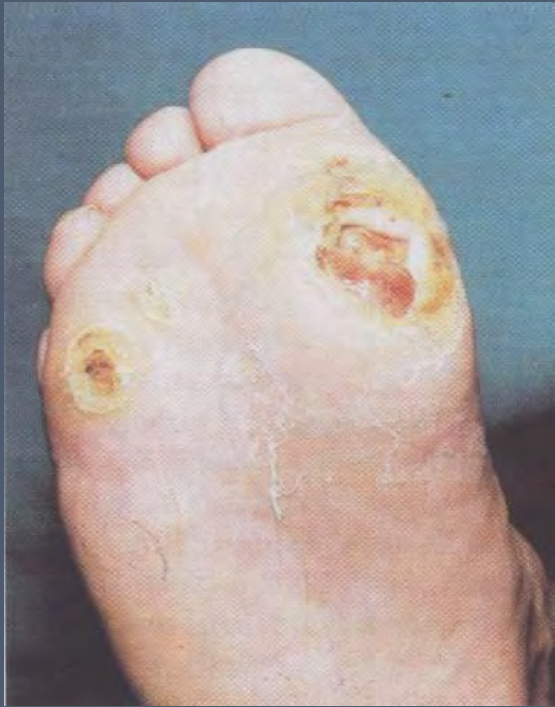
Diabetic Neuropathy



- Burning, tingling, and numbness in hands, feet, and legs
- Loss of feeling in extremities when sensory nerve fibers affected
- Inability to tell difference between hot and cold
- Client may have dizziness, double vision, ringing, or buzzing in ears
- Male client may have impotence, and both genders may have decreased libido
- Client may complain of inability to completely empty bladder

Clinical Manifestations

- Paresthesia
- Decreased or absent reflexes
- Decreased sensation to vibration or light touch
- Pain, aching, and burning in the lower extremities
- Poor peripheral pulses
- Skin breakdown and signs of infection
- Weakness or loss of sensation in cranial nerves III, IV, V or VI
- Dizziness and postural hypotension



White, Foundations of Adult Health Nursing



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Ulceration following trauma to the foot of a person with diabetes.



(Courtesy of Harry Przekop/Medichrome/The Stock Shop, Inc.)



Keep Feet Healthy

**Over time,
poorly controlled
diabetes can cause:**

Loss of feeling

Poor circulation

**Skin breakdown,
infection**

Possible amputation



Inspect Feet Every Day

**Check each foot
(top, bottom, and sides) for:**

- ▶ **Changes in color**
- ▶ **Blisters and ulcers**
- ▶ **Calluses**
- ▶ **Dry skin**
- ▶ **Cuts and sores**



Use a mirror or ask someone for help

Tips for Foot and Skin Care

DO:

- ✓ Examine feet daily
- ✓ Wash skin with mild soap and water; pat dry
- ✓ Keep toenails trim and smooth
- ✓ Wear fresh socks daily
- ✓ Check inside shoes before wearing



DON'T:

- ⊘ Go barefoot
- ⊘ Soak feet, bathe, or shower in hot water
- ⊘ Use drugstore remedies to self-treat foot problems

Schedule Regular Visits with Diabetes Care Providers

Every 6 months:

- ▶ A1c test
- ▶ Blood pressure test
- ▶ Dental checkup



Every year:

- ▶ Blood lipid test
- ▶ Complete foot exam
- ▶ Dilated pupil eye exam
- ▶ Urine test for kidney function
- ▶ Flu shot and other vaccines, as needed

Nursing Care of Clients with Diabetes Mellitus

► Assessment

- Take a thorough health history.
- The most common symptoms are the three Ps: polyuria, polydipsia, and polyphagia.
- Check the feet for circulation, wounds, and reddened areas.
- Screen for problems with vision, including blurred vision, cataracts, and glaucoma.

Assessment

BOX 17-8

ASSESSMENT

Assessing for Diabetes Mellitus

SUBJECTIVE DATA

- Present health status:
 - Presence of hyperglycemia manifestations: polyuria, polydipsia, polyphagia.
 - Weight loss or gain; changes in appetite.
 - Changes in vision or speech.
 - Presence of numbness and/or tingling or burning in feet.
 - Presence of slow healing wounds.
 - Pain or burning with urination.
 - Problems of vulvar itching in females.
- Family history of type 1 or type 2 diabetes mellitus.
- Use of insulin or oral antidiabetic medications.
- Any recent surgery.

OBJECTIVE DATA

- Vital signs (blood pressure—standing and lying, pulse, respirations, temperature).
- Weight and height.
- Assess for DKA, HHS, and/or hypoglycemia.
- Assess visual acuity.
- Assess sensations of touch and position, pain, and temperature.
- Observe mental status for signs of confusion or disorientation; slurred speech.
- Observe gait patterns, use of assistive devices for walking, and abnormal wear patterns on shoes.
- Inspect oral cavity for bad breath, bleeding, red gums, and tooth pain.
- Inspect skin for dryness or excessive perspiration; presence of hair on lower extremities; presence of lesions, redness over pressure points, cellulitis, or gangrene.
- Palpate peripheral pulses for decrease or absence.
- Palpate lower extremity for capillary refill, color and temperature of skin, and edema.
- Monitor and report blood glucose levels above or below expected range.

Special Issues

- Hospitalized diabetic patients
 - Self care & hygiene
 - Hyperglycemia in-house
 - Hypoglycemia in-house
 - Alterations in diet
 - NPO
 - Clear liquids
 - Enteral tube feedings
 - TPN
- Stress management

Sick-Day Plan

- 
- ✓ Medication instructions
 - ✓ Testing schedule
 - ✓ Sick-day menu
 - ✓ When to call health care team
 - ✓ Important phone numbers

During Illness, Call Your Care Team If You Have:



- ▶ Blood glucose of 300 mg/dL or higher (2 tests in a row)
- ▶ Positive urine ketones
- ▶ Symptoms such as:
 - Confusion
 - Fruity breath
 - Difficulty breathing
 - Nausea or vomiting
 - Diarrhea
 - Dehydration

Patient Teaching

- What to Do When Ill
 - Avoid exercise
 - Have regular intake of food and water.
 - Take insulin or oral hypoglycemic medicine.
 - Test blood glucose every 4 hours.
 - Test urine for Ketones
 - Notify physician
 - If vomiting or diarrhea persists for more than 6 hours
 - If unable to eat for more than 24 hours

Assessment

- ▶ Concerns for Young Adults
 - Assess the young adult's lifestyle including eating habits/patterns, exercise
 - Provide teaching to address the need for scheduled eating patterns and exercise regime
- ▶ Concerns for Middle-Aged Adults
 - Assess the client's lifestyle to include eating habits/patterns, exercise
 - Provide teaching to address the need for scheduled eating patterns and exercise regime.

Concerns for Older Adults

- If obese, might need diet, exercise, and weight reduction program
- Consider: dietary likes/dislikes, eating habits, meal preparation, age-related changes in taste and smell, dental health
- Consider: age-related decline in calorie needs and reduced physical activity
- Might be on a fixed income
- Coexisting illnesses and multiple medications can decrease appetite and reduce energy to plan, cook, or eat

Nursing Diagnoses

- Risk for Infection
- Risk for Imbalanced Nutrition: More Than Body Requirements
- Risk for Impaired Skin Integrity
- Delayed Surgical Recovery
- Ineffective Peripheral Tissue Perfusion
- Impaired Dentition
- Ineffective Health Maintenance

Nursing Diagnoses

- Knowledge, deficient
- Self-esteem, risk for situational low
- Sensory perceptions, disturbed
- Fluid volume, risk for deficient
- Injury, risk for
- Sexual dysfunction
- Body image, disturbed
- Coping, ineffective
- Home maintenance, impaired
- Nutrition: less than body requirements, imbalanced
- Nutrition: more than body requirement, imbalanced
- Activity intolerance

Interventions

- Take measures to prevent infections.
- Protect the client from bumps, bruises, and trauma, as small skin openings can lead to infection and gangrene.
- Inspect skin daily.
- Advise the client not to sit for a long time with the legs hanging down and to avoid crossing the legs.
- Encourage and provide opportunities for exercise.

Interventions

- Monitor finger-stick blood sugar levels when ordered before meals and at bedtime.
- Administer medication as ordered (insulin or antidiabetic drug) and teach the client to manage medication.
- Monitor vital signs of all clients with DM, especially blood pressure, as elevated blood pressure can lead to further complications for diabetics.
- For Type 1 diabetics especially, observe the client's tray and snacks and report any food not eaten so that calorie adjustments can be made.

Treatment

- Early prevention by the control of hypertension and blood glucose levels
- Careful foot care to prevent trauma
- Apply topical capsaicin (Axsain, Zostrix) for temporary relief of neuralgia as prescribed
- Initiate bladder-training programs
- Instruct in the use of estrogen-containing lubricants for women with dyspareunia

Patient Teaching

- Food Management

- Instruct client how to:

- Monitor own blood glucose
 - Avoid skipping or delaying meals and snacks
 - Read nutrition labels

- Provide information about diet prescribed

- Teach clients and families:
 - To make healthy food choices
 - About fast foods that are nutritious

Patient Teaching

▶ Avoiding Alcohol and Nicotine

- Advise clients that:

- Mixing alcohol with oral hypoglycemic medication may cause hypoglycemic reactions
- Nicotine use can damage nerves and walls of blood vessels

▶ Exercise

- Teach clients importance of consistent exercise in:

- Maintaining blood sugar control
- Decreasing stress
- Lowering heart rate and blood pressure

Patient Teaching

► Skin, Feet, and Teeth

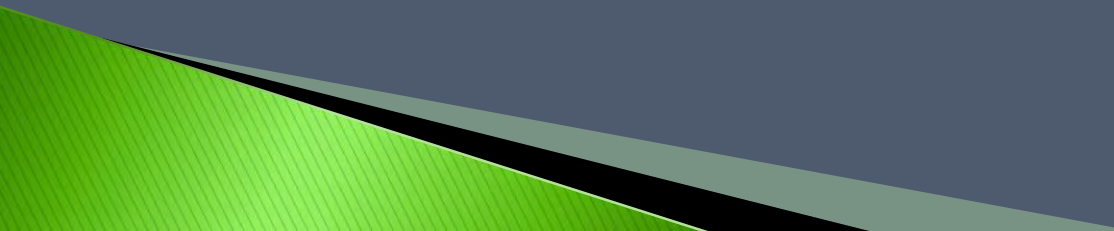
- Teach client to
 - Inspect the skin daily
 - Prevent cuts, cracks, and sores
 - Do proper care of the feet

- Reinforce need to see a dentist twice a year for checkups and cleaning

► Medication Teaching

- Teach
 - Proper administration of insulin to clients on insulin
 - Rotation of injection site

Nursing Process: The Care of the Patient with Diabetes—Assessment

- ▶ Assess the primary presenting problem
 - ▶ In addition, assess needs related to diabetes
 - ▶ Patient knowledge of diabetes and diabetes care skills
 - ▶ Blood glucose levels
 - ▶ Skin assessment
 - ▶ Preventative health measures
- 

Teaching Patients Self-Care

- ▶ Assess knowledge and adherence to plan of care.
 - ▶ Provide basic information about diabetes, its cause and symptoms, and acute and chronic complications and their treatment.
 - ▶ Teach self-care activities to prevent long-term complications including foot care, eye care, and risk-factor management.
 - ▶ Include family in plan of care.
 - ▶ Provide information, encourage health promotion activities, and recommended health screenings.
- 

Evaluation

- ▶ Collect data related to chronic complications
- ▶ Identify frequency of DKA, HHNS, hypoglycemia
- ▶ Document VS, LOC, skin integrity, complications
- ▶ Notify MD of client's response to treatment
- ▶ Reinforce teaching related to medications, diet, and self-care
- ▶ Document

Self-Management of DM

- ▶ Maintain prescribed diet and exercise
- ▶ Insulin needs are increased if you have surgery, trauma, fever, or infection
- ▶ Monitor blood glucose
- ▶ Report any illness or side effects to healthcare provider
- ▶ Undergo periodic lab evaluations
- ▶ Avoid alcohol intake
- ▶ Take medications as prescribed
- ▶ Some medications (oral) may interfere with oral contraceptives

