

Napa Valley College

ADN N142

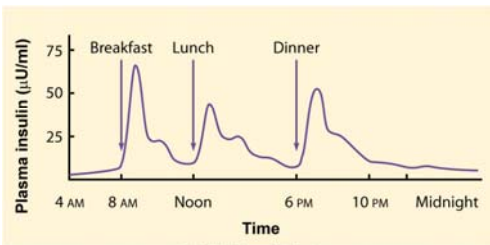
Unit IV Endocrine/Diabetes

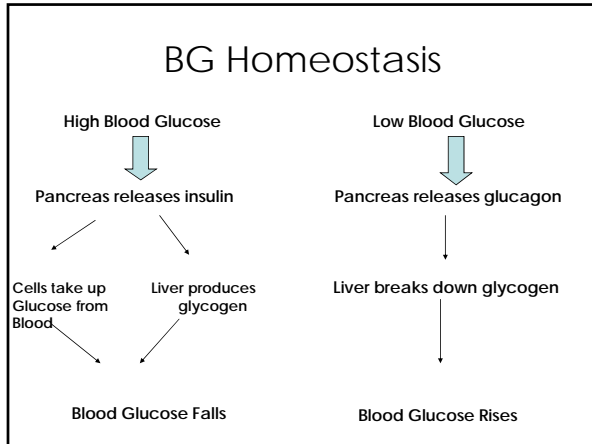
Objective #1 Explain factors that promote the normal reg. of BG in health

Normal insulin metabolism

- Produced by the β cells
 - Islets of Langerhans
- Released continuously into bloodstream in small increments with larger amounts released after food intake
- Stabilizes glucose range to 70 to 120 mg/dl
- Average daily secretion 0.6 units/kg body weight

Normal Insulin Secretion





Obj#2 factors that influence glucose regulation

Glucose Regulation

- Insulin
 - Decreases glucose in the bloodstream
 - Insulin ↑ after a meal
 - Stimulates storage of glucose as glycogen in liver and muscle
 - Inhibits gluconeogenesis
 - Enhances fat deposition
 - ↑ Protein synthesis
 - Promotes glucose transport from bloodstream across cell membrane to cytoplasm of cell

Glucose Regulation

- Stress
 - Emotional and physical can increase BG levels
- Medications
 - Can potentiate hypo/hyper glycemic effects
- Exercise
- Counterregulatory hormones
 - Oppose effects of insulin
 - Increase blood glucose levels
 - Provide a regulated release of glucose for energy
 - Help maintain normal blood glucose levels
 - Examples
 - Glucagon, epinephrine, growth hormone, cortisol

Obj#3 Define & describe

Diabetes Mellitus

- A chronic multisystem disease related to
 - Abnormal insulin production
 - Impaired insulin utilization
 - Or both

Diabetes Mellitus

- Leading cause of
 - End-stage renal disease
 - Adult blindness
 - Nontraumatic lower limb amputations
- Major contributing factor
 - Heart disease
 - Stroke

Diabetes Mellitus

- 73% of adults with diabetes have hypertension
- 20.8 million people with diabetes in the US
- 41 million people with prediabetes

Obj#4 Compare the etiology & characteristics
Obj#5 factors that indicate pts at risk for altered glucose regulation

Diabetes Mellitus

Etiology and Pathophysiology

- Two most common types
 - Type 1
 - Type 2
- Other types
 - Gestational
 - Prediabetes
 - Secondary diabetes

Type 1 (Immune-mediated) Diabetes Mellitus

- Formerly known as “juvenile onset” or “insulin dependent” diabetes
- Most often occurs in people under 30 years of age
- Peak onset between ages 11 and 13

Type 1 Diabetes Mellitus

Etiology and Pathophysiology

- End result of long-standing process
 - Progressive destruction of pancreatic β cells by body's own T cells
 - Autoantibodies cause a reduction of 80% to 90% of normal β cell function before manifestations occur

Type 1 Diabetes Mellitus
Etiology and Pathophysiology

- Causes
 - Theories link cause to single/ combination of these factors
 - Genetic
 - Autoimmune
 - Viral
 - Environmental

Type 1 Diabetes Mellitus
Onset of Disease

- Long preclinical period
- Antibodies present for months to years before symptoms occur
- Manifestations develop when pancreas can no longer produce insulin
 - Rapid onset of symptom
 - Will require exogenous insulin to sustain life

Type 1 Diabetes Mellitus
Clinical Manifestation

- History of recent, sudden, weight loss
- Classic symptoms
 - Polydipsia
 - Polyuria
 - Polyphagia
- Weight loss
- Weakness
- Fatigue

obj#7 manifestations that suggest an alteration in glucose reg.

Clinical Manifestation Type 1

Lack of insulin results in:

- Glucose molecules accumulate= hyperglycemia
 - which causes hyperosmolality (drawing H₂O from the intracellular spaces into circulation)
 - The increased blood vol. increases renal blood flow
 - Acting as an osmotic diuretic
 - » INCREASES URINE OUTPUT=

» **POLYURIA**

Clinical Manifestation type 1 continued...

- When the BG level exceeds the renal threshold for glucose: (about 180mg/dL)
 - Glucose is excreted in the urine-glucosuria
- The decrease in intracellular vol. & the increased urinary output cause dehydration
 - Thirst sensors are activated causing pt to drink increased amts of fluid= **POLYDIPSIA**

Clinical Manifestation type 1 continued

- Because glucose cannot enter the cell without insulin, energy production decreases
 - Stimulates hunger
 - Person wants/eats more food

= **POLYPHAGIA**

Clinical Manifestations continued

- Weight loss
 - acute - loss of H₂O, glycogen, triglyceride stores
 - chronic - ↓ muscle mass
- Blurred vision -
 - effect of hyperosmolar fluid on lenses & retina
- Fatigue, Malaise & Dizziness
 - ↓ fluid volume & K⁺, postural hypotension,
 - ↑ protein catabolism

Type 2 Diabetes Mellitus

- Most prevalent type of diabetes
- Over 90% of patients with diabetes
- Usually occurs in people over 35 years of age
- 80% to 90% of patients are overweight

Type 2 Diabetes

- Prevalence increases with age
- Genetic basis
- Greater in some ethnic populations
 - Increased rate in African Americans, Asian Americans, Hispanic Americans, and Native Americans
 - Native Americans and Alaskan Natives: Highest rate of diabetes in the world

Type 2 Diabetes Mellitus
Etiology and Pathophysiology

- Pancreas continues to produce some endogenous insulin
- Insulin produced is either insufficient or poorly utilized by tissues

Type 2 Diabetes Mellitus
Etiology and Pathophysiology

- Obesity (abdominal/visceral)
 - Most powerful risk factor
- Genetic mutations
 - Lead to insulin resistance
 - Increased risk for obesity
 - <http://cosmos.bcst.yahoo.com/up/player/popu p/?cl=7492540>

Type 2 Diabetes
Etiology and Pathophysiology

Major metabolic abnormalities

- 1. Insulin resistance
 - Body tissues do not respond to insulin
 - Insulin receptors either unresponsive or insufficient in number
 - Results in hyperglycemia
- 2. Pancreas ↓ ability to produce insulin
 - β cells fatigued from compensating
 - β -cell mass lost
- 3. Inappropriate glucose production from liver
 - Liver's response of regulating release of glucose is haphazard
 - Not considered a *primary* factor in development of type 2

Type 2 Diabetes Etiology and Pathophysiology

- Individuals with metabolic syndrome (“Syndrome X”) are at increased risk for type 2:
 - Cluster of abnormalities that increase risk for cardiovascular disease and diabetes
 - Elevated insulin levels, ↑ triglycerides & LDLs, ↓ HDLs, hypertension
 - Risk factors
 - Central obesity, sedentary lifestyle, urbanization, certain ethnicities

Type 2 Diabetes Mellitus *Onset of Disease*

- Gradual onset
- Person may go many years with undetected hyperglycemia
- Osmotic fluid/electrolyte loss from hyperglycemia may become severe
 - Hyperosmolar coma

Clinical Manifestations *Type 2 Diabetes Mellitus*

- Nonspecific symptoms
 - May have classic symptoms of type 1
- Fatigue
- Recurrent infections
- Recurrent vaginal yeast infections (Candida)
- Prolonged wound healing
- Visual changes

Prediabetes

- Known as impaired glucose tolerance (IGT) or impaired fasting glucose (IFG)
- IGT: Fasting glucose levels higher than normal (>100 mg/dl, but <126 mg/dl)
- IFG: 2-hour plasma glucose higher than normal (between 140 and 199 mg/dl)

Prediabetes

- Not high enough for diabetes diagnosis
- Increase risk for developing type 2 diabetes
- If no preventive measure taken—usually develop diabetes within 10 years
- Long-term damage already occurring
 - Heart, blood vessels
- Usually presents with no symptoms
- Must watch for diabetes symptoms
 - Polyuria
 - Polyphagia
 - Polydipsia

Gestational Diabetes

- Develops during pregnancy
- Detected at 24 to 28 weeks of gestation
- Usually glucose levels back to normal at 6 weeks postpartum
- Increased risk for cesarean delivery, perinatal death, and neonatal complications
- Increased risk for developing type 2 in 5 to 10 years
- Therapy: First nutritional, second insulin

Obj#9 nursing care for pts requiring diagnostic studies

Diabetes Mellitus

Diagnostic Studies

- Three methods of diagnosis
 - Fasting plasma glucose level >126 mg/dl
 - Random or casual plasma glucose measurement \geq 200 mg/dl plus symptoms
 - Two-hour OGTT level \geq 200 mg/dl using a glucose load of 75g-100 g

Diabetes Mellitus

Diagnostic Studies

- Hemoglobin A1C Test (also called glycosylated hemoglobin)
 - Useful in determining glycemic levels over time
 - Not diagnostic but monitors success of treatment
 - Shows the amount of glucose attached to hemoglobin molecules over RBC life span
 - 90 to 120days
 - Ideal goal
 - ADA \leq 7.0%
 - American College of Endocrinology <6.5%
 - Normal A1C reduces risk of retinopathy, nephropathy, and neuropathy

Obj#10 Chronic conditions & complications

Diabetes

Chronic Complications

- Angiopathy
 - **Macrovascular**
 - Diseases of large and medium-sized blood vessels
 - Heart, Cerebral vascular, Peripheral vascular
 - Patients with diabetes should be screened for dyslipidemia at diagnosis
 - Tight glucose control may delay atherosclerotic process
 - Risk factors

Diabetes
Chronic Complications

- Angiopathy (cont'd)
 - **Microvascular**
 - Result from thickening of vessel membranes in capillaries and arterioles
 - In response to chronic hyperglycemia
 - Is specific to diabetes unlike macrovascular
 - Areas most noticeably affected
 - Eyes (retinopathy)
 - Kidneys (nephropathy)
 - Skin (dermopathy)
 - Clinical manifestations usually appear after 10 to 20 years of diabetes
-

Diabetes
Chronic Complications

- Diabetic retinopathy
 - Microvascular damage to retina
 - Most common cause of new cases of blindness in people 20 to 74 years
 - Must have annual dilated eye examinations

Diabetes
Chronic Complications

- Diabetic retinopathy (cont'd)
 - Nonproliferative
 - Most common form
 - Partial occlusion of small blood vessels in retina
 - Causes development of microaneurysms
 - Capillary fluid leaks out
 - » Retinal edema and eventually hard exudates or intraretinal hemorrhages occur

Diabetes
Chronic Complications

- Diabetic retinopathy (cont'd)
 - Proliferative
 - Most severe form
 - Involves retina and vitreous
 - When retinal capillaries become occluded
 - Body forms new blood vessels
 - Vessels are extremely fragile and hemorrhage easily
 - » Produce vitreous contraction
 - Retinal detachment can occur

Diabetes
Chronic Complications

- Diabetic nephropathy
 - Associated with damage to small blood vessels that supply the glomeruli of the kidney
 - Leading cause of end-stage renal disease
 - Yearly screening
 - Microalbuminuria in urine
 - Serum creatinine
 - Critical factors for prevention/delay
 - Tight glucose control
 - Blood pressure management
 - Angiotensin-converting enzyme (ACE) inhibitors
 - » Used even when not hypertensive

Diabetes
Chronic Complications

- Diabetic neuropathy
 - 60% to 70% of patients with diabetes have some degree of neuropathy
 - Nerve damage due to metabolic derangements of diabetes
 - Sensory versus autonomic neuropathy

Diabetes
Chronic Complications

- Diabetic neuropathy (cont'd)
 - Sensory
 - Treatment
 - Tight blood glucose control
 - Drug therapy
 - » Topical creams
 - » Tricyclic antidepressants
 - » Selective serotonin and norepinephrine reuptake inhibitors
 - » Antiseizure medications

Diabetes
Chronic Complications

- Diabetic neuropathy (cont'd)
 - Sensory neuropathy
 - Distal symmetric
 - Most common form
 - Affects hands and/or feet bilaterally
 - Characteristics include
 - » Loss of sensation, abnormal sensations, pain, and paresthesias

Diabetes
Chronic Complications

- Diabetic neuropathy (cont'd)
 - Sensory
 - Usually worse at night
 - Foot injury and ulcerations can occur without the patient having pain
 - Can cause atrophy of small muscles of hands/feet

Diabetes
Chronic Complications

- Diabetic neuropathy (cont'd)
 - Autonomic
 - Can affect nearly all body systems
 - Complications
 - Gastroparesis
 - » Delayed gastric emptying
 - Cardiovascular abnormalities
 - Sexual function
 - Neurogenic bladder

Diabetes
Chronic Complications

- Complications of foot and lower extremity
 - Foot complications
 - Most common cause of hospitalization in diabetes
 - Result from combination of microvascular and macrovascular diseases
 - Risk factors
 - Sensory neuropathy
 - Peripheral arterial disease
 - Other contributors
 - Smoking
 - Clotting abnormalities
 - Impaired immune function
 - Autonomic neuropathy

Diabetes
Chronic Complications

- Integumentary complications
 - Acanthosis nigricans
 - Dark, coarse, thickened skin
 - Necrobiosis lipoidica diabetorum
 - Associated with type 1
 - Red-yellow lesions
 - Skin becomes shiny, revealing tiny blood vessels
 - Granuloma annulare
 - Associated mainly with type 1
 - Forms partial rings of papules

Diabetes
Chronic Complications

- Infection
 - Diabetics more susceptible to infections
 - Defect in mobilization of inflammatory cells
 - Loss of sensation may delay detection
 - Treatment must be prompt and vigorous

Obj#11 pathophys & manifestations of acute complications of DM 1&2

Diabetes
Acute Complications

- Diabetic ketoacidosis (DKA)
- Hyperosmolar hyperglycemic syndrome (HHS)
- Hypoglycemia

Diabetes
Acute Complications

- DKA
 - Caused by profound deficiency of insulin
 - Characterized by
 - Hyperglycemia
 - Ketosis
 - Acidosis
 - Dehydration
 - Most likely occurs in type 1diabetic
 - Occurs in absence of exogenous insulin
 - Life-threatening condition
 - Results in metabolic acidosis

Diabetes
Acute Complications

- DKA (cont'd)
 - When supply of insulin insufficient
 - Glucose cannot be properly used for energy
 - Body breaks down fats stores
 - Ketones are by-products of fat metabolism
 - Precipitating factors
 - Illness
 - Infection
 - Inadequate insulin dosage
 - Undiagnosed type 1
 - Poor self-management
 - Neglect

Diabetes
Acute Complications

- DKA (cont'd)
 - Signs and symptoms
 - Lethargy/weakness (early sympt), dehydration
 - Abdominal pain
 - N/V
 - Kussmaul respirations
 - Rapid deep breathing
 - Attempt to reverse metabolic acidosis
 - Sweet fruity odor
 - Serious condition
 - Must be treated promptly
 - Depending on signs/symptoms
 - May or may not need hospitalization

Diabetes
Acute Complications

- DKA (cont'd)
 - Laboratory findings
 - Blood glucose > 300 mg/dl
 - Arterial blood pH below 7.30
 - Serum bicarbonate level <15 mEq/L
 - Ketones in blood and urine
 - Correct fluid/electrolyte imbalance
 - IV infusion 0.45% or 0.9% NaCl
 - When blood glucose levels approach 250 mg/dl
 - 5% dextrose added to regimen
 - Prevent hypoglycemia
 - Potassium replacement
 - Sodium bicarbonate
 - If pH <7

Diabetes
Acute Complications

- DKA (cont'd)
 - Airway management
 - O₂ administration
 - Insulin therapy
 - Withheld until fluid resuscitation has begun
 - Bolus followed by insulin drip

Diabetes
Acute Complications

- **Hyperosmolar hyperglycemic syndrome (HHS)**
 - Life-threatening syndrome
 - Less common than DKA
 - Often occurs in patients over 60 years with type 2
 - Patient has enough circulating insulin so ketoacidosis does not occur
 - Produces fewer symptoms in earlier stages
 - Neurologic manifestations occur due to ↑ serum osmolality

Diabetes
Acute Complications

- **HHS (cont'd)**
 - Usually history of
 - Inadequate fluid intake
 - Increasing mental depression
 - Polyuria
 - Laboratory values
 - Blood glucose >400 mg/dl
 - Increase in serum osmolality
 - Absent/minimal ketone bodies
 - Therapy similar to DKA
 - Except HHS requires greater fluid replacement

Diabetes
Acute Complications

- Nursing management DKA/HHS
 - Patient closely monitored
 - Administration
 - IV fluids
 - Insulin therapy
 - Electrolytes
 - Signs potassium imbalance
 - Cardiac monitoring
 - Vital signs
 - Level of consciousness

Obj#16 Describe causes, assessment findings and nursing management of hypoglycemic disorders

Diabetes
Acute Complications

- **Hypoglycemia**
 - Low blood glucose
 - Occurs when
 - Too much insulin in proportion to glucose in the blood
 - Blood glucose level less than 70 mg/dl
 - Common manifestations
 - Confusion
 - Irritability
 - Diaphoresis
 - Tremors
 - Hunger

Diabetes
Acute Complications

- Hypoglycemia (cont'd)
 - Common manifestations
 - Weakness
 - Visual disturbances
 - Can mimic alcohol intoxication
 - Untreated can progress to loss of consciousness, seizures, coma, and death

Diabetes
Acute Complications

- Hypoglycemia (cont'd)
 - Hypoglycemic unawareness
 - Person does not experience warning signs/symptoms, increasing risk for decreased blood glucose levels
 - Related to autonomic neuropathy
 - Causes
 - Mismatch in timing
 - Food intake and peak action of insulin or oral hypoglycemic agents

Diabetes
Acute Complications

- Hypoglycemia (cont'd)
 - At the first sign
 - Check blood glucose
 - If <70 mg/dl, begin treatment
 - If >70 mg/dl, investigate further for cause of signs/symptoms
 - If monitoring equipment not available, treatment should be initiated

Diabetes
Acute Complications

- Hypoglycemia (cont'd)
 - Treatment
 - If alert enough to swallow
 - 15 to 20 g of a simple carbohydrate
 - » 4 to 6 oz fruit juice
 - » Regular soft drink
 - Avoid foods with fat
 - » Decrease absorption of sugar
 - Do not overtreat
 - Recheck blood sugar 15 minutes after treatment
 - Repeat until blood sugar >70 mg/dl
 - Patient should eat regularly scheduled meal/snack to prevent rebound hypoglycemia
 - Check blood sugar again 45 minutes after treatment

Diabetes
Acute Complications

- Hypoglycemia (cont'd)
 - Treatment
 - If no improvement after 2 or 3 doses of simple carbohydrate or pt not alert enough to swallow
 - Administer 1 mg of glucagon IM or subcutaneously
 - Side effect: Rebound hypoglycemia
 - Have patient ingest a complex carbohydrate after recovery
 - In acute care settings
 - 20 to 50 ml of 50% dextrose IV push

Obj#12 Assessment findings in pts with alterations in glucose regulation
Nursing Management
Nursing Assessment

- Past health history
 - Viral infections
 - Medications
 - Recent surgery
- Positive health history
- Obesity

Nursing Management
Nursing Assessment

- Weight loss
- Thirst
- Hunger
- Poor healing
- Kussmaul respirations

Obj#13 Identify nursing dx and outcomes for pts with DM

Nursing Management

Nursing Diagnoses

- Ineffective therapeutic regimen management
- Risk for injury
- Risk for infection
- Powerlessness
- Imbalanced nutrition: More than body requirements
- Fluid volume deficit
- Tissue perfusion, altered
- Altered sexuality patterns

Nursing Management

Planning

- Overall goals
 - Active patient participation
 - Few or no episodes of acute hyperglycemic emergencies or hypoglycemia
 - Maintain normal blood glucose levels
 - Prevent or delay chronic complications
 - Lifestyle adjustments with minimal stress

Nursing Management

Nursing Implementation

- Health promotion
 - Identify those at risk
 - Routine screening for overweight adults over age 45
 - FPG is preferred method in clinical settings

Nursing Management
Nursing Implementation

- Acute intervention
 - Hypoglycemia
 - Diabetic ketoacidosis
 - Hyperosmolar hyperglycemic nonketotic syndrome

Nursing Management
Nursing Implementation

- Acute intervention (cont'd)
 - Stress of illness and surgery
 - ↑ Blood glucose level
 - Continue regular meal plan
 - ↑ Intake of noncaloric fluids
 - Continue taking oral agents and insulin
 - Frequent monitoring of blood glucose
 - Ketone testing if glucose > 240 mg/dl

Nursing Management
Nursing Implementation

- Acute intervention (cont'd)
 - Stress of illness and surgery
 - Patients undergoing surgery or radiologic procedures requiring contrast medium should hold their metformin day of surgery and 48 hours
 - Begun after serum creatinine has been checked and is normal

Nursing Management
Nursing Implementation

- Ambulatory and home care
 - Overall goal is to enable patient or caregiver to reach an optimal level of independence
 - Insulin therapy and oral agents
 - Personal hygiene

Nursing Management
Nursing Implementation

- Ambulatory and home care (cont'd)
 - Insulin therapy and oral agent
 - Education on proper administration, adjustment and side effects
 - Assessment of patient's response to therapy
 - Personal hygiene
 - Regular bathing with emphasis on foot care
 - Daily brushing/flossing
 - Dentist should be informed about diabetes diagnosis

Nursing Management
Nursing Implementation

- Ambulatory and home care (cont'd)
 - Medical identification and travel card
 - Must carry identification indicating diagnosis of diabetes
 - Patient and family teaching
 - Educate on disease process, physical activity, medications, monitoring blood glucose, diet, resources
 - Enable patient to become most active participant in his/her care

Nursing Management *Evaluation*

- Knowledge
- Balance of nutrition
- Health benefits
- No injuries

Diabetes Mellitus *Collaborative Care*

- Goals of diabetes management
 - Decrease symptoms
 - Promote well-being
 - Prevent acute complications
 - Delay onset and progression of long-term complications

Obj#15 Formulate outcomes from use of Insulin and Oral hypoglycemic agents.

Drug Therapy *Insulin*

- Exogenous insulin
 - Insulin from an outside source
 - Required for type 1 diabetes
 - Prescribed for patient with type 2 diabetes who cannot control blood glucose by other means
- Types of insulin
 - Human insulin
 - Only type used today
 - Prepared through genetic engineering

Drug Therapy
Insulin

- Regimen that closely mimics endogenous insulin production is basal-bolus
 - Long-acting (basal) once a day
 - Rapid/short-acting (bolus) before meals

Drug Therapy
Insulin

Insulin preparations

- Rapid-acting (bolus) Lispro, aspart, glulisine
 - onset 0 to 15 minutes
 - Peak 60-90 min
 - Duration 3-4 hours
- Short-acting (bolus) Regular
 - Onset 30 to 60 minutes
 - Peak 2-3 hours
 - Duration 3-6 hours

Drug Therapy
Insulin

- Intermediate Acting NPH or Lente
 - Cloudy
 - Vial must be rolled or rocked a min of 20 times
 - onset 2-4 hours
 - Peak 4-10
 - Duration 10-16
- Long-acting (basal) glargine (Lantus), detemire (Levemir)
 - Injected once a day at bedtime or in the morning
 - Onset 1-2 hours
 - Duration 24+ hours
 - No peak action-released steadily and continuously
 - Cannot be mixed with any other insulin or solution

Drug Therapy
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
 - Cannot be taken orally
 - Subcutaneous injection for self-administration
 - IV administration

Drug Therapy
Insulin

- Administration of insulin (cont'd)
 - Fastest absorption from abdomen, followed by arm, thigh, buttock
 - Abdomen
 - Preferred site
 - Rotate injections within one particular site
 - Do not inject in site to be exercised

Drug Therapy
Insulin

- Administration of insulin (cont'd)
 - Do not inject in site to be exercised
 - Usually available as U100
 - 1 ml contains 100 units of insulin
 - No alcohol swab on site needed before injection
 - washing with soap and rinsing with water is adequate
 - Do not recap needle
 - 45- to 90-degree angle depending on fat thickness of patient
 - Insulin pens preloaded with insulin now available

Drug Therapy
Insulin

- 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

Drug Therapy
Insulin

- Inhaled insulin
 - Exubera
 - Rapid-acting, dry powder inhaled through mouth into lungs
 - Not recommended for patients with asthma, bronchitis, or emphysema

Drug Therapy
Insulin

- Problems with insulin therapy
 - Hypoglycemia
 - Allergic reactions
 - Lipodystrophy
 - Somogyi effect
 - Dawn phenomenon

Drug Therapy
Insulin

- Problems with insulin therapy
 - Somogyi effect
 - Rebound effect in which an overdose of insulin causes hypoglycemia
 - Usually during hours of sleep
 - Counterregulatory hormones released
 - Rebound hyperglycemia and ketosis occur

Drug Therapy
Insulin

- Problems with insulin therapy
 - Dawn phenomenon
 - Characterized by hyperglycemia present on awakening in the morning
 - Due to release of counterregulatory hormones in predawn hours
 - Growth hormone/cortisol possible factors

Drug Therapy
Oral Agents

- Not insulin
- Work to improve mechanisms by which insulin and glucose are produced and used by the body
- Work on three defects of type 2 diabetes
 - Insulin resistance
 - Decreased insulin production
 - Increased hepatic glucose production

Drug Therapy
Oral Agents

- Sulfonylureas
- Meglitinides
- Biguanides
- α -Glucosidase inhibitors
- Thiazolidinediones

Drug Therapy
Oral Agents

- Sulfonylureas
 - \uparrow Insulin production from pancreas
 - \downarrow Chance of prolonged hypoglycemia
 - 10% experience decreased effectiveness after prolonged use
 - Examples
 - Glipizide (Glucotrol)
 - Glimepiride (Amaryl)

Drug Therapy
Oral Agents

- Meglitinides
 - Increase insulin production from pancreas
 - Taken 30 minutes before each meal up to time of meal
 - Should not be taken if meal skipped
 - Examples
 - Repaglinide (Prandin)
 - Nateglinide (Starlix)

Drug Therapy
Oral Agents

- Biguanides
 - Reduce glucose production by liver
 - Enhance insulin sensitivity at tissues
 - Improve glucose transport into cells
 - Does not promote weight gain
 - Example
 - Metformin (Glucophage)

Drug Therapy
Oral Agents

- α -Glucosidase inhibitors
 - "Starch blockers"
 - Slow down absorption of carbohydrate in small intestine
 - Example
 - Acarbose (Precose)

Drug Therapy
Oral Agents

- Thiazolidinediones
 - Most effective in those with insulin resistance
 - Improves insulin sensitivity, transport, and utilization at target tissues
 - Examples
 - Pioglitazone (Actos)
 - Rosiglitazone (Avandia)

Drug Therapy *Other Agents*

- Amylin analog
 - Hormone secreted by β cells of pancreas
 - Cosecreted with insulin
 - Indicated for type 1 and type 2 diabetics
 - Administered subcutaneously
 - Thigh or abdomen
 - Slows gastric emptying, reduces postprandial glucagon secretion, increases satiety
 - Example
 - Pramlintide (Symlin)

Drug Therapy *Other Agents*

- Incretin mimetic
 - Synthetic peptide
 - Stimulates release of insulin from β cells
 - Subcutaneous injection
 - Suppresses glucagon secretion
 - Reduces food intake
 - Slows gastric emptying
 - Not to be used with insulin
 - Example
 - Byetta

Drug Therapy *Other Agents*

- β -Adrenergic blockers
 - Mask symptoms of hypoglycemia
 - Prolong hypoglycemic effects of insulin
- Thiazide/loop diuretics
 - Can potentiate hyperglycemia
 - By inducing potassium loss

Diabetes

Nutritional Therapy

- Cornerstone of care for person with diabetes
- Most challenging for many people
- Recommended that diabetes nurse educator and registered dietitian with diabetes experience be members of team

Diabetes

Nutritional Therapy

- American Diabetes Association (ADA)
 - Guidelines indicate that within context of an overall healthy eating plan, person with diabetes can eat same foods as person who does not have diabetes
 - Overall goal
 - Assist people in making changes in nutrition and exercise habits that will lead to improved metabolic control

Diabetes

Nutritional Therapy

- Type 1 diabetes mellitus
 - Meal plan based on individual's usual food intake and is balanced with insulin and exercise patterns
 - Insulin regimen managed day to day

Diabetes
Nutritional Therapy

- Type 2 diabetes mellitus
 - Emphasis based on achieving glucose, lipid, and blood pressure goals
 - Calorie reduction

Diabetes
Nutritional Therapy

- Food composition
 - Nutrient balance of diabetic diet is essential
 - Nutritional energy intake should be balanced with energy output

Diabetes
Nutritional Therapy

- Carbohydrates
 - Carbohydrates and monounsaturated fats should provide 45% to 65% of total energy intake
 - ↓ Carbohydrate diets are not recommended for diabetics
- Glycemic index (GI)
 - Term used to describe rise in blood glucose levels after consuming carbohydrate-containing food
 - Should be considered when formulating a meal plan

Diabetes
Nutritional Therapy

- Fats
 - No more than 20% to 35% of meal plan's total calories
 - <7% from saturated fats, minimal trans fat
- Protein
 - Contribute <10% of total energy consumed
 - Intake should be significantly less than general population

Diabetes
Nutritional Therapy

- Alcohol
 - High in calories
 - No nutritive value
 - Promotes hypertriglyceridemia
 - Detrimental effects on liver
 - Can cause severe hypoglycemia

Diabetes
Nutritional Therapy

- Diet teaching
 - Dietitian initially provides instruction
 - Should include patient's family and significant others
 - USDA MyPyramid guide
 - An appropriate basic teaching tool
 - Plate method
 - Helps patient visualize the amount of vegetable, starch, and meat that should fill a 9-inch plate

Diabetes *Exercise*

- Exercise
 - Essential part of diabetes management
 - ↑ Insulin receptor sites
 - Lowers blood glucose levels
 - Contributes to weight loss
 - Should be individualized
 - Monitor blood glucose levels before, during, and after exercise

Diabetes *Exercise*

- Exercise (cont'd)
 - Several small carbohydrate snacks can be taken every 30 minutes during exercise to prevent hypoglycemia
 - Best done after meals
 - Exercise plans should be started
 - After medical clearance
 - Slowly with gradual progression

Monitoring Blood Glucose

- Self-monitoring of blood glucose (SMBG)
 - Enables patient to make self-management decisions regarding diet, exercise, and medication

Monitoring Blood Glucose

- Self-monitoring of blood glucose (SMBG) (cont'd)
 - Important for detecting episodic hyperglycemia and hypoglycemia
 - Patient training is crucial
 - Supplies immediate information about blood glucose levels

Diabetes

Pancreas Transplantation

- Pancreas transplants alone are rare
 - Usually kidney and pancreas transplants done together
- Eliminates need for exogenous insulin
- Can also eliminate hypoglycemia and hyperglycemia
- Used for patients with type 1 diabetes who also have
 - End-stage renal disease
 - Had, or plan to have, a kidney transplant

Obj#17 Describe the periop management of pt with DM

Diabetes

Perioperative Management

- Acute illness, injury, surgery
 - May evoke counterregulatory hormone response
 - Resulting in hyperglycemia
 - IV fluids and insulin given immediately before during and after surg when there is no oral intake
 - Surg or radiologic procedure that involve the use of a contrast medium
 - Hold metformin for procedure and 48hrs after

Diabetes
Sick Day Guidelines

- Monitor BG every 4 hours Call provider if >240mg/dl.
- Never omit medication or insulin
- Continue to take usual insulin dose or OHA
- Continue with regular meal plan
 - Substitute easily digested liquids or soft foods if solid not tolerated
- Call provider if unable to eat for more than 24hr or if vomiting/diarrhea last longer than 6hrs
- Test for ketones every 3-4 hours
 - Pt should report moderate to large ketone levels to provider
- Increase intake non caloric fluids such as broth water diet gelatin & other decaf beverages

Diabetes

Gerontologic Considerations

- Recognize limitations in physical activity, manual dexterity and visual acuity
- Education based on individual's needs, using slower pace

Diabetes

Gerontologic Considerations

- Prevalence increases with age
- Hypoglycemia unawareness is more common
- Presence of delayed psychomotor function could interfere with treating hypoglycemia
- Must consider patient's own desire for treatment and coexisting medical problems
