Chapter 50

Care of the Patient with an Endocrine Disorder

Endocrine Glands and Hormones

- Pituitary gland
  - Anterior pituitary gland (adenohypophysis)
  - Posterior pituitary (neurohypophysis)
- Thyroid gland—responsible for growth, development, and metabolism
- Parathyroid glands—active in maintenance of calcium balance

Endocrine Glands and Hormones cont’d

- Adrenal glands
  - Adrenal cortex—releases mineralocorticoids, glucocorticoids, and sex hormones
  - Adrenal medulla—releases epinephrine and norepinephrine
- Pancreas—serves many functions, but is mainly known for insulin production
  - Is also responsible for the production of glucagon
Endocrine Glands and Hormones cont’d

- Female sex glands
  - Ovaries
    - Produce estrogen and progesterone
    - The placenta is a temporary endocrine gland
- Male sex glands
  - Testes
    - Produce testosterone

Endocrine Glands and Hormones cont’d

- Thymus gland—plays an integral role in immune function
- Pineal glands—secrete melatonin

Negative Feedback

- Information is constantly being exchanged between the target organs and the pituitary gland
- The amount of hormonal release is controlled by feedback
- Negative feedback means that an increase in the expected activity will lead to a decrease in the release of the hormone causing that effect
Effects of Hormones on Target Organs

- **Anterior pituitary gland**
  - Prolactin causes the mammary glands to produce milk

- **Posterior pituitary gland**
  - Oxytocin promotes the release of milk and stimulates uterine contractions during labor
  - Antidiuretic hormone (ADH) causes the kidneys to conserve water by decreasing the amount of urine produced.

- **Thyroid gland**
  - T3 and T4 serve to promote growth and development, maintain metabolism, and are involved in nervous function
  - Thyroid-stimulating hormone (TSH, secreted by the pituitary gland) controls the release of these two hormones
  - Calcitonin decreases calcium level by causing calcium to be stored in the bones

Effects of the Hormones on Target Organs cont’d

- **Parathyroid glands**
  - Parathyroid hormone (PTH) serves as an antagonist to calcitonin
  - PTH tends to increase calcium concentration in the blood
  - PTH also regulates the amount of phosphorus in the blood

Effects of the Hormones on Target Organs cont’d

- **Adrenal cortex**
  - Mineralocorticoids—"Salt"—primarily involved in water and electrolyte balance, which indirectly manages blood pressure
  - Glucocorticoids—"Sugar"—involved in glucose metabolism
  - Sex hormones—"Sex"—control male and female sex characteristics

- **Adrenal medulla**
  - Epinephrine
  - Norepinephrine
Effects of the Hormones on Target Organs cont’d

- Pancreas
  - Insulin—acts as the “key” that allows sugar into the cell
  - Glucagon—acts as the “key” to allow sugar back out of the cell

- Thymus gland
  - Thymosin plays an active role in immune development

- Pineal gland
  - Thought to affect mood and sleep

Hypothalamus

- Produces the hormones of the posterior pituitary

Acromegaly

- Caused by an overproduction of growth hormone
- Usually begins in the third to fourth decade of life
- Characterized by bulging forehead, bulbous nose, thick lips, and coarse facial features
- Patient’s ability to maintain normal body function and maintain quality of life should be closely assessed
- Diagnosis is based largely on medical history
- Treatment includes dopamine agonists, somatostatin analogs, and surgery
Gigantism

- Overproduction of growth hormone before close of growth plates
- Leads to great height and size
- Assessment is aimed at early detection
- Treatment usually involves medication or surgery

Dwarfism

- Hypopituitary dwarfism is caused by growth hormone deficiency
- Assessment is aimed at early detection
- Diagnostic exams include CT scan and MRI
- Medical management involves replacement of growth hormone
- Nursing interventions are aimed at early detection

Diabetes Insipidus

- Disorder of the posterior pituitary in which ADH is deficient
- A decrease in ADH results in electrolyte and fluid imbalances
- Diabetes insipidus is characterized by significant polyuria and intense polydipsia
- Patients with diabetes insipidus may have a urinary output exceeding 5-20 L per 24 hours
- The patient is weak, tired, and lethargic
- Specific gravity is altered and skin turgor is poor
Diabetes Insipidus cont’d
- Diagnosed with urine spectrometry and lab values, along with a careful history
- Medical management focuses on treatment ADH deficiency
- Nursing interventions are aimed at protecting the patient from injury
- Patient should be weighed daily and I&O should be monitored closely
- Encourage oral intake of fluids

Syndrome of Inappropriate Antidiuretic Hormone
- Syndrome of inappropriate ADH (SIADH) occurs when the pituitary gland releases too much ADH
- As a result, excess water is reabsorbed by the kidneys
- Characterized by hyponatremia, hemodilution, and fluid overload
- Signs and symptoms include nausea, vomiting, irritability, confusion, tremors, seizures, stupor, and coma
- Diagnosed through urine spectrometry and lab values, with careful history
- Treatment includes strict fluid restriction

SIADH cont’d
- Patient may be limited to as little as 500 mL of fluid per day
- Treatment is aimed at resolving underlying conditions
- Nursing interventions are aimed at fluid restriction and electrolyte replacement
- I&O should be closely monitored
Disorders of the Thyroid Gland

- Hyperthyroidism
- Hypothyroidism
- Thyroid cancer
- Goiter

Hyperthyroidism

- Also called Graves’ disease
- Results in an increased production of T₃ and T₄, which leads to exaggerated metabolic processes
- Symptoms include weight loss, nervousness, insomnia, shortness of breath
- Objective data includes VS changes, increased BP, tachycardia, hair becomes fine and brittle, diarrhea
- T₃ and T₄ levels are measured to diagnose

Hyperthyroidism cont’d

- Ablation therapy using radioactive iodine is the gold standard for treating hyperthyroidism
- Treated medically with propylthiouracil or Tapazole
- Surgery may also be used to treat
- Nursing interventions include
  - Diet therapy
  - Increase vitamin intake
  - Teaching foods that aid in easing the burden of Graves’ disease
  - Provide preoperative and postoperative care
Thyroidectomy

- Removal of the thyroid
- Postoperatively, the nurse should
  - Monitor the airway
  - Monitor carpopedal spasms, Chvostek’s sign, and Trousseau’s sign
  - Monitor for thyroid storm

Signs of Hypocalcemia

- As a result of thyroidectomy, one or more parathyroid glands may be inadvertently removed
- This can result in hypocalcemia
- Signs of hypocalcemia include
  - Carpopedal spasms—muscle spasms of the wrist and feet
  - Chvostek’s sign
  - Trousseau’s sign

Hypothyroidism

- A state that occurs when the thyroid fails to secrete sufficient hormones
- Signs and symptoms include weight gain, fluid gain, mood swings, infertility, depression
- Diagnosed by assessing TSH, T3, T4, and FT4 levels
- Medical management is aimed at replacing thyroid hormones
- Nursing interventions are aimed at keeping the patient comfortable and preventing complications
Simple Goiter

- Enlarged thyroid gland
- Characterized by overt thyroid dysfunction
- Symptoms include dysphagia, hoarseness, and dyspnea
- Objective data includes increased goiter size, voice changes, decreased food intake
- Diagnosis is made through lab values of T<sub>3</sub>, T<sub>4</sub>, and TSH
- Medical management is aimed at replacing iodine
- Nursing interventions are aimed at patient teaching and postoperative care for the patient who undergoes thyroidectomy

Cancer of the Thyroid

- Relatively rare malignancy
- Affects about 25 per 1,000,000 people
- Risk factors include diets low in iodine, women in their 40s and 50s, and radiation exposure
- Characterized by a firm, fixed, small, rounded, painless mass or nodule that is felt over the thyroid gland
- Diagnosed when a thyroid scan shows a "cold" nodule
- Treatment is usually a total thyroidectomy

Hyperparathyroidism

- Overactivity of the parathyroid glands, which increases production of PTH
- The primary clinical manifestation is hypercalcemia
- Assessment findings include skeletal pain, fatigue, weakness, drowsiness, pathologic fractures, dysrhythmias
- Assessed via radiography, lab levels, and history
- Usually treated via surgical intervention
- Nursing interventions are aimed at restoring and maintaining fluid and electrolyte balance
Hypoparathyroidism cont’d

- Occurs when PTH is decreased
- Characterized by a decreased serum calcium level and increased serum phosphorus level
- May be characterized by
  - Laryngeal stridor
  - Muscle spasms
  - Chvostek’s sign
  - Hypocalcemic tetany

Diagnosis is made by assessing laboratory calcium, PTH, and phosphorus levels
- Medical management is aimed at replacing calcium
- Vitamin D is also given orally
- Patient should be provided education about eating foods that are high in calcium

Cushing’s Syndrome
(Adrenal Hyperfunction)

- Caused by increased corticosteroids, especially glucocorticoids
- Signs and symptoms include
  - Weight gain
  - Accumulation of adipose tissue in the trunk, face, and cervical spine
  - Hypokalemia
  - Hyperglycemia
Addison’s Disease (Adrenal Hypofunction)

- Most commonly caused by an autoimmune response
- The patient should be assessed for weakness, vertigo, syncope, and postural hypotension
- The patient also usually experiences weight loss, vomiting, and diarrhea
- Medical therapy is aimed at replacing steroids, usually with hydrocortisone
- Nursing interventions are aimed at improving circulatory status, maintaining accurate I&O, and daily weights

Diabetes Mellitus (DM)

- DM Type I: Most commonly referred to as insulin-dependent diabetes
- DM Type II: More commonly linked to sedentary lifestyle and lack of activity
- Insulin sensitivity may be decreased, the patient may not produce enough insulin, or a combination of both

Prediabetes

- 1/3 of 29 million Americans with type 2 diabetes have no idea they have this disease
- Even more people, 86 million, have a condition called “prediabetes”
  - Blood sugar higher than normal, but not at threshold for diabetes diagnosis
  - They will likely develop diabetes within 10 years
- Victoria Dolby Toews, MPH Taste for Life article Nov. 2015
**Prediabetes recommendations**

- Get tested
  - FBS btw 100-125 ml/dl
  - Hba1C btw 5.7 - 6.9%
- Vit. D
  - 1000-4000 units/day
  - up to 5000 units/day
- Omega 3 FA
  - 500mg/daily EPA & DHA
  - fish, flax seed
- Pycnogenol
  - French maritime pine bark
  - Action similar to Acarbose
  - 190% more potent
- Chromium
  - Makes glucose tolerance factor
  - Improves action of insulin
  - Broccoli, oats, barley, tomatoes
- Silymarin (milk thistle herb)
  - 15-20% decrease in BS
  - 200 mg 3x day
- Curcumin (tumeric extract)
  - 750-1500 mg daily
- ALA: Alpha Lipolic Acid
  - Europe – to DM nerve dz
  - Antioxidant
  - 200-400 mg daily

Always consult your primary care provider for medical advice.

**Statin drugs and DM ?**

- A study of more than 6000 people in the military health care system, Tricare:
  - those taking statin drugs to lower cholesterol were 87% more likely to develop diabetes
  - and 250% more likely to have diabetes complications.
- At the beginning of the study, this group had no heart disease, diabetes or other severe chronic disease


**Signs and Symptoms of DM**

- DM is characterized by three cardinal signs and symptoms
  - Polydipsia
  - Polyphagia
  - Polyuria
Assessment of the Patient with DM

- Subjective data
  - The three Ps
  - Nocturia
  - Weakness
  - Fatigue
  - Blurred vision

- Objective data
  - Slow wound healing
  - Hyperglycemia
  - Weight loss
  - Muscle wasting

Diagnostic Exams for DM

- Any random blood glucose greater than 200
- Fasting blood glucose greater than 126
- Elevated results on an oral glucose tolerance test (OGTT)
Treatment Triad for DM

- Diet
  - Limit refined sugars
- Exercise:
  - Daily exercise helps body use up sugar, improves circulation
- Medications: oral glycemics
- Supplements:
  - Vitamin D boosts body’s production of insulin while improving the cells response to insulin

Nursing Interventions and Patient Teaching

- Nursing interventions and patient teaching are aimed at
  - Diet education
  - Exercise education
  - Medication for dosage, type, route

Hyperglycemia

- Condition of elevated blood glucose associated with DM
- Fasting blood glucose >126
- Random blood glucose >200
Hypoglycemia

- Blood glucose level less than normal
- Caused by administration of excessive insulin, excessive secretion of insulin, or dietary deficiency
- Signs and symptoms include faintness, hunger, excessive perspiration, irritability, trembling
- Treatment is aimed at replacing glucose in the body by
  - Oral intake
  - IV intake
  - IM injection
Diabetic Ketoacidosis

- Associated with type I DM
- Caused by lack of insulin and/or increased sugar intake
- Onset is hours to days
- Patient is hot, dry, and flushed and has fruity breath – acetone breath
- Kussmaul’s respirations:
  - abnormal deep, rapid, sighing
- Treated with insulin and limited intake

Hyperglycemic Hyperosmolar Nonketotic Coma

- Caused by inadequate insulin or oral hypoglycemic intake
- Onset is days
- Usually occurs in type 2 diabetes
- Patient is hot and dry
- Characterized by lethargy and decreased LOC
- Treatment includes large amounts of IV fluid and insulin
DM Triad of Treatment

- Diet
- Exercise
- Nutrition

Diet

- Low concentrated sweets
- Moderate carbs
- Low fat
- High protein
- Small meals with frequent snacks

Exercise

- Improves insulin sensitivity
- Improves insulin production
- Improves cardiovascular health
Medications

- Insulin
- Oral hypoglycemic agents

- See pages 544-545
- Tables 11-7 & 11-8

Oral Hypoglycemic Agents

- Sulfonylureas, Meglitinide, and thiazolidinediones improve insulin production and increase insulin sensitivity
- Biguanides decrease hepatic glucose production and increase insulin sensitivity
- Alpha-glucosidase inhibitors delay carbohydrate absorption

Insulin

- Rapid- or short-acting has a short onset and peak of action
- Mixed is a combination of short-acting and long-acting
- Intermediate acting generally has an onset of about 30 minutes and a 6-12 hour effect
- Long-acting has a long duration
Insulin Administration

Preparation of Insulin

- Wash hands
- Assemble equipment
- Turn insulin vial in hands
- Clean rubber stopper with alcohol
- Insert air into vial
- Withdraw insulin
- Inspect for air bubbles

Two Insulins

- Following procedure described earlier.
  - First withdraw regular insulin
  - Then withdraw longer-acting insulin
- Box 11-3 & 11-4
- Pgs. 534 - 536

Insulin Injection

- Don gloves
- Clean injection site
- Quickly insert needle in subcutaneous tissue
- Inject insulin slowly
- Dispose of syringe appropriately
Short-Term DM Complications

- Hypoglycemia
- HHNC: hyperglycemic hyperosmolar nonketotic coma
- DKA: diabetic ketoacidosis

Long-Term DM Complications

- Blindness
- Kidney disease
- Heart disease
- Poor circulation