CHAPTER 46

Endocrine Problems

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Priority Concepts

Glucose Regulation; Hormonal Regulation

I. Anatomy and Physiology of Endocrine Glands (Box 46-1)
- A. Functions
  1. Maintenance and regulation of vital functions
  2. Response to stress and injury
  3. Growth and development
  4. Energy metabolism
  5. Reproduction
  6. Fluid, electrolyte, and acid-base balance
- B. Risk factors for endocrine problems (Box 46-2)
- C. Hypothalamus (Box 46-3)
  1. Portion of the diencephalon of the brain, forming the floor and part of the lateral wall of the third ventricle
  2. Activates, controls, and integrates the peripheral autonomic nervous system, endocrine processes, and many somatic functions, such as body temperature, sleep, and appetite
- D. Pituitary gland (Box 46-4; Fig. 46-1)
  1. The master gland; located at the base of the brain
  2. Influenced by the hypothalamus; directly affects the function of the other endocrine glands
  3. Promotes growth of body tissue, influences water absorption by the kidney, and controls sexual development and function
- E. Adrenal gland
  1. One adrenal gland is on top of each kidney.
  2. Regulates sodium and electrolyte balance; affects carbohydrate, fat, and protein metabolism; influences the development of sexual characteristics; and sustains the fight-or-flight response
  3. Adrenal cortex
     a. The cortex is the outer shell of the adrenal gland.
     b. The cortex synthesizes glucocorticoids and mineralocorticoids and secretes

small amounts of sex hormones (androgens, estrogens; Box 46-5)

4. Adrenal medulla
    a. The medulla is the inner core of the adrenal gland.
    b. The medulla works as part of the sympathetic nervous system and produces epinephrine and norepinephrine.

F. Thyroid gland
1. Located in the anterior part of the neck
2. Controls the rate of body metabolism and growth and produces thyroxine (T_4), triiodothyronine (T_3), and thyrocalcitonin

G. Parathyroid glands
1. Located on the thyroid gland
2. Controls calcium and phosphorus metabolism; produces parathyroid hormone

H. Pancreas
1. Located posteriorly to the stomach
2. Influences carbohydrate metabolism, indirectly influences fat and protein metabolism, and produces insulin and glucagon

I. Ovaries and testes
1. The ovaries are located in the pelvic cavity and produce estrogen and progesterone.
2. The testes are located in the scrotum, control the development of the secondary sex characteristics, and produce testosterone.

J. Negative-feedback loop
1. Regulates hormone secretion by the hypothalamus and pituitary gland
2. Increased amounts of target gland hormones in the bloodstream decrease secretion of the same hormone and other hormones that stimulate its release.

II. Diagnostic Tests

A. Stimulation and suppression tests
1. Stimulation tests
    a. In the client with suspected underactivity of an endocrine gland, a stimulus may be provided to determine whether the gland is capable of normal hormone production.
    b. Measured amounts of selected hormones or substances are administered to stimulate the target gland to produce its hormone.

c. Hormone levels produced by the target gland are measured.
d. Failure of the hormone level to increase with stimulation indicates hypofunction.

2. Suppression tests
   a. Suppression tests are used when hormone levels are high or in the upper range of normal.
   b. Agents that normally induce a suppressed response are administered to determine whether normal negative feedback is intact.
   c. Failure of hormone production to be suppressed during standardized testing indicates hyperfunction.
3. Overnight dexamethasone suppression test
   a. Used to distinguish between Cushing's syndrome and Cushing's disease.
   b. In Cushing's disease the source of excess cortisol is the pituitary gland rather than the adrenal cortex or exogenous corticosteroid administration.
   c. Dexamethasone, a potent long-acting corticosteroid given at bedtime, should suppress the morning cortisol in clients without Cushing's disease by suppressing adrenocorticotropic hormone (ACTH) production; in the client with Cushing's disease, this suppression will not occur.

B. Radioactive iodine uptake
1. This thyroid function test measures the absorption of an iodine isotope to determine how the thyroid gland is functioning.
2. A small dose of radioactive iodine is given by mouth or intravenously; the amount of radioactivity is measured in 2 to 4 hours and again at 24 hours.
3. Normal values are approximately 3% to 10% at 2 to 4 hours, and 5% to 30% in 24 hours.
4. Elevated values indicate **hyperthyroidism**, decreased iodine intake, or increased iodine excretion.
5. Decreased values indicate a low T_4 level, the use of antithyroid medications, thyroiditis, myxedema, or **hypothyroidism**.
6. The test is contraindicated in pregnancy.

C. T_3 and T_4 resin uptake test

1. Blood tests are used to diagnose thyroid disorders.
2. T_3 and T_4 regulate thyroid-stimulating hormone.
3. Normal values (normal findings vary between laboratory settings)
    a. Triiodothyronine, total T_3: 110.4 to 337.7 ng/dL (1.7 to 5.2 pmol/L)
    b. Thyroxine, total T_4: 5 to 12 mcg/dL (64 to 154 nmol/L)
    c. Thyroxine, free (FT_4): 0.8 to 2.8 ng/dL (10 to 36 pmol/L)
4. The T_4 level is elevated in hyperthyroidism and decreased in hypothyroidism.

D. Thyroid-stimulating hormone

1. Blood test is used to differentiate the diagnosis of primary hypothyroidism.
2. Normal value is 2 to 10 mclU/mL (2 to 10 mlU/L).
3. Elevated values indicate primary hypothyroidism.
4. Decreased values indicate hyperthyroidism or secondary hypothyroidism.

E. Thyroid scan

1. A thyroid scan is performed to identify nodules or growths in the thyroid gland.
2. A radioisotope of iodine or technetium is administered before scanning the thyroid gland.
3. Reassure the client that the level of radioactive medication is not dangerous to self or others.
4. Determine whether the client has received radiographic contrast agents within the past 3 months, because these may invalidate the scan.
5. Check with the primary health care provider (PHCP) regarding discontinuing medications containing iodine for 14 days before the test and the need to discontinue thyroid medication before the test.
6. Instruct the client to maintain NPO (nothing by mouth) status after midnight on the day before the test; if iodine is used, the client will fast for an additional 45 minutes after ingestion of the oral isotope and the scan will be performed in 24 hours.
7. If technetium is used, it is administered by the intravenous (IV) route 30 minutes before the scan.

8. The test is contraindicated in pregnancy.

F. Needle aspiration of thyroid tissue

1. Aspiration of thyroid tissue is done for cytological examination.
2. No client preparation is necessary; NPO status may or may not be prescribed.
3. Light pressure is applied to the aspiration site after the procedure.

G. Glycosylated hemoglobin

1. HgbA1c is blood glucose bound to hemoglobin.
2. **Hemoglobin A1c** (glycosylated hemoglobin A; HbA1c) is a reflection of how well blood glucose levels have been controlled for the past 3 to 4 months.
3. **Hyperglycemia** in clients with diabetes is usually a cause of an increase in HbA1c.
4. Fasting is not required before the test.
5. Normal reference intervals: <6% (adult without diabetes)
6. HgbA1c and estimated average glucose (eAG) reference intervals: Refer to Table 10-4 for these reference intervals.

Poor glycemic control in a client with diabetes mellitus is usually the cause of an increase in the HbA1c value.

H. 24-hour urine collection for vanillylmandelic acid (VMA)

1. Diagnostic tests for pheochromocytoma include a 24-hour urine collection for VMA, a product of catecholamine metabolism, metanephrine, and catecholamines, all of which are elevated in the presence of pheochromocytoma.
2. The normal range of urinary catecholamines:
    a. Epinephrine: less than 20 mcg/day (less than 109 nmol/day)
    b. Norepinephrine: less than 100 mcg/day (less than 590 nmol/day)

III. Pituitary Gland Problems (Box 46-6)

A. Hypopituitarism

1. Description: Hyposecretion of 1 or more of the pituitary hormones caused by tumors, trauma, encephalitis, autoimmunity, or stroke
2. Hormones most often affected are growth hormone (GH) and gonadotropic hormones (luteinizing hormone, follicle-stimulating hormone), but thyroid-stimulating hormone (TSH), adrenocorticotropic

hormone (ACTH), or antidiuretic hormone (ADH) may be involved.

3. Assessment

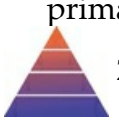
a. Mild to moderate obesity (GH, TSH)
b. Reduced cardiac output (GH, ADH)
c. Infertility, sexual dysfunction (gonadotropins, ACTH)
d. Fatigue, low blood pressure (TSH, ADH, ACTH, GH)
e. Tumors of the pituitary also may cause headaches and visual defects (the pituitary is located near the optic nerve).

4. Interventions

a. Client may need hormone replacement for the specific deficient hormones.
b. Provide emotional support to the client and family.
c. Encourage the client and family to express feelings related to disturbed body image or sexual dysfunction.
d. Client education is needed regarding the signs and symptoms of hypofunction and hyperfunction related to insufficient or excess hormone replacement.

B. Hyperpituitarism (acromegaly)

1. Description: Hypersecretion of growth hormone by the anterior pituitary gland in an adult; caused primarily by pituitary tumors



2. Assessment

a. Large hands and feet
b. Thickening and protrusion of the jaw
c. Arthritic changes and joint pain, impingement syndromes
d. Visual disturbances
e. Diaphoresis
f. Oily, rough skin
g. Organomegaly
h. Hypertension, atherosclerosis, cardiomegaly, heart failure
i. Dysphagia
j. Deepening of the voice
k. Thickening of the tongue, narrowing of

the airway, sleep apnea

l. Hyperglycemia

m. Colon polyps, increased colon cancer risk

3. Interventions

a. Provide pharmacological interventions to suppress GH or to block the action of GH

b. Prepare the client for radiation of the pituitary gland or for stereotactic radiosurgery if prescribed.

c. Prepare the client for hypophysectomy if planned.

d. Provide pharmacological and nonpharmacological interventions for joint pain.

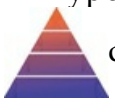
e. Provide emotional support to the client and family, and encourage the client and family to express feelings related to disturbed body image.

C. Hypophysectomy (pituitary adenectomy, sublabial transsphenoidal pituitary surgery)

1. Description

a. Removal of a pituitary tumor via craniotomy or a sublabial transsphenoidal (endoscopic transnasal) approach (the latter approach is preferred because it is associated with fewer complications)

b. Complications for craniotomy include increased intracranial pressure, bleeding, meningitis, and hypopituitarism.



c. Complications for the sublabial transsphenoidal surgery include cerebrospinal fluid leak, infection, diabetes insipidus, and hypopituitarism.

d. If the sublabial approach is used, an incision is made along the gum line of the inner upper lip.

2. Postoperative interventions

a. Initial postoperative care is similar to craniotomy care (see Chapter 58).

b. Monitor vital signs, neurological status, and level of consciousness.
c. Elevate the head of the bed.
d. Monitor for increased intracranial pressure.
e. Instruct the client to avoid sneezing, coughing, and blowing the nose.
f. Monitor for bleeding.
g. Monitor for and report signs of temporary **diabetes insipidus**; monitor intake and output, and report excessive urinary output.
h. If the entire pituitary is removed, clients will require lifelong replacement of ADH, cortisol, and thyroid hormone.
i. Monitor for and report signs of infection and meningitis.
j. Administer antibiotics, analgesics, and antipyretics as prescribed.
k. Administer oral mouth rinses as prescribed. Clients may be instructed to avoid using a toothbrush or to brush teeth gently with an ultrasoft toothbrush for 10 days to 2 weeks after surgery.
l. Instruct the client in the administration of prescribed medications.

Following transsphenoidal hypophysectomy, monitor for and report postnasal drip or clear nasal drainage, which might indicate a cerebrospinal fluid leak. Clear drainage should be checked for glucose.

D. Diabetes insipidus

1. Description

a. Hyposecretion of ADH by the posterior pituitary gland caused by stroke, trauma, or surgery, or it may be idiopathic
b. Kidney tubules fail to reabsorb water.
c. In central diabetes insipidus there is decreased ADH production.
d. In nephrogenic diabetes insipidus, ADH production is adequate, but the kidneys do not respond appropriately

to the ADH.

2. Assessment

a. Excretion of large amounts of dilute urine
b. Polydipsia
c. Dehydration (decreased skin turgor and dry mucous membranes)
d. Inability to concentrate urine
e. Low urinary specific gravity; normal is 1.010 to 1.025 (1.005 to 1.030)
f. Fatigue
g. Muscle pain and weakness
h. Headache
i. Postural hypotension that may progress to vascular collapse without rehydration
j. Tachycardia

3. Interventions

a. Monitor vital signs and neurological and cardiovascular status.
b. Provide a safe environment, particularly for the client with postural hypotension.
c. Monitor electrolyte values and for signs of dehydration.
d. Maintain client intake of adequate fluids; IV hypotonic saline may be prescribed to replace urinary losses.
e. Monitor intake and output, weight, serum osmolality, and specific gravity of urine for excessive urinary output, weight loss, and low urinary specific gravity.
f. Instruct the client to avoid foods or liquids that produce diuresis.
g. Vasopressin or desmopressin acetate may be prescribed; these are used when the ADH deficiency is severe or chronic.
h. Instruct the client in the administration of medications as prescribed; desmopressin acetate may be administered by subcutaneous injection, intravenously, intranasally, or orally; watch for signs of water

intoxication indicating overtreatment.

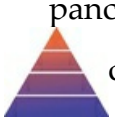
i. Instruct the client to wear a MedicAlert bracelet.

E. **Syndrome of inappropriate antidiuretic hormone secretion (SIADH)**

1. Description

a. Condition of hyperfunctioning of the posterior pituitary gland in which excess ADH is released, but not in response to the body's need for it

b. Causes include trauma, stroke, malignancies (often in the lungs or pancreas), medications, and stress.



c. The syndrome results in increased intravascular volume, water intoxication, and dilutional hyponatremia.

d. May cause cerebral edema, and the client is at risk for seizures.

2. Assessment

a. Signs of fluid volume overload

b. Changes in level of consciousness and mental status changes

c. Weight gain without edema

d. Hypertension

e. Tachycardia

f. Anorexia, nausea, and vomiting

g. Hyponatremia

h. Low urinary output and concentrated urine

3. Interventions

a. Monitor vital signs and cardiac and neurological status.

b. Provide a safe environment, particularly for the client with changes in level of consciousness or mental status.

c. Monitor for signs of increased intracranial pressure.

d. Implement seizure precautions.

e. Elevate the head of the bed a maximum of 10 degrees to promote venous return and decrease baroreceptor-induced ADH release.

f. Monitor intake and output and obtain weight daily.
g. Monitor fluid and electrolyte balance.
h. Monitor serum and urine osmolality.
i. Restrict fluid intake as prescribed.
j. Administer IV fluids (usually normal saline [NS] or hypertonic saline) as prescribed; monitor IV fluids carefully because of the risk for fluid volume overload.
k. Loop diuretics may be prescribed to promote diuresis, but only if serum sodium is at least 125 mEq/L (125 mmol/L); potassium replacement may be necessary if loop diuretics are prescribed.
l. Vasopressin antagonists may be prescribed to decrease the renal response to ADH.

IV. Adrenal Gland Problems (Box 46-7)

A. Adrenal cortex insufficiency (Addison's disease)

1. Primary adrenal insufficiency

a. Also known as **Addison's disease,** refers to hyposecretion of adrenal cortex hormones (glucocorticoids, mineralocorticoids, and androgen); autoimmune destruction is a common cause.
b. Requires lifelong replacement of glucocorticoids and possibly of mineralocorticoids if significant hyposecretion occurs; the condition is fatal if left untreated.

2. Secondary adrenal insufficiency is caused by hyposecretion of ACTH from the anterior pituitary gland; mineralocorticoid release is spared.
3. Loss of glucocorticoids in Addison's disease leads to decreased vascular tone, decreased vascular response to the catecholamines epinephrine and norepinephrine, and decreased gluconeogenesis.
4. In Addison's disease, loss of the mineralocorticoid aldosterone leads to dehydration, hypotension, hyponatremia, and hyperkalemia.

5. Assessment (Table 46-1)

6. Interventions

a. Monitor vital signs (particularly for hypotension), for weight loss, and intake and output.
b. Monitor white blood cell (WBC) count; blood glucose; and potassium, sodium, and calcium levels.
c. Administer glucocorticoid and/or mineralocorticoid medications as prescribed.
d. Observe for addisonian crisis caused by stress, infection, trauma, or surgery.

7. Client education

a. Need for lifelong glucocorticoid replacement and possibly lifelong mineralocorticoid replacement.
b. Corticosteroid replacement will need to be increased during times of stress.
c. Avoid individuals with an infection.
d. Avoid strenuous exercise and stressful situations.
e. Avoid over-the-counter medications.
f. Diet should be high in protein and carbohydrates; clients taking glucocorticoids should be prescribed calcium and vitamin D supplements to maintain normal levels and to protect against corticosteroid-induced osteoporosis; some clients taking mineralocorticoids may be prescribed a diet high in sodium.
g. Wear a MedicAlert bracelet.
h. Report signs and symptoms of complications, such as underreplacement and overreplacement of corticosteroid hormones.

B. Addisonian crisis
1. Description (Box 46-8)
2. Assessment
a. Severe headache
b. Severe abdominal, leg, and lower back pain
c. Generalized weakness
d. Irritability and confusion
e. Severe hypotension
f. Shock
3. Interventions

a. Prepare to administer glucocorticoids intravenously as prescribed.
b. Administer IV fluids as prescribed to replace fluids and restore electrolyte balance.
c. Following resolution of the crisis, administer glucocorticoid and mineralocorticoid orally as prescribed.
d. Monitor vital signs, particularly blood pressure.
e. Monitor neurological status, noting irritability and confusion.
f. Monitor intake and output.
g. Monitor laboratory values, particularly sodium, potassium, and blood glucose levels.
h. Protect the client from infection.
i. Maintain bed rest and provide a quiet environment.

Clients taking exogenous corticosteroids must establish a plan with their PHCPs or endocrinologist for increasing their corticosteroids during times of stress.

C. Cushing's syndrome and Cushing's disease (hypercortisolism)

1. Cushing's syndrome
   a. A metabolic disorder resulting from the chronic and excessive production of cortisol by the adrenal cortex or from the administration of glucocorticoids in large doses for several weeks or longer (exogenous or iatrogenic).
   b. ACTH secreting tumors (most often of the lung, pancreas, or gastrointestinal [GI] tract) can cause Cushing's syndrome.
2. **Cushing's disease** is a metabolic disorder characterized by abnormally increased secretion (endogenous) of cortisol, caused by increased amounts of ACTH secreted by the pituitary gland.

3. Assessment (Fig. 46-2; see Table 46-1)

4. Interventions

a. Monitor vital signs, particularly blood pressure.
b. Monitor intake and output and weight.
c. Monitor laboratory values, particularly WBC count and serum glucose, sodium, potassium, and calcium levels.
d. Prepare the client for radiation as prescribed if the condition results from a pituitary adenoma.
e. Administer chemotherapeutic agents as prescribed for inoperable adrenal tumors.
f. Prepare the client for removal of the pituitary tumor (hypophysectomy, sublabial transsphenoidal adenectomy) if the condition results from increased pituitary secretion of ACTH.
g. Prepare the client for **adrenalectomy** if the condition results from an adrenal adenoma; glucocorticoid replacement may be required following adrenalectomy.
h. Clients requiring lifelong glucocorticoid replacement following adrenalectomy should obtain instructions from their PHCPs about increasing their glucocorticoid during times of stress.
i. Assess for and protect against postoperative thrombus formation; Cushing's syndrome predisposes to thromboemboli.
j. Allow the client to discuss feelings related to body appearance.
k. Instruct the client about the need to wear a MedicAlert bracelet.

Addison's disease is characterized by the hyposecretion of adrenal cortex hormones, whereas Cushing's syndrome and Cushing's disease are characterized by a hypersecretion of glucocorticoids.

D. Primary hyperaldosteronism (Conn's syndrome)
1. Description
a. Hypersecretion of mineralocorticoids (aldosterone) from the adrenal cortex of the adrenal gland
b. Most commonly caused by an adenoma

c. Excess secretion of aldosterone causes sodium and water retention and potassium excretion, leading to hypertension and hypokalemic alkalosis.

2. Assessment

a. Symptoms related to hypokalemia, hypernatremia, and hypertension
b. Headache, fatigue, muscle weakness
c. Cardiac dysrhythmias
d. Paresthesias, tetany
e. Visual changes
f. Glucose intolerance
g. Elevated serum aldosterone levels

3. Interventions

a. Monitor vital signs, particularly blood pressure.
b. Monitor potassium and sodium levels.
c. Monitor intake and output and urine for specific gravity.
d. Monitor for hyperkalemia, particularly for clients with impaired renal function or excessive potassium intake, because potassium-retaining diuretics and aldosterone antagonists may be prescribed to promote fluid balance and control hypertension.
e. Administer potassium supplements as prescribed to treat hypokalemia; clients taking potassium-retaining diuretics and potassium supplementation are at risk for hyperkalemia.
f. Prepare the client for adrenalectomy.
g. Maintain sodium restriction, if prescribed, preoperatively.
h. Administer glucocorticoids preoperatively, as prescribed, to prevent adrenal hypofunction and prepare for stress of surgery.
i. Monitor the client for adrenal insufficiency postoperatively.
j. Instruct the client regarding the need for glucocorticoid therapy following adrenalectomy.
k. Instruct the client about the need to wear a MedicAlert bracelet.

E. Pheochromocytoma

1. Description

a. Catecholamine-producing tumor usually found in the adrenal medulla, but extraadrenal locations include the chest, bladder, abdomen, and brain; typically is a benign tumor but can be malignant
b. Excessive amounts of epinephrine and norepinephrine are secreted.
c. Diagnostic test includes a 24-hour urine collection for VMA.
d. Surgical removal of the adrenal gland is the primary treatment.
e. Symptomatic treatment is initiated if surgical removal is not possible.
f. The complications associated with pheochromocytoma include hypertensive crisis; hypertensive retinopathy and nephropathy, cardiac enlargement, and dysrhythmias; heart failure; myocardial infarction; increased platelet aggregation; and stroke.
g. Death can occur from shock, stroke, renal failure, dysrhythmias, or dissecting aortic aneurysm.

2. Assessment

a. Paroxysmal or sustained hypertension
b. Severe headaches
c. Palpitations
d. Flushing and profuse diaphoresis
e. Pain in the chest or abdomen with nausea and vomiting
f. Heat intolerance
g. Weight loss
h. Tremors
i. Hyperglycemia

3. Interventions

a. Monitor vital signs, particularly blood pressure and heart rate.
b. Monitor for hypertensive crisis; monitor for complications that can occur with hypertensive crisis, such as stroke, cardiac dysrhythmias, and myocardial

infarction.

c. Instruct the client not to smoke, drink caffeine-containing beverages, or change position suddenly.

d. Prepare to administer α-adrenergic blocking agents and β-adrenergic blocking agents as prescribed to control hypertension. α-Adrenergic blocking agents are started 7 to 10 days before β-adrenergic blocking agents.

e. Monitor serum glucose level.

f. Promote rest and a nonstressful environment.

g. Provide a diet high in calories, vitamins, and minerals.

h. Prepare the client for adrenalectomy.

For the client with pheochromocytoma, avoid stimuli that can precipitate a hypertensive crisis, such as increased abdominal pressure and vigorous abdominal palpation.

F. Adrenalectomy

1. Description (Box 46-9)
2. Preoperative interventions
   a. Monitor electrolyte levels and correct electrolyte imbalances.
   b. Assess for dysrhythmias.
   c. Monitor for hyperglycemia.
   d. Protect the client from infections.
   e. Administer glucocorticoids as prescribed.
3. Postoperative interventions
   a. Monitor vital signs.

   b. Monitor intake and output; if the urinary output is lower than 30 mL/hr, notify the PHCP or nephrologist, because this may result in acute kidney injury and indicate impending shock.
   c. Monitor weight daily.
   d. Monitor electrolyte and serum glucose levels.
   e. Monitor for signs of hemorrhage and shock, particularly during the first 24

to 48 hours.
f. Monitor for manifestations of adrenal insufficiency (see Table 46-1).
g. Assess the dressing for drainage.
h. Monitor for paralytic ileus.
i. Administer IV fluids as prescribed to maintain blood volume.
j. Administer glucocorticoids and mineralocorticoids as prescribed.
k. Administer pain medication as prescribed.
l. Provide pulmonary interventions to prevent atelectasis (coughing and deep breathing, incentive spirometry, splinting of incision).
m. Instruct the client in the importance of hormone replacement therapy following surgery.
n. Instruct the client regarding signs and symptoms of complications such as underreplacement and overreplacement of hormones.
o. Instruct the client regarding the need to wear a MedicAlert bracelet.

V. Thyroid Gland Problems

A. **Hypothyroidism**

1. Description

a. Hypothyroid state resulting from hyposecretion of thyroid hormones and characterized by a decreased rate of body metabolism
b. The T_4 is low and the TSH is elevated.
c. In primary hypothyroidism, the source of dysfunction is the thyroid gland, and the thyroid cannot produce the necessary amount of hormones. In secondary hypothyroidism, the thyroid is not being stimulated by the pituitary to produce hormones.

2. Assessment (Table 46-2)

3. Interventions

a. Monitor vital signs, including heart rate

and rhythm.
b. Administer thyroid replacement; levothyroxine sodium is most commonly prescribed.
c. Instruct the client about thyroid replacement therapy and about the clinical manifestations of both hypothyroidism and hyperthyroidism related to underreplacement or overreplacement of the hormone.
d. Instruct the client in a low-calorie, low-cholesterol, low–saturated fat diet; discuss a daily exercise program such as walking.
e. Assess the client for constipation; provide roughage and fluids to prevent constipation.
f. Provide a warm environment for the client.
g. Avoid sedatives and opioid analgesics because of increased sensitivity to these medications; may precipitate myxedema coma.
h. Monitor for overdose of thyroid medications, characterized by tachycardia, chest pain, restlessness, nervousness, and insomnia.
i. Instruct the client to report episodes of chest pain or other signs of overdose immediately.

B. **Myxedema coma**

1. Description (Box 46-10)
2. Assessment
   a. Hypotension
   b. Bradycardia
   c. Hypothermia
   d. Hyponatremia
   e. **Hypoglycemia**
   f. Generalized edema
   g. Respiratory failure
   h. Coma
3. Interventions
   a. Maintain a patent airway.
   b. Institute aspiration precautions.
   c. Administer IV fluids (normal or hypertonic saline) as prescribed.
   d. Administer levothyroxine sodium

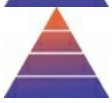
intravenously as prescribed.
e. Administer glucose intravenously as prescribed.
f. Administer corticosteroids as prescribed.
g. Assess the client's temperature hourly.
h. Monitor blood pressure frequently.
i. Keep the client warm.
j. Monitor for changes in mental status.
k. Monitor electrolyte and glucose levels.

C. **Hyperthyroidism**

1. Description

a. Hyperthyroid state resulting from hypersecretion of thyroid hormones (T_3 and T_4)
b. Characterized by an increased rate of body metabolism
c. A common cause is Graves' disease, also known as toxic diffuse goiter.
d. Clinical manifestations are referred to as *thyrotoxicosis*.
e. The T_3 and T_4 are usually elevated and the TSH level is low.

2. Assessment (see Table 46-2; Fig. 46-3)



3. Interventions

a. Provide adequate rest.
b. Administer sedatives as prescribed.
c. Provide a cool and quiet environment.
d. Obtain weight daily.
e. Provide a high-calorie diet.
f. Avoid the administration of stimulants.
g. Administer antithyroid medications, such as methimazole or propylthiouracil, that block thyroid synthesis as prescribed.
h. Administer iodine preparations that inhibit the release of thyroid hormone as prescribed.
i. Administer propranolol for tachycardia as prescribed.
j. Prepare the client for radioactive iodine therapy, as prescribed, to destroy thyroid cells.
k. Prepare the client for subtotal

thyroidectomy if prescribed.
l. Elevate the head of the bed of a client experiencing exophthalmos; in addition, instruct on low-salt diet, administer artificial tears, encourage the use of dark glasses, and tape eyelids closed at night if necessary.
m. Allow the client to express concerns about body image changes.

D. **Thyroid storm**

1. Description (Box 46-11)

2. Assessment

a. Elevated temperature (fever)
b. Tachycardia
c. Systolic hypertension
d. Nausea, vomiting, and diarrhea
e. Agitation, tremors, anxiety
f. Irritability, agitation, restlessness, confusion, and seizures as the condition progresses
g. Delirium and coma

3. Interventions

a. Maintain a patent airway and adequate ventilation.
b. Administer antithyroid medications, iodides, propranolol, and glucocorticoids as prescribed.
c. Monitor vital signs.
d. Monitor continually for cardiac dysrhythmias.
e. Administer nonsalicylate antipyretics as prescribed (salicylates increase free thyroid hormone levels).
f. Use a cooling blanket to decrease temperature as prescribed.

E. **Thyroidectomy**

1. Description

a. Removal of the thyroid gland
b. Performed when persistent hyperthyroidism exists
c. Subtotal thyroidectomy, removal of a portion of the thyroid gland, is the preferred surgical intervention.

2. Preoperative interventions

a. Obtain vital signs and weight.

b. Assess electrolyte levels.
c. Assess for hyperglycemia.
d. Instruct the client in how to perform coughing and deep-breathing exercises and how to support the neck in the postoperative period when coughing and moving.
e. Administer antithyroid medications, iodides, propranolol, and glucocorticoids as prescribed to prevent the occurrence of thyroid storm.

3. Postoperative interventions

a. Monitor for respiratory distress.
b. Have a tracheotomy set, oxygen, and suction at the bedside.
c. Limit client talking, and assess level of hoarseness.
d. Avoid neck flexion and stress on the suture line.
e. Monitor for laryngeal nerve damage, as evidenced by airway obstruction, dysphonia, high-pitched voice, stridor, dysphagia, and restlessness.
f. Monitor for signs of hypocalcemia and tetany, which can be caused by trauma to the parathyroid gland (Box 46-12).
g. Prepare to administer calcium gluconate as prescribed for tetany.
h. Monitor for thyroid storm.

Following thyroidectomy, maintain the client in a semi-Fowler's position. Monitor the surgical site for edema and for signs of bleeding and check the dressing anteriorly and at the back of the neck. Monitor for inflammation, which may block the airway. An emergency tracheostomy kit should be at the bedside.

VI. Parathyroid Gland Problems

A. **Hypoparathyroidism**

1. Description

a. Condition caused by hyposecretion of parathyroid hormone by the parathyroid gland
b. Can occur following thyroidectomy

because of removal of parathyroid tissue

2. Assessment

a. Hypocalcemia and hyperphosphatemia
b. Numbness and tingling in the face
c. Muscle cramps and cramps in the abdomen or in the extremities
d. Positive **Trousseau's sign** or **Chvostek's sign**
e. Signs of overt tetany, such as bronchospasm, laryngospasm, carpopedal spasm, dysphagia, photophobia, cardiac dysrhythmias, seizures
f. Hypotension
g. Anxiety, irritability, depression

3. Interventions

a. Monitor vital signs.
b. Monitor for signs of hypocalcemia and tetany.
c. Initiate seizure precautions.
d. Place a tracheotomy set, oxygen, and suctioning equipment at the bedside.
e. Prepare to administer calcium gluconate intravenously for hypocalcemia.
f. Provide a high-calcium, low-phosphorus diet.
g. Instruct the client in the administration of calcium supplements as prescribed.
h. Instruct the client in the administration of vitamin D supplements as prescribed; vitamin D enhances the absorption of calcium from the gastrointestinal (GI) tract.
i. Instruct the client in the use of thiazide diuretics if prescribed, to protect the kidney if vitamin D is also taken.
j. Instruct the client in the administration of phosphate binders as prescribed to promote the excretion of phosphate through the GI tract.
k. Instruct the client to wear a MedicAlert bracelet.

B. **Hyperparathyroidism**

1. Description: Condition caused by hypersecretion of parathyroid hormone (PTH) by the parathyroid gland
2. Assessment

a. Hypercalcemia and hypophosphatemia
b. Fatigue and muscle weakness
c. Skeletal pain and tenderness

d. Bone deformities that result in pathological fractures
e. Anorexia, nausea, vomiting, epigastric pain
f. Weight loss
g. Constipation
h. Hypertension
i. Cardiac dysrhythmias
j. Renal stones

3. Interventions

a. Monitor vital signs, particularly blood pressure.
b. Monitor for cardiac dysrhythmias.
c. Monitor intake and output and for signs of renal stones.
d. Monitor for skeletal pain; move the client slowly and carefully.
e. Encourage fluid intake.
f. Administer furosemide as prescribed to lower calcium levels.
g. Administer NS intravenously as prescribed to maintain hydration.
h. Administer phosphates, which interfere with calcium reabsorption, as prescribed.
i. Administer calcitonin as prescribed to decrease skeletal calcium release and increase renal excretion of calcium.
j. Administer IV or oral bisphosphonates to inhibit bone resorption.
k. Monitor calcium and phosphorus levels.
l. Prepare the client for parathyroidectomy as prescribed.
m. Encourage a high-fiber, moderate-calcium diet.
n. Emphasize the importance of an

exercise program and avoiding prolonged inactivity.

C. Parathyroidectomy

1. Description: Removal of 1 or more of the parathyroid glands

a. Endoscopic radioguided parathyroidectomy with autotransplantation is a common procedure.

b. Parathyroid tissue is transplanted in the forearm or near the sternocleidomastoid muscle, allowing PTH secretion to continue.

2. Preoperative interventions

a. Monitor electrolytes, calcium, phosphate, and magnesium levels.

b. Ensure that calcium levels are decreased to near-normal values.

c. Inform the client that talking may be painful for the first day or two after surgery.

3. Postoperative interventions

a. Monitor for respiratory distress.

b. Place a tracheotomy set, oxygen, and suctioning equipment at the bedside.

c. Monitor vital signs.

d. Position the client in semi-Fowler's position.

e. Assess neck dressing for bleeding.

f. Monitor for hypocalcemic crisis, as evidenced by tingling and twitching in the extremities and face.

g. Assess for positive Trousseau's sign or Chvostek's sign, which indicates tetany.

h. Monitor for changes in voice pattern and hoarseness.

i. Monitor for laryngeal nerve damage.

j. Instruct the client in the administration of calcium and vitamin D supplements as prescribed.

VII. Problems of the Pancreas

A. **Diabetes mellitus**

1. Description

a. Chronic disorder of impaired

carbohydrate, protein, and lipid metabolism caused by a deficiency of insulin

b. An absolute or relative deficiency of insulin results in hyperglycemia.

c. Type 1 diabetes mellitus is a nearly absolute deficiency of insulin (primary beta cell destruction); if insulin is not given, fats are metabolized for energy, resulting in ketonemia (acidosis).

d. Type 2 diabetes mellitus is a relative lack of insulin or resistance to the action of insulin; usually, insulin is sufficient to stabilize fat and protein metabolism but not carbohydrate metabolism.

e. Metabolic syndrome is also known as syndrome X, and the individual has coexisting risk factors for developing type 2 diabetes mellitus; these risk factors include abdominal obesity, hyperglycemia, hypertension, high triglyceride level, and a lowered HDL (high-density lipoprotein) cholesterol level.

f. Diabetes mellitus can lead to chronic health problems and early death as a result of complications that occur in the large and small blood vessels in tissues and organs.

g. Macrovascular complications include coronary artery disease, cardiomyopathy, hypertension, cerebrovascular disease, and peripheral vascular disease. (Refer to Chapter 52 for information on cardiovascular problems.)

h. Microvascular complications include retinopathy, nephropathy, and neuropathy.

i. Infection is also a concern because of reduced healing ability.

j. Male erectile dysfunction can also occur as a result of the disease.

Obesity is a major risk factor for diabetes

mellitus.

2. Assessment

a. Polyuria, polydipsia, polyphagia (more common in type 1 diabetes mellitus)
b. Hyperglycemia
c. Weight loss (common in type 1 diabetes mellitus, rare in type 2 diabetes mellitus)
d. Blurred vision
e. Slow wound healing
f. Vaginal infections
g. Weakness and paresthesias
h. Signs of inadequate circulation to the feet
i. Signs of accelerated atherosclerosis (renal, cerebral, cardiac, peripheral)

3. Diet

a. The diabetic client's diet should take into account weight, medication, activity level, and other health problems.
b. Day-to-day consistency in timing and amount of food intake helps control the blood glucose level.
c. As prescribed by the PHCP or endocrinologist, the client may be advised to follow the recommendations of the American Diabetic Association diet or U.S. dietary guidelines (MyPlate; http://www.choosemyplate.gov/) issued by the U.S. Departments of Agriculture and Health and Human Services.
d. Carbohydrate counting may be a simpler approach for some clients; it focuses on the total grams of carbohydrates eaten per meal. The client may be more compliant with carbohydrate counting, resulting in better glycemic control; it is usually necessary for clients undergoing intense insulin therapy.
e. Incorporate the diet into individual client needs, lifestyle, and cultural and socioeconomic patterns.

4. Exercise

a. Exercise lowers the blood glucose level, encourages weight loss, reduces cardiovascular risks, improves circulation and muscle tone, decreases total cholesterol and triglyceride levels, and decreases insulin resistance and glucose intolerance.
b. Instruct the client in dietary adjustments when exercising; dietary adjustments are individualized.
c. If the client requires extra food during exercise to prevent hypoglycemia, it need not be deducted from the regular meal plan.
d. If the blood glucose level is higher than 250 mg/dL (13.9 mmol/L) and urinary ketones (type 1 diabetes mellitus) are present, the client is instructed not to exercise until the blood glucose level is closer to normal and urinary ketones are absent.
e. The client should try to exercise at the same time each day and should exercise when glucose from the meal is peaking, not when insulin or glucose-lowering medications are peaking.
f. Insulin should not be injected into an area of the body that will be exercised following injection, as exercise speeds absorption.

Instruct the client with diabetes mellitus to monitor the blood glucose level before, during, and after exercising.

5. Oral hypoglycemic medications: Oral medications are prescribed for clients with diabetes mellitus type 2 when diet and weight control therapy have failed to maintain satisfactory blood glucose levels (Chapter 47).

6. Insulin (refer to Chapter 47 for additional information on insulin)

a. Insulin is used to treat type 1 diabetes

mellitus and may be used to treat type 2 diabetes mellitus when diet, weight control therapy, and oral hypoglycemic agents have failed to maintain satisfactory blood glucose levels.

b. Illness, infection, and stress increase the blood glucose level and the need for insulin; insulin should not be withheld during times of illness, infection, or stress because hyperglycemia and **diabetic ketoacidosis** can result.

c. The peak action time of insulin is important to explain to the client because of the possibility of hypoglycemic reactions occurring during this time.

Regular insulin (U-100 strength) can be administered via IV injection (IV push). Regular insulin (U-100) and the short-duration insulins (lispro, aspart, and glulisine) can be administered via IV infusion.

B. Complications of insulin therapy

1. Local allergic reactions

a. Redness, swelling, tenderness, and induration or a wheal at the site of injection may occur 1 to 2 hours after administration.

b. Reactions usually occur during the early stages of insulin therapy.

c. Instruct the client to cleanse the skin with alcohol before injection.

2. Insulin lipodystrophy

a. The development of fibrous fatty masses at the injection site caused by repeated use of an injection site; use of human insulin helps prevent this.

b. Instruct the client to avoid injecting insulin into affected sites.

c. Instruct the client about the importance of rotating insulin injection sites. Systematic rotation within 1 anatomical area is recommended to

prevent lipodystrophy; the client should be instructed not to use the same site more than once in a 2- to 3-week period. Injections should be 1.5 inches (3.8 cm) apart within the anatomical area.

3. **Dawn phenomenon**
    a. Dawn phenomenon is characterized by hyperglycemia upon morning awakening that results from excessive early morning release of GH and cortisol.
    b. Treatment requires an increase in the client's insulin dose or a change in the time of insulin administration.
4. **Somogyi phenomenon**
    a. Normal or elevated blood glucose levels are present at bedtime; hypoglycemia occurs at about 2 to 3 a.m., which causes an increase in the production of counterregulatory hormones.
    b. By about 7 a.m., in response to the counterregulatory hormones, the blood glucose rebounds significantly to the hyperglycemic range.
    c. Treatment includes a decrease in the client's insulin dose or increase in the bedtime snack, or both.
    d. Clients experiencing the Somogyi phenomenon may complain of early morning headaches, night sweats, or nightmares caused by the early morning hypoglycemia.

C. Insulin administration

1. Subcutaneous injections and mixing insulin: See Chapter 47.
2. Insulin pumps
    a. Continuous subcutaneous insulin infusion is administered by an externally worn device that contains a syringe and pump; different types of pumps are available and the one selected is based on the client's needs.
    b. The client inserts the needle or Teflon catheter into the subcutaneous tissue (usually on the abdomen or upper arm) and secures it with tape or a

transparent dressing; the needle or Teflon catheter is changed at least every 2 to 3 days.

c. A continuous basal rate of insulin infuses; in addition, on the basis of the blood glucose level, the anticipated food intake, and the activity level, the client delivers a bolus of insulin before each meal.

d. Both rapid-acting and regular short-acting insulin (buffered to prevent the precipitation of insulin crystals within the catheter) are appropriate for use in these pumps.

3. Insulin pump and skin sensor

a. A skin sensor device can be used that monitors the client's blood glucose continuously; the information is transmitted to the pump, which determines the need for insulin, and then the insulin is injected.

b. The pump holds up to a 3-day supply of insulin and can be disconnected easily if necessary for certain activities such as bathing.

4. Pancreas transplants

a. The goal of pancreatic transplantation is to halt or reverse the complications of diabetes mellitus.

b. Transplantations are performed on a limited number of clients (in general, these are clients who are undergoing kidney transplantation simultaneously).

c. Immunosuppressive therapy is prescribed to prevent and treat rejection.

D. Self-monitoring of blood glucose level

1. Self-monitoring provides the client with the current blood glucose level and information to maintain good glycemic control.
2. Monitoring requires a finger prick to obtain a drop of blood for testing.
3. Alternative site testing (obtaining blood from the forearm, upper arm, abdomen, thigh, or calf) is available, using specific measurement devices.
4. Tests must be used with caution in clients with

diabetic neuropathy.

5. Client instructions (Box 46-13)

E. Urine testing

1. Urine testing for glucose is not a reliable indicator of the blood glucose level and is not used for monitoring purposes.
2. Instruct the client in the procedure for testing for urine ketones.
3. The presence of ketones may indicate impending ketoacidosis.
4. Urine ketone testing should be performed during illness and whenever the client with type 1 diabetes mellitus has persistently elevated blood glucose levels (higher than 250 mg/dL [13.9 mmol/L] or as prescribed for 2 consecutive testing periods).

VIII. Acute Complications of Diabetes Mellitus

A. Hypoglycemia

1. Description

a. Hypoglycemia occurs when the blood glucose level falls below 70 mg/dL (3.9 mmol/L), or when the blood glucose level drops rapidly from an elevated level.
b. Hypoglycemia is caused by too much insulin or too large an amount of an oral hypoglycemic agent, too little food, or excessive activity.
c. The client needs to be instructed always to carry some form of fast-acting simple carbohydrate with him or her (Box 46-14).
d. If the client has a hypoglycemic reaction and does not have any of the recommended emergency foods available, any available food should be eaten; high-fat foods slow the absorption of glucose, and the hypoglycemic symptoms may not resolve quickly.
e. Clients who experience frequent episodes of hypoglycemia, older clients, and clients taking β-adrenergic blocking agents may not experience the warning signs of hypoglycemia until the blood glucose level is dangerously low; this phenomenon is termed *hypoglycemia unawareness.*

2. Assessment (Box 46-15)

a. Mild hypoglycemia: The client remains fully awake but displays adrenergic symptoms; the blood glucose level is lower than 70 mg/dL (3.9 mmol/L).
b. Moderate hypoglycemia: The client displays symptoms of worsening hypoglycemia; the blood glucose level is usually lower than 3.9 mg/dL (2.2 mmol/L).
c. Severe hypoglycemia: The client displays severe neuroglycopenic symptoms; the blood glucose level is usually lower than 20 mg/dL (1.1 mmol/L).

3. Interventions (see Priority Nursing Actions)

Priority Nursing Actions

Suspected Hypoglycemic Reaction (the 15/15 rule)

1. If a blood glucose monitor is readily available, check the client's blood glucose level. If the client is experiencing symptoms suggestive of hypoglycemia such as diaphoresis, hunger, pallor, and shakiness, and a blood glucose monitor is not readily available, assume hypoglycemia and treat accordingly.
2. For the client whose blood glucose is below 70 mg/dL (3.9 mmol/L), or for the client with an unknown blood glucose who is exhibiting signs of hypoglycemia, administer 15 g of a simple carbohydrate such as ½ cup of fruit juice or 15 g of glucose gel.
3. Recheck the blood glucose level in 15 minutes.
4. If the blood glucose remains below 70 mg/dL (3.9 mmol/L), administer another 15 g of a simple carbohydrate.
5. Recheck the blood glucose level in 15 minutes; if still below 70 mg/dL (3.9 mmol/L), treat with an additional 15 g of a simple carbohydrate.
6. Recheck the blood glucose level in 15 minutes; if still below 70 mg/dL (3.9 mmol/L), treat with 25 to 50 mL of 50% dextrose intravenously or, if no intravenous (IV) equipment is present, treat with 1 mg of glucagon subcutaneously or intramuscularly.
7. After the blood glucose level has recovered, have the client ingest a snack that includes a complex carbohydrate and a protein.
8. Document the client's complaints, actions taken, and outcome.
9. Explore the precipitating cause of the hypoglycemia with the client.
10. If the client is experiencing an altered level of consciousness, bypass oral treatment and start with injectable glucagon or 50% dextrose. If the client is at home and does not have access to injectable glucagon, the client should seek immediate medical care.

Reference

Lewis et al. (2017), pp. 1146-1147.
American Diabetes Association. The 15/15 rule. Retrieved from http://www.ndei.org/uploadedFiles/Common/NDEI/Home/Wha To-Treat-Hypoglycemia.pdf;

Do not attempt to administer oral food or fluids to the client experiencing a severe hypoglycemic reaction who is semiconscious or unconscious and is unable to swallow. This client is at risk for aspiration. For this client, an injection of glucagon is administered subcutaneously or intramuscularly. In the hospital or emergency department, the client may be treated with an IV injection of 25 to 50 mL (12.5 to 25 g) of 50% dextrose in water.

B. Diabetic ketoacidosis (DKA)

1. Description (Fig. 46-4)
    a. Diabetic ketoacidosis is a life-threatening complication of type 1 diabetes mellitus that develops when a severe insulin deficiency occurs.
    b. The main clinical manifestations include hyperglycemia, dehydration, ketosis, and acidosis.

2. Assessment (Table 46-3)

3. Interventions
    a. Restore circulating blood volume and protect against cerebral, coronary, and renal hypoperfusion.
    b. Treat dehydration with rapid IV infusions of 0.9% or 0.45% NS as prescribed; dextrose is added to IV fluids when the blood glucose level reaches 250 to 300 mg/dL (13.9 to 16.7 mmol/L). Too rapid administration of IV fluids; use of the incorrect types of IV fluids, particularly hypotonic solutions; and correcting the blood glucose level too rapidly can lead to cerebral edema.
    c. Treat hyperglycemia with insulin administered intravenously as prescribed.
    d. Correct electrolyte imbalances (potassium level may be elevated as a result of dehydration and acidosis).

e. Monitor potassium level closely, because when the client receives treatment for the dehydration and acidosis, the serum potassium level will decrease and potassium replacement may be required.
f. Cardiac monitoring should be in place for the client with DKA due to risks associated with abnormal serum potassium levels.

4. Insulin IV administration

a. Use short-duration insulin only.
b. An IV bolus dose of short-duration regular U-100 insulin (usually 5 to 10 units) may be prescribed before a continuous infusion is begun.
c. The prescribed IV dose of insulin for continuous infusion is prepared in 0.9% or 0.45% NS as prescribed.
d. Always place the insulin infusion on an IV infusion controller.
e. Insulin is infused continuously until subcutaneous administration resumes, to prevent a rebound of the blood glucose level.
f. Monitor vital signs.
g. Monitor urinary output and monitor for signs of fluid overload.
h. Monitor potassium and glucose levels and for signs of increased intracranial pressure.
i. The potassium level will fall rapidly within the first hour of treatment as the dehydration and the acidosis are treated.
j. Potassium is administered intravenously in a diluted solution as prescribed; ensure adequate renal function before administering potassium.

5. Client education (Box 46-16)

Monitor the client being treated for DKA closely for signs of increased intracranial pressure. If the blood glucose level falls too far or too fast before the brain has time to equilibrate, water is pulled from the blood to the cerebrospinal fluid and the brain, causing cerebral edema and increased intracranial pressure.

C. **Hyperosmolar hyperglycemic syndrome (HHS)**

1. Description

a. Extreme hyperglycemia occurs without ketosis or acidosis.

b. The syndrome occurs most often in individuals with type 2 diabetes mellitus.

c. The major difference between HHS and DKA is that ketosis and acidosis do not occur with HHS; enough insulin is present with HHS to prevent the breakdown of fats for energy, thus preventing ketosis.

2. Assessment (see Table 46-3)

3. Interventions

a. Treatment is similar to that for DKA.

b. Treatment includes fluid replacement, correction of electrolyte imbalances, and insulin administration.

c. Fluid replacement in the older client must be done very carefully because of the potential for heart failure.

d. Insulin plays a less critical role in the treatment of HHS than it does in the treatment of DKA because ketosis and acidosis do not occur; rehydration alone may decrease glucose levels.

IX. Chronic Complications of **Diabetes Mellitus**

A. Diabetic retinopathy

1. Description

a. Chronic and progressive impairment of the retinal circulation that eventually causes hemorrhage

b. Permanent vision changes and blindness can occur.

c. The client has difficulty with carrying out the daily tasks of blood glucose testing and insulin injections.

2. Assessment

a. A change in vision is caused by the rupture of small microaneurysms in retinal blood vessels.

b. Blurred vision results from macular

edema.
c. Sudden loss of vision results from retinal detachment.
d. Cataracts result from lens opacity.

3. Interventions
a. Maintain safety.

b. Early prevention via the control of hypertension and blood glucose levels
c. Photocoagulation (laser therapy) may be done to remove hemorrhagic tissue to decrease scarring and prevent progression of the disease process.
d. Vitrectomy may be done to remove vitreous hemorrhages and thus decrease tension on the retina, preventing detachment.
e. Cataract removal with lens implantation improves vision.


B. Diabetic nephropathy

1. Description: Progressive decrease in kidney function
2. Assessment
a. Microalbuminuria
b. Thirst
c. Fatigue
d. Anemia
e. Weight loss
f. Signs of malnutrition
g. Frequent urinary tract infections
h. Signs of a neurogenic bladder

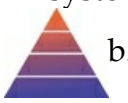
3. Interventions
a. Early prevention measures include the control of hypertension and blood glucose levels.
b. Assess vital signs.
c. Monitor intake and output.
d. Monitor the blood urea nitrogen, creatinine, and urine albumin levels.
e. Restrict dietary protein, sodium, and potassium intake as prescribed.
f. Avoid nephrotoxic medications.
g. Prepare the client for dialysis procedures if planned.
h. Prepare the client for kidney transplant if planned.

i. Prepare the client for pancreas transplant if planned.

C. Diabetic neuropathy

1. Description

a. General deterioration of the nervous system throughout the body



b. Complications include the development of nonhealing ulcers of the feet, gastric paresis, and erectile dysfunction.

2. Classifications

a. Focal neuropathy or mononeuropathy: Involves a single nerve or group of nerves, most frequently cranial nerves III (oculomotor) and VI (abducens), resulting in diplopia

b. Sensory or peripheral neuropathy: Affects distal portion of nerves, most frequently in the lower extremities

c. Autonomic neuropathy: Symptoms vary according to the organ system involved.

d. Cardiovascular: Cardiac denervation syndrome (heart rate does not respond to changes in oxygenation needs) and orthostatic hypotension occur.

e. Pupillary: Pupil does not dilate in response to decreased light.

f. Gastric: Decreased gastric emptying (gastroparesis)

g. Urinary: Neurogenic bladder

h. Skin: Decreased sweating

i. Adrenal: Hypoglycemic unawareness

j. Reproductive: Impotence (male), painful intercourse (female)

3. Assessment: Findings depend on the classification

a. Paresthesias

b. Decreased or absent reflexes

c. Decreased sensation to vibration or light touch

d. Pain, aching, and burning in the lower extremities

e. Poor peripheral pulses

f. Skin breakdown and signs of infection

g. Weakness or loss of sensation in cranial nerves III (oculomotor), IV (trochlear), V (trigeminal), and VI (abducens)
h. Dizziness and postural hypotension
i. Nausea and vomiting
j. Diarrhea or constipation
k. Incontinence
l. Dyspareunia
m. Impotence
n. Hypoglycemic unawareness

4. Interventions
a. Early prevention measures include the control of hypertension and blood glucose levels.
b. Careful foot care is required to prevent trauma (Box 46-17).
c. Administer medications as prescribed for pain relief.
d. Initiate bladder training programs.
e. Instruct in the use of estrogen-containing lubricants for women with dyspareunia.
f. Prepare the male client with impotence for penile injections or other possible treatment options as prescribed.
g. Prepare for surgical decompression of compression lesions related to the cranial nerves as prescribed.

X. Care of the Diabetic Client Undergoing Surgery

A. Preoperative care
1. Check with PHCP regarding withholding oral hypoglycemic medications or insulin.
2. Some long-acting oral antidiabetic medications are discontinued 24 to 48 hours before surgery.
3. Metformin may need to be discontinued 48 hours before surgery and may not be restarted until renal function is normal postoperatively.
4. All other oral antidiabetic medications are usually withheld on the day of surgery.
5. Insulin dose may be adjusted or withheld if IV insulin administration during surgery is planned.
6. Monitor blood glucose level.
7. Administer IV fluids as prescribed.

B. Postoperative care
1. Administer IV glucose and insulin infusions as prescribed until the client can tolerate oral feedings.
2. Administer supplemental short-acting insulin as

prescribed based on blood glucose results.
3. Monitor blood glucose levels frequently, especially if the client is receiving parenteral nutrition.
4. When the client is tolerating food, ensure that the client receives an adequate amount of carbohydrates daily to prevent hypoglycemia.
5. Client is at higher risk for cardiovascular and renal complications postoperatively.
6. Client is also at risk for impaired wound healing.

Box 46-1

Endocrine Glands

- Adrenal
- Hypothalamus
- Ovaries
- Pancreas
- Parathyroid
- Pituitary
- Testes
- Thyroid

Box 46-2

Risk Factors for Endocrine Problems

- Age
- Heredity
- Congenital factors
- Trauma
- Environmental factors
- Consequence of other health problems or surgery

Box 46-3

Hypothalamus Hormones

- Corticotropin-releasing hormone (CRH)
- Gonadotropin-releasing hormone (GnRH)
- Growth hormone–inhibiting hormone (GHIH)

- Growth hormone–releasing hormone (GHRH)
- Melanocyte-inhibiting hormone (MIH)
- Prolactin-inhibiting hormone (PIH)
- Thyrotropin-releasing hormone (TRH)

Box 46-4

Pituitary Gland Hormones

Anterior Lobe Production

- Adrenocorticotropic hormone (ACTH)
- Follicle-stimulating hormone (FSH)
- Growth hormone (GH)
- Luteinizing hormone (LH)
- Melanocyte-stimulating hormone (MSH)
- Prolactin (PRL)
- Somatotropic growth-stimulating hormone
- Thyroid-stimulating hormone (TSH)

Posterior Lobe

These hormones are produced by the hypothalamus, stored in the posterior lobe, and secreted into the blood when needed:

- Oxytocin
- Vasopressin, antidiuretic hormone (ADH)

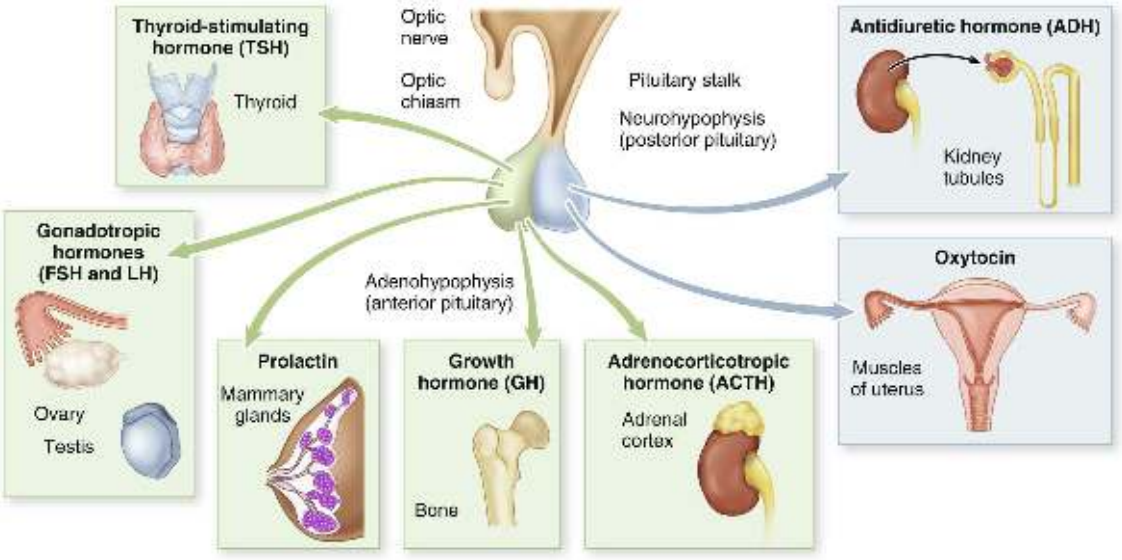


FIG. 46-1 Pituitary hormones. *FSH,* Follicle-stimulating hormone; *LH,* luteinizing hormone.

Box 46-5

Adrenal Cortex

Glucocorticoids: Cortisol, Cortisone, Corticosterone

Responsible for glucose metabolism, protein metabolism, fluid and electrolyte balance, suppression of the inflammatory response to injury, protective immune response to invasion by infectious agents, and resistance to stress

Mineralocorticoids: Aldosterone

Regulation of electrolyte balance by promoting sodium retention and potassium excretion

Box 46-6

Pituitary Gland Problems

Anterior Pituitary

- Hyperpituitarism
- Hypopituitarism

Posterior Pituitary

These problems can be caused by damage to the posterior pituitary or hypothalamus:

- Diabetes insipidus
- Syndrome of inappropriate antidiuretic hormone secretion (SIADH)

Box 46-7

Adrenal Gland Problems

Adrenal Cortex

- Addison's disease
- Primary hyperaldosteronism (Conn's syndrome)
- Cushing's disease
- Cushing's syndrome

Adrenal Medulla

- Pheochromocytoma

Table 46-1

Assessment: Addison's Disease and Cushing's Disease and Cushing's Syndrome

Addison's Disease	Cushing's Disease and Cushing's Syndrome
Lethargy, fatigue, and muscle weakness	Generalized muscle wasting and weakness
Gastrointestinal disturbances	Moon face, buffalo hump
Weight loss	Truncal obesity with thin extremities, supraclavicular fat pads; weight gain
Menstrual changes in women; impotence in men	Hirsutism (masculine characteristics in females)
Hypoglycemia, hyponatremia	Hyperglycemia, hypernatremia
Hyperkalemia, hypercalcemia	Hypokalemia, hypocalcemia
Hypotension	Hypertension
Hyperpigmentation of skin (bronzed) with primary disease	Fragile skin that bruises easily Reddish-purple striae on the abdomen and upper thighs

Box 46-8

Addisonian Crisis

- A life-threatening disorder caused by acute adrenal insufficiency
- Precipitated by stress, infection, trauma, surgery, or abrupt withdrawal of exogenous corticosteroid use
- Can cause hyponatremia, hyperkalemia, hypoglycemia, and shock

FIG. 46-2 Typical appearance of a client with Cushing's syndrome. Note truncal obesity, moon face, buffalo hump, thinner arms and legs, and abdominal striae. (From Wenig, Heffess, Adair, 1997.)

Box 46-9

Adrenalectomy

- Surgical removal of an adrenal gland
- Lifelong glucocorticoid and mineralocorticoid replacement is necessary with bilateral adrenalectomy.
- Temporary glucocorticoid replacement, usually up to 2 years, is necessary after a unilateral adrenalectomy.
- Catecholamine levels drop as a result of surgery, which can result in cardiovascular collapse, hypotension, and shock, and the client needs to be monitored closely.
- Hemorrhage also can occur because of the high vascularity of the adrenal glands.

Table 46-2

Assessment: Hypothyroidism and Hyperthyroidism

Hypothyroidism	Hyperthyroidism

Lethargy and fatigue	Personality changes such as irritability, agitation, and mood swings
Weakness, muscle aches, paresthesias	Nervousness and fine tremors of the hands Weakness, muscle aches, paresthesias
Intolerance to cold	Heat intolerance
Weight gain	Weight loss
Dry skin and hair and loss of body hair	Smooth, soft skin and hair
Bradycardia	Palpitations, cardiac dysrhythmias, such as tachycardia or atrial fibrillation
Constipation	Diarrhea
Generalized puffiness and edema around the eyes and face (myxedema)	Protruding eyeballs (exophthalmos) may be present (see Fig. 46-3)
Forgetfulness and loss of memory	Diaphoresis
Menstrual disturbances	Hypertension
Goiter may or may not be present	Enlarged thyroid gland (goiter)
Cardiac enlargement, tendency to develop heart failure	

Box 46-10

Myxedema Coma

- This rare but serious disorder results from persistently low thyroid production.
- Coma can be precipitated by acute illness, rapid withdrawal of thyroid medication, anesthesia and surgery, hypothermia, or the use of sedatives and opioid analgesics.

FIG. 46-3 Exophthalmos. (From Ignatavicius, Workman, 2016.)

Box 46-11

Thyroid Storm

- This acute and life-threatening condition occurs in a client with uncontrollable hyperthyroidism.
- It can be caused by manipulation of the thyroid gland during surgery and the release of thyroid hormone into the bloodstream; it also can occur from severe infection and stress.
- Antithyroid medications, beta blockers, glucocorticoids, and iodides may be administered to the client before thyroid surgery to prevent its occurrence.

Box 46-12

Signs of Tetany

- Cardiac dysrhythmias
- Carpopedal spasm
- Dysphagia
- Muscle and abdominal cramps
- Numbness and tingling of the face and extremities
- Positive Chvostek's sign
- Positive Trousseau's sign
- Visual disturbances (photophobia)
- Wheezing and dyspnea (bronchospasm, laryngospasm)
- Seizures

Box 46-13

Client Instructions: Self-Monitoring of Blood Glucose Level

- Use the proper procedure to obtain the sample for determining the blood glucose level.
- Perform the procedure precisely to obtain accurate results.
- Follow the manufacturer's instructions for the glucometer.
- Wash hands before and after performing the procedure to prevent infection.
- If needed, calibrate the monitor as instructed by the manufacturer.
- Check the expiration date on the test strips.
- If the blood glucose level results do not seem reasonable, reread the instructions, reassess technique, check the expiration date of the test strips, and perform the procedure again to verify results.

Box 46-14

Simple Carbohydrates to Treat Hypoglycemia

- Commercially prepared glucose tablets or glucose gel
- 6 to 10 Life Savers or hard candy
- 4 tsp of sugar
- 4 sugar cubes
- 1 Tbsp of honey or syrup

- ½ cup of fruit juice or regular (nondiet) soft drink
- 8 oz (235 mL) of low-fat milk
- 6 saltine crackers
- 3 graham crackers

Box 46-15

Assessment of Hypoglycemia

Mild

- Hunger
- Nervousness
- Palpitations
- Sweating
- Tachycardia
- Tremor

Moderate

- Confusion
- Double vision
- Drowsiness
- Emotional changes
- Headache
- Impaired coordination
- Inability to concentrate
- Irrational or combative behavior
- Lightheadedness
- Numbness of the lips and tongue
- Slurred speech

Severe

- Difficulty arousing
- Disoriented behavior
- Loss of consciousness
- Seizures

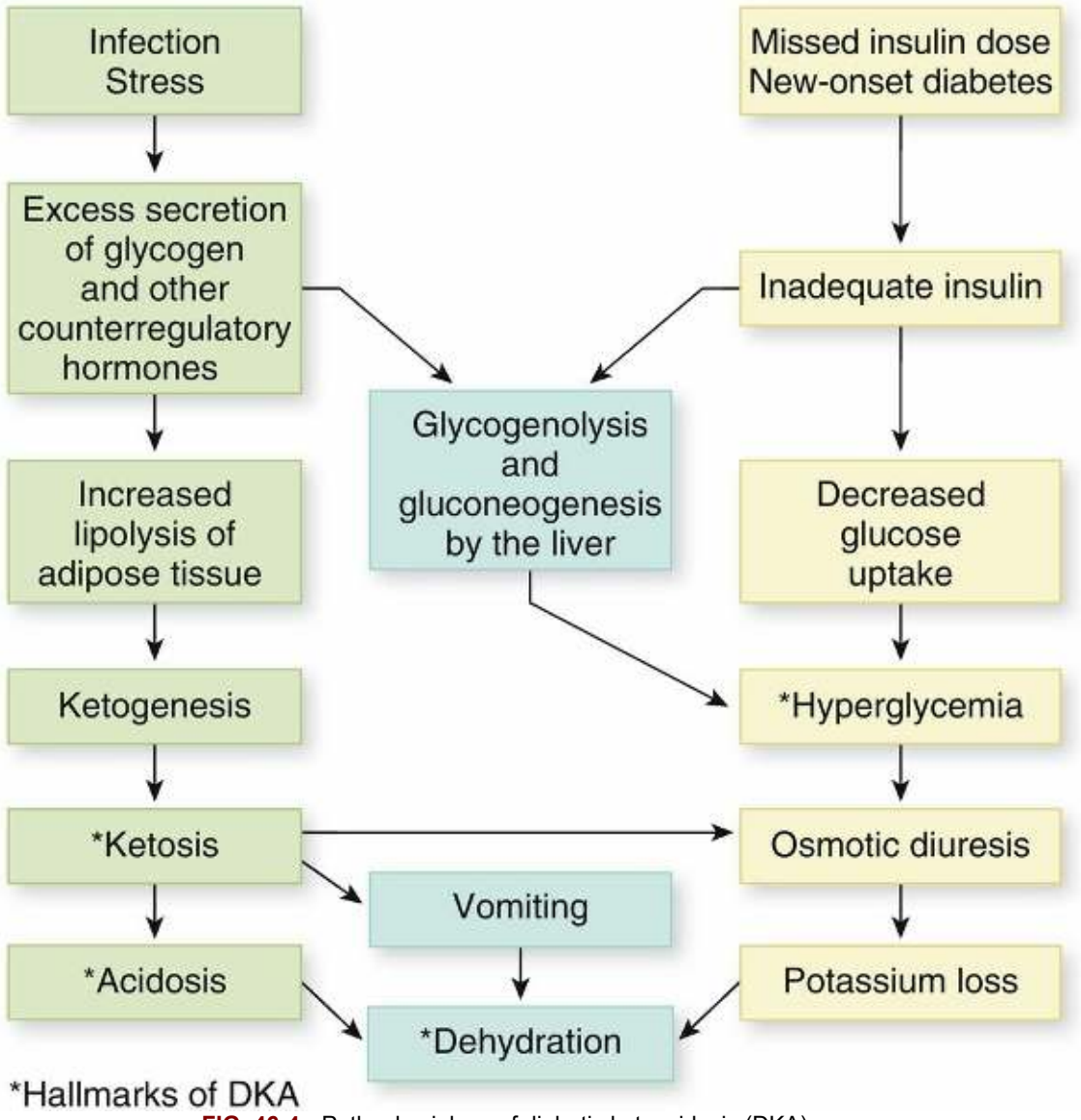


FIG. 46-4 Pathophysiology of diabetic ketoacidosis (DKA).

Table 46-3

Differences Between Diabetic Ketoacidosis and Hyperosmolar Hyperglycemic Syndrome

	Diabetic Ketoacidosis (DKA)	Hyperosmolar Hyperglycemic Syndrome (HHS)
Onset	Sudden	Gradual
Precipitating factors	Infection	Infection
	Other stressors	Other stressors
	Inadequate insulin dose	Poor fluid intake
Manifestations	Ketosis: Kussmaul's respiration, "fruity" breath, nausea, abdominal pain	Altered central nervous system function with neurological symptoms
	Dehydration or electrolyte loss: Polyuria, polydipsia, weight loss, dry skin, sunken eyes, soft eyeballs, lethargy, coma	Dehydration or electrolyte loss: Same as for DKA
Laboratory Findings		
Serum glucose	> 300 mg/dL (> 16.7 mmol/L)	> 800 mg/dL (> 44.5 mmol/L)
Osmolarity	Variable	> 350 mOsm/kg (.350 mmol/kg)
Serum ketones	Positive at 1:2 dilution	Negative
Serum pH	< 7.35	> 7.4
Serum HCO_3	< 15 mEq/L (15 mmol/L)	> 20 mEq/L (> 20 mmol/L)
Serum Na	Low, normal, or high	Normal or low
Serum K	Normal; elevated with acidosis, decreases following hydration	Normal or low
BUN	> 20 mg/dL (> 7.1 mmol/L); elevated because of dehydration	Elevated
Creatinine	> 1.5 mg/dL (> 132.5 mcmol/L); elevated because of dehydration	Elevated
Urine ketones	Positive	Negative

BUN, Blood urea nitrogen; *HCO_3*, bicarbonate; *K*, potassium; *Na*, sodium.

From Ignatavicius D, Workman M: *Medical-surgical nursing: patient-centered collaborative care*, ed 7, St. Louis, 2013, Saunders.

Box 46-16

Client Education: Guidelines During Illness

- Take insulin or oral antidiabetic medications as prescribed.
- Determine the blood glucose level and test the urine for ketones every 3 to 4 hours.
- If the usual meal plan cannot be followed, substitute soft foods 6 to 8 times a day.
- If vomiting, diarrhea, or fever occurs, consume liquids every 30 to 60 minutes to prevent dehydration and to provide calories.
- Notify the primary health care provider if vomiting, diarrhea, or fever persists; if blood glucose levels are higher than 250 to 300 mg/dL (13.9 to 16.7 mmol/L); when ketonuria is present for more than 24 hours; when unable to take food or fluids for a period of 4 hours; or when illness persists for more than 2 days.

Box 46-17

Preventive Foot Care Instructions

- Provide meticulous skin care and proper foot care.
- Inspect feet daily and monitor feet for redness, swelling, or break in skin integrity.
- Notify the primary health care provider if redness or a break in the skin occurs.
- Avoid thermal injuries from hot water, heating pads, and baths.
- Wash feet with warm (not hot) water and dry thoroughly (avoid foot soaks).
- Avoid treating corns, blisters, or ingrown toenails.
- Do not cross legs or wear tight garments that may constrict blood flow.
- Apply moisturizing lotion to the feet but not between the toes.
- Prevent moisture from accumulating between the toes.
- Wear loose socks and well-fitting (not tight) shoes; do not go barefoot.
- Wear clean cotton socks to keep the feet warm and change the socks daily.
- Avoid wearing the same pair of shoes 2 days in a row.
- Avoid wearing open-toed shoes or shoes with a strap that goes between the toes.
- Check shoes for cracks or tears in the lining and for foreign objects before putting them on.
- Break in new shoes gradually.
- Cut toenails straight across and smooth nails with an emery board.
- Avoid smoking.
- Follow-up with podiatry referral and recommendations as needed.

Practice Questions

487. A client is brought to the emergency department in an unresponsive state, and a diagnosis of hyperosmolar hyperglycemic syndrome is made. The nurse would **immediately** prepare to initiate which anticipated primary health care provider's prescription?
    1. Endotracheal intubation
    2. 100 units of NPH insulin
    3. Intravenous infusion of normal saline
    4. Intravenous infusion of sodium bicarbonate

488. An external insulin pump is prescribed for a client with diabetes mellitus. When the client asks the nurse about the functioning of the pump, the nurse bases the response on which information about the pump?
    1. It is timed to release programmed doses of either short-duration or NPH insulin into the bloodstream at specific intervals.
    2. It continuously infuses small amounts of NPH insulin into the bloodstream while regularly monitoring blood glucose levels.
    3. It is surgically attached to the pancreas and infuses regular insulin into the pancreas. This releases insulin into the bloodstream.
    4. It administers a small continuous dose of short-duration insulin subcutaneously. The client can self-administer an additional bolus dose from the pump before each meal.

489. A client with a diagnosis of diabetic ketoacidosis (DKA) is being treated in

the emergency department. Which findings support this diagnosis? **Select all that apply.**

- ☐ 1. Increase in pH
- ☐ 2. Comatose state
- ☐ 3. Deep, rapid breathing
- ☐ 4. Decreased urine output
- ☐ 5. Elevated blood glucose level

490. The nurse teaches a client with diabetes mellitus about differentiating between hypoglycemia and ketoacidosis. The client demonstrates an understanding of the teaching by stating that a form of glucose should be taken if which symptoms develop? **Select all that apply.**

- ☐ 1. Polyuria
- ☐ 2. Shakiness
- ☐ 3. Palpitations
- ☐ 4. Blurred vision
- ☐ 5. Lightheadedness
- ☐ 6. Fruity breath odor

491. A client with diabetes mellitus demonstrates acute anxiety when admitted to the hospital for the treatment of hyperglycemia. What is the appropriate intervention to decrease the client's anxiety?
    1. Administer a sedative.
    2. Convey empathy, trust, and respect toward the client.
    3. Ignore the signs and symptoms of anxiety, anticipating that they will soon disappear.
    4. Make sure that the client is familiar with the correct medical terms to promote understanding of what is happening.
492. The nurse provides instructions to a client newly diagnosed with type 1 diabetes mellitus. The nurse recognizes accurate understanding of measures to prevent diabetic ketoacidosis when the client makes which statement?
    1. "I will stop taking my insulin if I'm too sick to eat."
    2. "I will decrease my insulin dose during times of illness."
    3. "I will adjust my insulin dose according to the level of glucose in my urine."
    4. "I will notify my primary health care provider (PHCP) if my blood glucose level is higher than 250 mg/dL (13.9 mmol/L)."
493. A client is admitted to a hospital with a diagnosis of diabetic ketoacidosis (DKA). The initial blood glucose level is 950 mg/dL (52.9 mmol/L). A continuous intravenous (IV) infusion of short-acting insulin is initiated, along with IV rehydration with normal saline. The serum glucose level is now decreased to 240 mg/dL (13.3 mmol/L). The nurse would **next** prepare to administer which medication?
    1. An ampule of 50% dextrose

2. NPH insulin subcutaneously
3. IV fluids containing dextrose
4. Phenytoin for the prevention of seizures

494. The nurse is monitoring a client newly diagnosed with diabetes mellitus for signs of complications. Which sign or symptom, if frequently exhibited in the client, indicates that the client is at risk for chronic complications of diabetes if the blood glucose is not adequately managed?
    1. Polyuria
    2. Diaphoresis
    3. Pedal edema
    4. Decreased respiratory rate
495. The nurse is preparing a plan of care for a client with diabetes mellitus who has hyperglycemia. The nurse places **priority** on which client problem?
    1. Lack of knowledge
    2. Inadequate fluid volume
    3. Compromised family coping
    4. Inadequate consumption of nutrients
496. The home health nurse visits a client with a diagnosis of type 1 diabetes mellitus. The client reports a history of vomiting and diarrhea and tells the nurse that no food has been consumed for the last 24 hours. Which additional statement by the client indicates a **need for further teaching**?
    1. "I need to stop my insulin."
    2. "I need to increase my fluid intake."
    3. "I need to monitor my blood glucose every 3 to 4 hours."
    4. "I need to call my primary health care provider (PHCP) because of these symptoms."
497. The nurse is caring for a client after hypophysectomy and notes clear nasal drainage from the client's nostril. The nurse should take which **initial** action?
    1. Lower the head of the bed.
    2. Test the drainage for glucose.
    3. Obtain a culture of the drainage.
    4. Continue to observe the drainage.
498. The nurse is admitting a client who is diagnosed with syndrome of inappropriate antidiuretic hormone secretion (SIADH) and has serum sodium of 118 mEq/L (118 mmol/L). Which primary health care provider prescriptions should the nurse anticipate receiving? **Select all that apply.**
    - ☐ 1. Initiate an infusion of 3% NaCl.
    - ☐ 2. Administer intravenous furosemide.
    - ☐ 3. Restrict fluids to 800 mL over 24 hours.
    - ☐ 4. Elevate the head of the bed to high-Fowler's.
    - ☐ 5. Administer a vasopressin antagonist as prescribed.
499. A client is admitted to an emergency department, and a diagnosis of myxedema coma is made. Which action should the nurse prepare to carry out **initially**?
    1. Warm the client.

2. Maintain a patent airway.
3. Administer thyroid hormone.
4. Administer fluid replacement.

500. The nurse is caring for a client admitted to the emergency department with diabetic ketoacidosis (DKA). In the acute phase, the nurse plans for which **priority** intervention?
    1. Correct the acidosis.
    2. Administer 5% dextrose intravenously.
    3. Apply a monitor for an electrocardiogram.
    4. Administer short-duration insulin intravenously.

501. A client with type 1 diabetes mellitus who takes NPH daily in the morning calls the nurse to report recurrent episodes of hypoglycemia with exercising. Which statement by the client indicates an adequate understanding of the peak action of NPH insulin and exercise?
    1. "I should not exercise since I am taking insulin."
    2. "The best time for me to exercise is after breakfast."
    3. "The best time for me to exercise is mid- to late afternoon."
    4. "NPH is a basal insulin, so I should exercise in the evening."

502. The nurse is completing an assessment on a client who is being admitted for a diagnostic workup for primary hyperparathyroidism. Which client complaints would be characteristic of this disorder? **Select all that apply.**
    - ☐ 1. Polyuria
    - ☐ 2. Headache
    - ☐ 3. Bone pain
    - ☐ 4. Nervousness
    - ☐ 5. Weight gain

503. The nurse is teaching a client with hyperparathyroidism how to manage the condition at home. Which response by the client indicates the **need for additional teaching**?
    1. "I should consume less than 1 liter of fluid per day."
    2. "I should use my treadmill or go for walks daily."
    3. "I should follow a moderate-calcium, high-fiber diet."
    4. "My alendronate helps keep calcium from coming out of my bones."

504. A client with a diagnosis of addisonian crisis is being admitted to the intensive care unit. Which findings will the interprofessional health care team focus on? **Select all that apply.**
    - ☐ 1. Hypotension
    - ☐ 2. Leukocytosis
    - ☐ 3. Hyperkalemia
    - ☐ 4. Hypercalcemia
    - ☐ 5. Hypernatremia

505. The nurse is monitoring a client who was diagnosed with type 1 diabetes mellitus and is being treated with NPH and regular insulin. Which manifestations would alert the nurse to the presence of a possible hypoglycemic reaction? **Select all that apply.**

- ☐ 1. Tremors
- ☐ 2. Anorexia
- ☐ 3. Irritability
- ☐ 4. Nervousness
- ☐ 5. Hot, dry skin
- ☐ 6. Muscle cramps

506. The nurse is performing an assessment on a client with pheochromocytoma. Which assessment data would indicate a potential complication associated with this disorder?

1. A urinary output of 50 mL/hr
2. A coagulation time of 5 minutes
3. A heart rate that is 90 beats per minute and irregular
4. A blood urea nitrogen level of 20 mg/dL (7.1 mmol/L)

507. The nurse is monitoring a client diagnosed with acromegaly who was treated with transsphenoidal hypophysectomy and is recovering in the intensive care unit. Which findings should alert the nurse to the presence of a possible postoperative complication? **Select all that apply.**

- ☐ 1. Anxiety
- ☐ 2. Leukocytosis
- ☐ 3. Chvostek's sign
- ☐ 4. Urinary output of 800 mL/hr
- ☐ 5. Clear drainage on nasal dripper pad

508. The nurse performs a physical assessment on a client with type 2 diabetes mellitus. Findings include a fasting blood glucose level of 70 mg/dL (3.9 mmol/L), temperature of 101° F (38.3° C), pulse of 82 beats per minute, respirations of 20 breaths per minute, and blood pressure of 118/68 mm Hg. Which finding would be the **priority** concern to the nurse?

1. Pulse
2. Respiration
3. Temperature
4. Blood pressure

509. The nurse is preparing a client with a new diagnosis of hypothyroidism for discharge. The nurse determines that the client understands discharge instructions if the client states that which signs and symptoms are associated with this diagnosis? **Select all that apply.**

- ☐ 1. Tremors

- ☐ 2. Weight loss
- ☐ 3. Feeling cold
- ☐ 4. Loss of body hair
- ☐ 5. Persistent lethargy
- ☐ 6. Puffiness of the face

510. A client has just been admitted to the nursing unit following thyroidectomy. Which assessment is the **priority** for this client?
    1. Hoarseness
    2. Hypocalcemia
    3. Audible stridor
    4. Edema at the surgical site

511. A client has been diagnosed with hyperthyroidism. The nurse monitors for which signs and symptoms indicating a complication of this disorder? **Select all that apply.**
    - ☐ 1. Fever
    - ☐ 2. Nausea
    - ☐ 3. Lethargy
    - ☐ 4. Tremors
    - ☐ 5. Confusion
    - ☐ 6. Bradycardia

Answers

487. ***Answer:*** 3

Rationale: The primary goal of treatment in hyperosmolar hyperglycemic syndrome (HHS) is to rehydrate the client to restore fluid volume and to correct electrolyte deficiency. Intravenous (IV) fluid replacement is similar to that administered in diabetic ketoacidosis (DKA) and begins with IV infusion of normal saline. Regular insulin, not NPH insulin, would be administered. The use of sodium bicarbonate to correct acidosis is avoided because it can precipitate a further drop in serum potassium levels. Intubation and mechanical ventilation are not required to treat HHS.

Test-Taking Strategy: Focus on the **subject,** treatment of HHS, and note the **strategic word,** *immediately*. If you can recall the treatment for DKA, you will be able to answer this question easily. Treatment for HHS is similar to the treatment for DKA and begins with rehydration.

Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Planning

Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Diabetes Mellitus
Priority Concepts: Clinical Judgment; Glucose Regulation
Reference: Ignatavicius, Workman, Rebar (2018), pp. 1314-1316.

488. ***Answer:*** 4

Rationale: An insulin pump provides a small continuous dose of short-duration (rapid- or short-acting) insulin subcutaneously throughout the day and night. The client can self-administer an additional bolus dose from the pump before each meal as needed. Short-duration insulin is used in an insulin pump. An external pump is not attached surgically to the pancreas.

Test-Taking Strategy: Focus on the **subject,** use of an insulin pump. Recalling that short-duration insulin is used in an insulin pump will assist in eliminating options 1 and 2. Noting the word *external* in the question will assist in eliminating option 3.

Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Teaching and Learning
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Diabetes Mellitus
Priority Concepts: Client Education; Glucose Regulation
Reference: Lewis et al. (2017), pp. 1128-1129.

489. ***Answer:*** 2, 3, 5

Rationale: Because of the profound deficiency of insulin associated with DKA, glucose cannot be used for energy and the body breaks down fat as a secondary source of energy. Ketones, which are acid by-products of fat metabolism, build up, and the client experiences a metabolic ketoacidosis. High serum glucose contributes to an osmotic diuresis and the client becomes severely dehydrated. If untreated, the client will become comatose due to severe dehydration, acidosis, and electrolyte imbalance. Kussmaul's respirations, the deep rapid breathing associated with DKA, is a compensatory mechanism by the body. The body attempts to correct the acidotic state by blowing off carbon dioxide (CO_2), which is an acid. In the absence of insulin, the client will experience severe hyperglycemia. Option 1 is incorrect, because in acidosis the pH would be low. Option 4 is incorrect because a high serum glucose will result in an osmotic diuresis and the client will experience polyuria.

Test-Taking Strategy: Focus on the **subject,** findings associated with DKA. Recall that the pathophysiology of DKA is the breakdown of fats for energy. The breakdown of fats leads to a state of acidosis. The high serum glucose contributes to an osmotic diuresis. Knowing the pathophysiology of DKA will aid in identification of the correct answers.

Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Assessment
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Diabetes Mellitus

Priority Concepts: Clinical Judgment; Glucose Regulation
Reference: Lewis et al. (2017), pp. 1143-1145.

490. ***Answer:*** 2, 3, 5

Rationale: Shakiness, palpitations, and lightheadedness are signs/symptoms of hypoglycemia and would indicate the need for food or glucose. Polyuria, blurred vision, and a fruity breath odor are manifestations of hyperglycemia.
Test-Taking Strategy: Focus on the **subject,** the treatment of hypoglycemia. Think about its pathophysiology and the manifestations that occur. Recalling the signs and symptoms of hypoglycemia will direct you to the correct option.
Level of Cognitive Ability: Evaluating
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Evaluation
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Diabetes Mellitus
Priority Concepts: Client Education; Glucose Regulation
Reference: Ignatavicius, Workman, Rebar (2018), p. 1309.

491. ***Answer:*** 2

Rationale: Anxiety is a subjective feeling of apprehension, uneasiness, or dread. The appropriate intervention is to address the client's feelings related to the anxiety. Administering a sedative is not the most appropriate intervention and does not address the source of the client's anxiety. The nurse should not ignore the client's anxious feelings. Anxiety needs to be managed before meaningful client education can occur.
Test-Taking Strategy: Use **therapeutic communication techniques** to answer the question. Remember that the client's feelings are the priority. Keeping this in mind will direct you easily to the correct option.
Level of Cognitive Ability: Applying
Client Needs: Psychosocial Integrity
Integrated Process: Caring
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Diabetes Mellitus
Priority Concepts: Anxiety; Caregiving
References: Lewis et al. (2017), pp. 302-303; Potter et al. (2017), pp. 327-329.

492. ***Answer:*** 4

Rationale: During illness, the client with type 1 diabetes mellitus is at increased risk of diabetic ketoacidosis, due to hyperglycemia associated with the stress response and due to a typically decreased caloric intake. As part of sick day management, the client with diabetes should monitor blood glucose levels and should notify the PHCP if the level is higher than 250 mg/dL (13.9 mmol/L). Insulin should never be stopped. In fact, insulin may need to be increased during times of illness. Doses should not be adjusted without the PHCP's advice and are usually

adjusted on the basis of blood glucose levels, not urinary glucose readings.

Test-Taking Strategy: Use general medication guidelines to answer the question. Note that options 1, 2, and 3 are **comparable or alike** and all relate to adjustment of insulin doses.

Level of Cognitive Ability: Evaluating
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Evaluation
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Diabetes Mellitus
Priority Concepts: Client Education; Glucose Regulation
Reference: Ignatavicius, Workman, Rebar (2018), p. 1314.

493. ***Answer:*** 3

Rationale: Emergency management of DKA focuses on correcting fluid and electrolyte imbalances and normalizing the serum glucose level. If the corrections occur too quickly, serious consequences, including hypoglycemia and cerebral edema, can occur. During management of DKA, when the blood glucose level falls to 250 to 300 mg/dL (13.9 to 16.7 mmol/L), the IV infusion rate is reduced and a dextrose solution is added to maintain a blood glucose level of about 250 mg/dL (13.9 mmol/L), or until the client recovers from ketosis. Fifty percent dextrose is used to treat hypoglycemia. NPH insulin is not used to treat DKA. Phenytoin is not a usual treatment measure for DKA.

Test-Taking Strategy: Note the **strategic word,** *next.* Focus on the **subject,** management of DKA. Eliminate option 2 first, knowing that short-duration (rapid-acting) insulin is used in the management of DKA. Eliminate option 1 next, knowing that this is the treatment for hypoglycemia. Note the words *the serum glucose level is now decreased to 240 mg/dL (13.3 mmol/L).* This should indicate that the IV solution containing dextrose is the next step in the management of care.

Level of Cognitive Ability: Synthesizing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Planning
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Diabetes Mellitus
Priority Concepts: Clinical Judgment; Glucose Regulation
Reference: Ignatavicius, Workman, Rebar (2018), pp. 1312-1313.

494. ***Answer:*** 1

Rationale: Chronic hyperglycemia, resulting from poor glycemic control, contributes to the microvascular and macrovascular complications of diabetes mellitus. Classic symptoms of hyperglycemia include polydipsia, polyuria, and polyphagia. Diaphoresis may occur in hypoglycemia. Hypoglycemia is an acute complication of diabetes mellitus; however, it does not predispose a client to the chronic complications of diabetes mellitus. Therefore, option 2 can be eliminated because this finding is characteristic of hypoglycemia. Options 3 and 4 are not associated with diabetes mellitus.

Test-Taking Strategy: Focus on the **subject,** chronic complications of diabetes mellitus. Recall that poor glycemic control contributes to development of the chronic complications of diabetes mellitus. Remember the 3 Ps associated with hyperglycemia—polyuria, polydipsia, and polyphagia.
Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Analysis
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Diabetes Mellitus
Priority Concepts: Clinical Judgment; Glucose Regulation
Reference: Ignatavicius, Workman, Rebar (2018), pp. 1282-1283.

495. ***Answer:*** 2

Rationale: An increased blood glucose level will cause the kidneys to excrete the glucose in the urine. This glucose is accompanied by fluids and electrolytes, causing an osmotic diuresis leading to dehydration. This fluid loss must be replaced when it becomes severe. Options 1, 3, and 4 are not related specifically to the information in the question.
Test-Taking Strategy: Note the **strategic word,** *priority*, and focus on the **information in the question.** Use **Maslow's Hierarchy of Needs theory**. The correct option indicates a physiological need and is the priority. Options 1, 3, and 4 are problems that may need to be addressed after providing for the priority physiological needs.
Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Planning
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Diabetes Mellitus
Priority Concepts: Clinical Judgment; Glucose Regulation
Reference: Lewis et al. (2017), p. 1143.

496. ***Answer:*** 1

Rationale: When a client with diabetes mellitus is unable to eat normally because of illness, the client still should take the prescribed insulin or oral medication. The client should consume additional fluids and should notify the PHCP. The client should monitor the blood glucose level every 3 to 4 hours. The client should also monitor the urine for ketones during illness.
Test-Taking Strategy: Note the **strategic words,** *need for further teaching*. These words indicate a **negative event query** and the need to select the incorrect statement. Remembering that the client needs to take insulin will direct you easily to the correct option.
Level of Cognitive Ability: Evaluating
Client Needs: Physiological Integrity
Integrated Process: Teaching and Learning
Content Area: Adult Health: Endocrine

Health Problem: Adult Health: Endocrine: Diabetes Mellitus
Priority Concepts: Client Education; Glucose Regulation
Reference: Ignatavicius, Workman, Rebar (2018), p. 1314.

497. ***Answer:*** 2

Rationale: After hypophysectomy, the client should be monitored for rhinorrhea, which could indicate a cerebrospinal fluid leak. If this occurs, the drainage should be collected and tested for the presence of cerebrospinal fluid. Cerebrospinal fluid contains glucose, and if positive, this would indicate that the drainage is cerebrospinal fluid. The head of the bed should remain elevated to prevent increased intracranial pressure. Clear nasal drainage would not indicate the need for a culture. Continuing to observe the drainage without taking action could result in a serious complication.

Test-Taking Strategy: Note the **strategic word,** *initial,* and **determine whether an abnormality exists**. This indicates that an action is required. Option 1 can be eliminated first by recalling that this action can increase intracranial pressure. Option 3 can be eliminated also, because the drainage is clear. Because an action is required, eliminate option 4.

Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Pituitary Disorders
Priority Concepts: Clinical Judgment; Intracranial Regulation
Reference: Ignatavicius, Workman, Rebar (2018), p. 1249.

498. ***Answer:*** 1, 3, 5

Rationale: Clients with SIADH experience excess secretion of antidiuretic hormone (ADH), which leads to excess intravascular volume, a declining serum osmolarity, and dilutional hyponatremia. Management is directed at correcting the hyponatremia and preventing cerebral edema. Hypertonic saline is prescribed when the hyponatremia is severe, less than 120 mEq/L (120 mmol/L). An intravenous (IV) infusion of 3% saline is hypertonic. Hypertonic saline must be infused slowly as prescribed, and an infusion pump must be used. Fluid restriction is a useful strategy aimed at correcting dilutional hyponatremia. Vasopressin is an ADH; vasopressin antagonists are used to treat SIADH. Furosemide may be used to treat extravascular volume and dilutional hyponatremia in SIADH, but it is only safe to use if the serum sodium is at least 125 mEq/L (125 mmol/L). When furosemide is used, potassium supplementation should also occur and serum potassium levels should be monitored. To promote venous return, the head of the bed should not be raised more than 10 degrees for the client with SIADH. Maximizing venous return helps avoid stimulating stretch receptors in the heart that signal to the pituitary that more ADH is needed.

Test-Taking Strategy: Focus on the **subject,** treatment for SIADH. Think about the pathophysiology associated with SIADH. Remember that SIADH is associated with

the increased secretion of ADH, or vasopressin. Excess vasopressin leads to increased intravascular fluid volume, decreased serum osmolality, and hyponatremia. When hyponatremia and decreased serum osmolality become severe, cerebral edema occurs.

Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Planning
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Pituitary Disorders
Priority Concepts: Clinical Judgment; Fluids and Electrolytes
Reference: Ignatavicius, Workman, Rebar (2018), pp. 954, 1251-1253.

499. ***Answer:*** 2

Rationale: Myxedema coma is a rare but serious disorder that results from persistently low thyroid production. Coma can be precipitated by acute illness, rapid withdrawal of thyroid medication, anesthesia and surgery, hypothermia, and the use of sedatives and opioid analgesics. In myxedema coma, the initial nursing action is to maintain a patent airway. Oxygen should be administered, followed by fluid replacement, keeping the client warm, monitoring vital signs, and administering thyroid hormones by the intravenous route.

Test-Taking Strategy: Note the **strategic word,** *initially*. All the options are appropriate interventions, but use the **ABCs—airway, breathing, and circulation**—in selecting the correct option.

Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Thyroid Disorders
Priority Concepts: Gas Exchange; Thermoregulation
Reference: Ignatavicius, Workman, Rebar (2018), p. 1271.

500. ***Answer:*** 4

Rationale: Lack of insulin (absolute or relative) is the primary cause of DKA. Treatment consists of insulin administration (short- or rapid-acting), intravenous fluid administration (normal saline initially, not 5% dextrose), and potassium replacement, followed by correcting acidosis. Cardiac monitoring is important due to alterations in potassium levels associated with DKA and its treatment, but applying an electrocardiogram monitor is not the priority action.

Test-Taking Strategy: Focus on the client's diagnosis. Note the **strategic word,** *priority*. Remember that in DKA, the initial treatment is short- or rapid-acting insulin. Normal saline is administered initially; therefore, option 2 is incorrect. Options 1 and 3 may be components of the treatment plan but are not the priority.

Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation

Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Diabetes Mellitus
Priority Concepts: Clinical Judgment; Glucose Regulation
Reference: Lewis et al. (2017), p. 1144.

501. ***Answer:*** 2

Rationale: Exercise is an important part of diabetes management. It promotes weight loss, decreases insulin resistance, and helps control blood glucose levels. A hypoglycemic reaction may occur in response to increased exercise, so clients should exercise either an hour after mealtime or after consuming a 10- to 15-g carbohydrate snack, and they should check their blood glucose level before exercising. Option 1 is incorrect because clients with diabetes should exercise, though they should check with their primary health care provider before starting a new exercise program. Option 3 in incorrect; clients should avoid exercise during the peak time of insulin. NPH insulin peaks at 4 to 12 hours; therefore, afternoon exercise takes place during the peak of the medication. Option 4 is incorrect; NPH insulin is an intermediate-acting insulin, not a basal insulin.

Test-Taking Strategy: Focus on the **subject,** peak action of NPH insulin. Recalling that NPH insulin peaks at 4 to 12 hours and that exercise is beneficial for clients with diabetes will direct you to the correct option.

Level of Cognitive Ability: Evaluating
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Evaluation
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Diabetes Mellitus
Priority Concepts: Client Education; Glucose Regulation
Reference: Ignatavicius, Workman, Rebar (2018), pp. 1300-1301.

502. ***Answer:*** 1, 3

Rationale: The role of parathyroid hormone (PTH) in the body is to maintain serum calcium homeostasis. In hyperparathyroidism, PTH levels are high, which causes bone resorption (calcium is pulled from the bones). Hypercalcemia occurs with hyperparathyroidism. Elevated serum calcium levels produce osmotic diuresis and thus polyuria. This diuresis leads to dehydration (weight loss rather than weight gain). Loss of calcium from the bones causes bone pain. Options 2, 4, and 5 are not associated with hyperparathyroidism. Some gastrointestinal symptoms include anorexia, nausea, vomiting, and constipation.

Test-Taking Strategy: Focus on the **subject,** assessment findings in hyperparathyroidism. Think about the pathophysiology associated with hyperparathyroidism. Remember that hypercalcemia is associated with this disorder and that hypercalcemia leads to diuresis, and that calcium loss from bone leads to bone pain.

Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Assessment

Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Parathyroid Disorders
Priority Concepts: Clinical Judgment; Fluids and Electrolytes
Reference: Ignatavicius, Workman, Rebar (2018), pp. 1275-1276.

503. ***Answer:*** 1

Rationale: In hyperparathyroidism, clients experience excess parathyroid hormone (PTH) secretion. A role of PTH in the body is to maintain serum calcium homeostasis. When PTH levels are high, there is excess bone resorption (calcium is pulled from the bones). In clients with elevated serum calcium levels, there is a risk of nephrolithiasis. One to two liters of fluids daily should be encouraged to protect the kidneys and decrease the risk of nephrolithiasis. Moderate physical activity, particularly weight-bearing activity, minimizes bone resorption and helps protect against pathological fracture. Walking, as an exercise, should be encouraged in the client with hyperparathyroidism. Even though serum calcium is already high, clients should follow a moderate-calcium diet, because a low-calcium diet will surge PTH. Calcium causes constipation, so a diet high in fiber is recommended. Alendronate is a bisphosphate that inhibits bone resorption. In bone resorption, bone is broken down and calcium is deposited into the serum.
Test-Taking Strategy: Note the **strategic words,** *need for additional teaching*. These words indicate a **negative event query** and the need to select the incorrect statement. Consider the pathophysiology of hyperparathyroidism. Hyperparathyroidism leads to bone demineralization, which places the client at risk for pathological fracture, and high serum calcium, which places the client at risk for nephrolithiasis. Knowing that fluids should be encouraged rather than limited to help prevent nephrolithiasis should direct you to the correct option.
Level of Cognitive Ability: Evaluating
Client Needs: Physiological Integrity
Integrated Process: Teaching and Learning
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Parathyroid Disorders
Priority Concepts: Client Education; Fluids and Electrolytes
Reference: Lewis et al. (2017), pp. 1172-1173.

504. ***Answer:*** 1, 3

Rationale: In Addison's disease, also known as adrenal insufficiency, destruction of the adrenal gland leads to decreased production of adrenocortical hormones, including the glucocorticoid cortisol and the mineralocorticoid aldosterone. Addisonian crisis, also known as *acute adrenal insufficiency,* occurs when there is extreme physical or emotional stress and lack of sufficient adrenocortical hormones to manage the stressor. Addisonian crisis is a life-threatening emergency. One of the roles of endogenous cortisol is to enhance vascular tone and vascular response to the catecholamines epinephrine and norepinephrine. Hypotension occurs when vascular tone is decreased and blood vessels cannot respond to epinephrine and norepinephrine. The role of aldosterone in the body is to support the blood pressure

by holding salt and water and excreting potassium. When there is insufficient aldosterone, salt and water are lost and potassium builds up; this leads to hypotension from decreased vascular volume, hyponatremia, and hyperkalemia. The remaining options are not associated with addisonian crisis.

Test-Taking Strategy: Focus on the **subject,** addisonian crisis. Think about the pathophysiology associated with Addison's disease. Recalling that in Addison's disease there is a decrease in the glucocorticoid cortisol and the mineralocorticoid aldosterone will assist in determining the correct answer.

Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Planning
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Adrenal Disorders
Priority Concepts: Clinical Judgment; Fluids and Electrolytes
Reference: Ignatavicius, Workman, Rebar (2018), pp. 1253-1254.

505. ***Answer:*** 1, 3, 4

Rationale: Decreased blood glucose levels produce autonomic nervous system symptoms, which are manifested classically as nervousness, irritability, and tremors. Option 5 is more likely to occur with hyperglycemia. Options 2 and 6 are unrelated to the manifestations of hypoglycemia. In hypoglycemia, usually the client feels hunger.

Test-Taking Strategy: Focus on the **subject,** a hypoglycemic reaction. Think about the pathophysiology and manifestations that occur when the blood glucose is low. Recalling the signs of this type of reaction will direct you easily to the correct options.

Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Assessment
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Diabetes Mellitus
Priority Concepts: Clinical Judgment; Glucose Regulation
Reference: Ignatavicius, Workman, Rebar (2018), p. 1309.

506. ***Answer:*** 3

Rationale: Pheochromocytoma is a catecholamine-producing tumor usually found in the adrenal medulla, but extra-adrenal locations include the chest, bladder, abdomen, and brain; it is typically a benign tumor but can be malignant. Excessive amounts of epinephrine and norepinephrine are secreted. The complications associated with pheochromocytoma include hypertensive retinopathy and nephropathy, myocarditis, increased platelet aggregation, and stroke. Death can occur from shock, stroke, kidney failure, dysrhythmias, or dissecting aortic aneurysm. An irregular heart rate indicates the presence of a dysrhythmia. A coagulation time of 5 minutes is normal. A urinary output of 50 mL/hr is an adequate output. A blood urea nitrogen level of 20 mg/dL (7.1 mmol/L) is a normal

finding.

Test-Taking Strategy: Use the **ABCs—airway, breathing, and circulation.** An irregular heart rate is associated with circulation. In addition, knowing the normal hourly expectations associated with urinary output and the normal laboratory values for coagulation time and blood urea nitrogen level assists in selection of the correct option.

Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Assessment
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Adrenal Disorders
Priority Concepts: Clinical Judgment; Perfusion
Reference: Ignatavicius, Workman, Rebar (2018), pp. 721, 1261-1262.

507. ***Answer:*** 2, 4, 5

Rationale: Acromegaly results from excess secretion of growth hormone, usually caused by a benign tumor on the anterior pituitary gland. Treatment is surgical removal of the tumor, usually with a sublingual transsphenoidal complete or partial hypophysectomy. The sublingual transsphenoidal approach is often through an incision in the inner upper lip at the gum line. Transsphenoidal surgery is a type of brain surgery, and infection is a primary concern. Leukocytosis, or an elevated white count, may indicate infection. Diabetes insipidus is a possible complication of transsphenoidal hypophysectomy. In diabetes insipidus there is decreased secretion of antidiuretic hormone, and clients excrete large amounts of dilute urine. Following transsphenoidal surgery, the nasal passages are packed and a dripper pad is secured under the nares. Clear drainage on the dripper pad is suggestive of a cerebrospinal fluid leak. The surgeon should be notified and the drainage should be tested for glucose. A cerebrospinal fluid leak increases the postoperative risk of meningitis. Anxiety is a nonspecific finding that is common to many disorders. Chvostek's sign is a test of nerve hyperexcitability associated with hypocalcemia and is seen as grimacing in response to tapping on the facial nerve. Chvostek's sign has no association with complications of sublingual transsphenoidal hypophysectomy.

Test-Taking Strategy: Focus on the **subject,** postoperative complications of sublingual transsphenoidal hypophysectomy. Knowing that infection, diabetes insipidus, and cerebrospinal fluid leak are possible complications will assist in determining the correct answer.

Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Assessment
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Pituitary Disorders
Priority Concepts: Clinical Judgment; Intracranial Regulation
Reference: Ignatavicius, Workman, Rebar (2018), pp. 1247, 1249.

508. ***Answer:*** 3

Rationale: In the client with type 2 diabetes mellitus, an elevated temperature may indicate infection. Infection is a leading cause of hyperosmolar hyperglycemic syndrome in the client with type 2 diabetes mellitus. The other findings are within normal limits.

Test-Taking Strategy: Note the **strategic word,** *priority.* Use knowledge of the normal values of vital signs to direct you to the correct option. The client's temperature is the only abnormal value. Remember that an elevated temperature can indicate an infectious process that can lead to complications in the client with diabetes mellitus.

Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Assessment
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Diabetes Mellitus
Priority Concepts: Glucose Regulation; Infection
Reference: Lewis et al. (2017), p. 1145.

509. ***Answer:*** 3, 4, 5, 6

Rationale: Feeling cold, hair loss, lethargy, and facial puffiness are signs of hypothyroidism. Tremors and weight loss are signs of hyperthyroidism.

Test-Taking Strategy: Focus on the **subject,** signs and symptoms associated with hypothyroidism. Options 1 and 2 can be eliminated if you remember that in *hypo*thyroidism there is an *under*secretion of thyroid hormone that causes the metabolism to *slow* down.

Level of Cognitive Ability: Evaluating
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Evaluation
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Thyroid Disorders
Priority Concepts: Client Education; Clinical Judgment
Reference: Lewis et al. (2017), pp. 1168-1169.

510. ***Answer:*** 3

Rationale: Thyroidectomy is the removal of the thyroid gland, which is located in the anterior neck. It is very important to monitor airway status, as any swelling to the surgical site could cause respiratory distress. Although all of the options are important for the nurse to monitor, the priority nursing action is to monitor the airway.

Test-Taking Strategy: Note the **strategic word,** *priority*. Use the **ABCs—airway, breathing, and circulation,** to assist in directing you to the correct option.

Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Assessment
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Thyroid Disorders

Priority Concepts: Clinical Judgment; Gas Exchange
Reference: Lewis et al. (2017), pp. 1167-1168.

511. ***Answer:*** 1, 2, 4, 5

Rationale: Thyroid storm is an acute and life-threatening complication that occurs in a client with uncontrollable hyperthyroidism. Signs and symptoms of thyroid storm include elevated temperature (fever), nausea, and tremors. In addition, as the condition progresses, the client becomes confused. The client is restless and anxious and experiences tachycardia.

Test-Taking Strategy: Focus on the **subject,** signs and symptoms indicating a complication of hyperthyroidism. Recall that thyroid storm is a complication of hyperthyroidism. Options 3 and 6 can be eliminated if you remember that thyroid storm is caused by the release of thyroid hormones into the bloodstream, causing uncontrollable *hyper*thyroidism. Lethargy and bradycardia (think: slow down) are signs of *hypo*thyroidism (slow metabolism).

Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Assessment
Content Area: Adult Health: Endocrine
Health Problem: Adult Health: Endocrine: Thyroid Disorders
Priority Concepts: Clinical Judgment; Thermoregulation
Reference: Ignatavicius, Workman, Rebar (2018), p. 1270.