chapter 50

Pituitary and Adrenocortical Hormones

Key Terms

adrenal insufficiency
corticosteroids
cryptorchism
Cushing's syndrome
diabetes insipidus
feedback mechanism
glucocorticoids
gonadotropins
gonads
hyperstimulation syndrome
mineralocorticoids
rhinyle
somatotropic hormone

Chapter Objectives

On completion of this chapter, the student will:

- List the hormones produced by the pituitary gland and the adrenal cortex.
- Discuss general actions, uses, adverse reactions, contraindications, precautions, and interactions of the pituitary and adrenocortical hormones.
- Discuss important preadministration and ongoing assessment activities the nurse should perform on a patient taking the pituitary and adrenocortical hormones.
- List some nursing diagnoses particular to a patient taking a pituitary or adrenocortical hormone.
- Discuss ways to promote an optimal response to therapy, how to manage common adverse reactions, and important points to keep in mind when educating patients about the use of pituitary or adrenocortical hormones.

The pituitary gland lies deep within the cranial vault, connected to the brain by the infundibular stalk (a downward extension of the floor of the third ventricle) and protected by an indentation of the sphenoid bone called the sella turcica (see Fig. 50-1). The pituitary gland, a small, gray rounded structure, has two parts:

- Anterior pituitary (adenohypophysis)
- Posterior pituitary (neurohypophysis)

The gland secretes a number of pituitary hormones that regulate growth, metabolism, the reproductive cycle, electrolyte balance, and water retention or loss. Because the pituitary gland secretes so many hormones that regulate numerous vital processes, the gland is often referred to as the "master gland." The hormones secreted by the anterior and posterior pituitary and the organs influenced by these hormones are shown in Figure 50-2.

ANTERIOR PITUITARY HORMONES

The hormones of the anterior pituitary include:

- Follicle-stimulating hormone (FSH)
- Luteinizing hormone (LH)
- Growth hormone (GH)
- Adrenocorticotropic hormone (ACTH)
- Thyroid-stimulating hormone (TSH), and prolactin

This section of the chapter discusses FSH, LH, GH, and ACTH. FSH and LH are called **gonadotropins** because they influence the **gonads** (the organs of reproduction). GH, also called somatotropin, contributes to the growth of the body during childhood, especially the growth of muscles and bones. ACTH is produced by the anterior pituitary and stimulates the adrenal cortex to secrete the corticosteroids. The anterior pituitary hormone, TSH, is discussed in Chapter 51. Prolactin, which is also secreted by the anterior pituitary, stimulates the production of breast milk in the postpartum patient. Additional functions of prolactin are not well understood. Prolactin is the only anterior pituitary hormone that is not used medically.

GONADOTROPINS: FSH AND LH

The gonadotropins (FSH and LH) influence the secretion of sex hormones, development of secondary sex characteristics, and the reproductive cycle in both men and

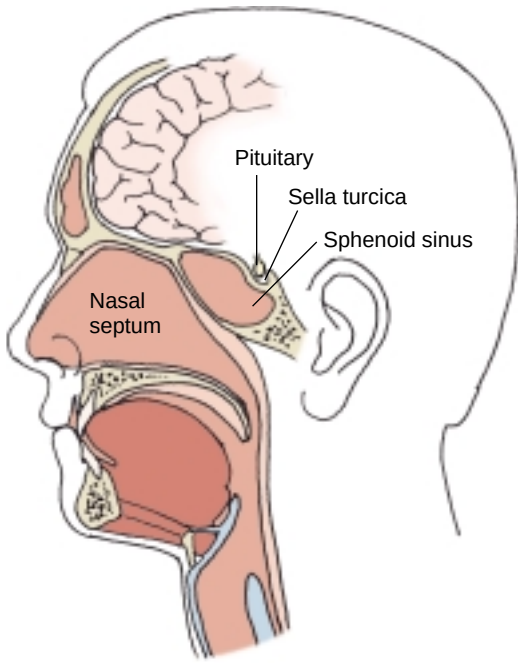

FIGURE 50-1. Location of the pituitary gland.

women. The gonadotropins discussed in this chapter include menotropins, urofollitropin, clomiphene, and chorionic gonadotropin.

ACTION AND USES

Menotropins and Urofollitropin

Menotropins (Pergonal) and urofollitropin (Metrodin) are purified preparations of the gonadotropins (FSH and LH) extracted from the urine of postmenopausal women. Menotropins are used to induce ovulation and pregnancy in anovulatory (failure to produce an ovum or failure to ovulate) women. Menotropins are also used with human chorionic gonadotropin in women to stimulate multiple follicles for in vitro fertilization. In men, menotropins are used to induce the production of sperm (spermatogenesis). Urofollitropin is used to induce ovulation in women with polycystic ovarian disease and to stimulate multiple follicular development in ovulatory women for in vitro fertilization. See the Summary Drug Table: Anterior and Posterior Pituitary Hormones for additional information on the gonadotropins.

Clomiphene and Chorionic Gonadotropin

Clomiphene (Clomid) is a synthetic nonsteroidal compound that binds to estrogen receptors, decreasing the amount of available estrogen receptors and causing the anterior pituitary to increase secretion of FSH and LH. It is used to induce ovulation in anovulatory (nonovulating) women.

Chorionic gonadotropin (HCG) is extracted from human placentas. The actions of HCG are identical to those of the pituitary LH. The hormone is used to induce ovulation in anovulatory women. This drug is also used for the treatment of prepubertal **cryptorchism** (failure of the testes to descend into the scrotum) and in men to treat selected cases of hypogonadotropic hypogonadism.

ADVERSE REACTIONS

Menotropins and Urofollitropin

The adverse reactions associated with the menotropins include ovarian enlargement, hemoperitoneum (blood in the peritoneal cavity), abdominal discomfort, and febrile reactions. Urofollitropin administration may result in mild to moderate ovarian enlargement, abdominal discomfort, nausea, vomiting, breast tenderness, and irritation at the injection site. Multiple births and birth defects have been reported with the use of both menotropins and urofollitropin.

Clomiphene and HCG

Administration of clomiphene may result in vasomotor flushes (which are like the hot flashes of menopause), abdominal discomfort, ovarian enlargement, blurred vision, nausea, vomiting, and nervousness. HCG administration may result in headache, irritability, restlessness, fatigue, edema, and precocious puberty (when given for cryptorchism).

CONTRAINDICATIONS, PRECAUTIONS, AND INTERACTIONS

Menotropins and Urofollitropin

These drugs are contraindicated in patients who have hypersensitivity to the drug or any component of the drug. Menotropins are contraindicated in patients with high gonadotropin levels, thyroid dysfunction, adrenal dysfunction, abnormal bleeding, ovarian cysts, or those with an organic intracranial lesion. Urofollitropin is contraindicated during pregnancy (Pregnancy Category X). Menotropins are Pregnancy Category C drugs and also are contraindicated for use during pregnancy.

Clomiphene and HCG

These drugs are contraindicated in patients with known hypersensitivity to the drugs. Clomiphene is contraindicated in patients with liver disease, abnormal bleeding of undetermined origin, or ovarian cysts, and during

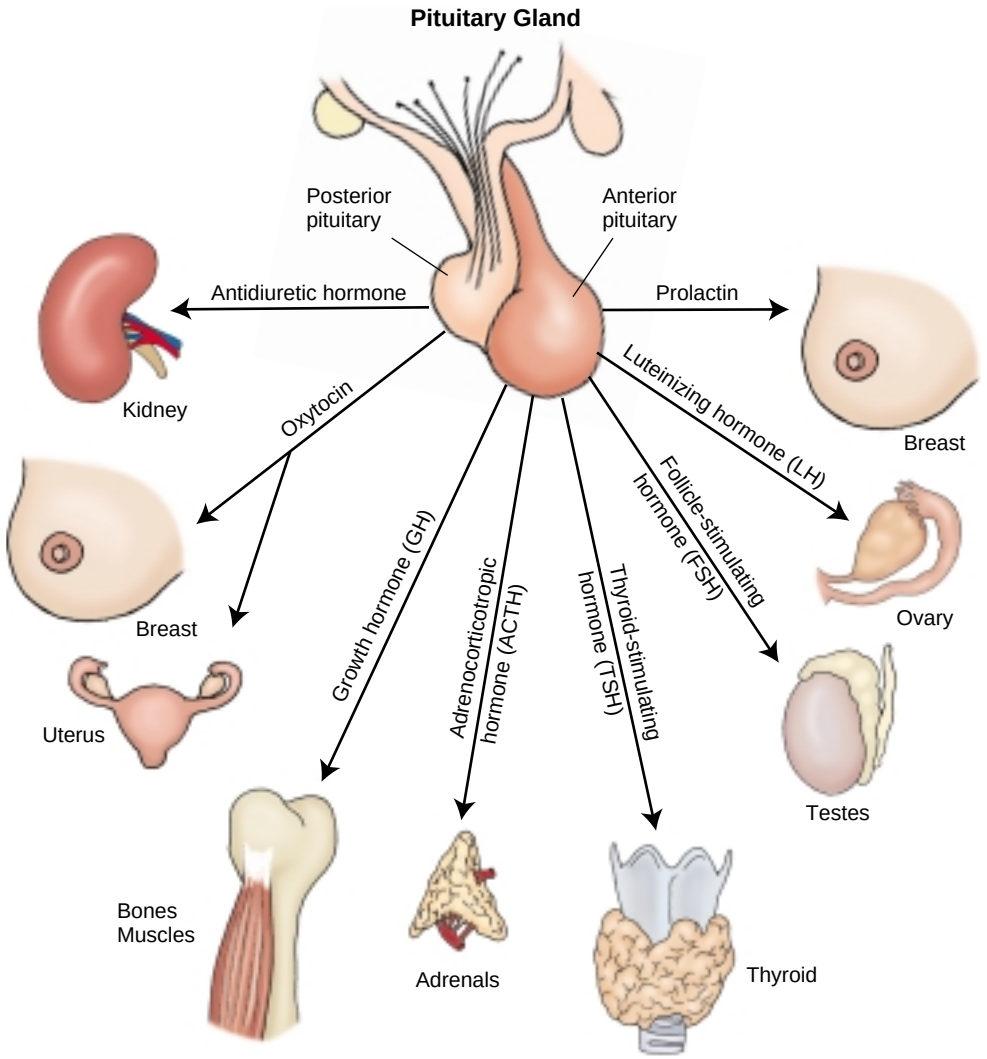

FIGURE 50-2. The pituitary gland, and the hormones secreted by the anterior pituitary and the posterior pututary.

pregnancy (Pregnancy Category C). HCG is contraindicated in patients with precocious puberty, prostatic cancer, or androgen-dependent neoplasm, and during pregnancy (Pregnancy Category X). These drugs are used cautiously in patients with epilepsy, migraine headaches, asthma, cardiac or renal dysfunction, and during lactation. There are no clinically significant known interactions when administering the gonadotropins.

NURSING PROCESS

● The Patient Receiving a Gonadotropin

ASSESSMENT

Preadministration Assessment

These drugs are almost always administered on an outpatient basis. Before prescribing any one of these drugs, the primary health care provider will take a thorough medical history and perform a physical examination. Additional laboratory and diagnostic tests for ovarian function and tubal patency may also be performed. The nurse takes and records the patient's vital signs and weight before therapy is instituted. A pelvic examination may be performed by the primary health care provider to rule out ovarian enlargement, pregnancy, or uterine problems.

Ongoing Assessment

At the time of each office or clinic visit, the nurse questions the patient regarding the occurrence of adverse reactions and records the patient's vital signs and weight.

Nursing Alert

The patient is checked for signs of excessive ovarian enlargement (abdominal distention, pain, ascites ([with serious cases]). The drug is discontinued at the first sign of ovarian stimulation or enlargement. The patient is usually admitted to the hospital for supportive measures.

SUMMARY DRUG TABLE ANTERIOR AND POSTERIOR PITUITARY HORMONES

GENERIC NAME	TRADE NAME*	USES	ADVERSE REACTIONS	DOSAGE RANGES
Anterior Pituitary Hormones				
chorionic gonadotropin (HCG) *go-nad'-oh-tro-pin*	A.P.L., Chorex, Gonic, Profasi, *generic*	Ovulatory failure, prepubertal cryptorchidism	Headache, edema, irritability, fatigue, nervousness, restlessness, precocious puberty, gynecomastia	Dosage frequency, length of treatment are individualized; ranges 5000–10,000 units dose IM
clomiphene citrate *klo'-mi-feen*	Clomid, Milophene, Serophene, *generic*	Ovulatory failure	Vasomotor flushes, breast tenderness, abdominal discomfort, blurred vision, ovarian enlargement, nausea, vomiting, nervousness	First course: 50 mg/d PO for 5 d; second and third course (if necessary) 100 mg/d for 5 d PO
corticotropin (ACTH) *kor-ti-ko-trop'-in*	Acthar, *generic*	Diagnostic testing of adrenocortical function, nonsuppurative thyroiditis, hypercalcemia associated with cancer, acute exacerbations of multiple sclerosis (MS)	Same as glucocorticoids (Display 50-2)	20 units QID IM, SC; diagnostic: 10–25 units *in 500 mL of 5% dextrose injection infused* IV over 8 h; acute exacerbations of MS: 80–120 units/d IM for 2–3 wk
menotropins *men-oh-troe'-pins*	Humegon, Pergonal	Ovulatory failure, stimulation of spermatogenesis	Ovarian enlargement, hemoperitoneum, febrile reactions, multiple pregnancies, hypersensitivity	75–150 IU IM
somatropin *soe-ma-tro'-pin*	Genotropin, Humatrope	Growth failure due to deficiency of pituitary growth hormone in children	Failure to respond to therapy due to development of antibodies, hypothyroidism, insulin resistance, swelling of the joints, joint and/or muscle pain	Genotropin: 0.16–0.24 mg/kg/wk SC divided into 6–7 injections; Humatrope: 0.006–0.0125 mg/kg/d SC
somatrem *soe'-ma-trem*	Protropin	Growth failure	Same as somatropin	Individualize dosage based on response. Up to 0.1 mg/kg IM or SC 3 times a week.
urofollitropin *your-oh-fahl-ih-troe'-pin*	Fertinex, Metrodin	Induction of ovulation, stimulation of multiple follicle development	Ovarian enlargement, nausea, vomiting, breast tenderness, ectopic pregnancy, abdominal discomfort	75 IU IM for 7–12 d then 5000–10,000 U; 1 day after last dose, may repeat sequence using 150 mg for 7–12 d followed by 5000–10,000 U HCG 1 day after last dose
Posterior Hormones				
desmopressin acetate *des-moe-press'-in*	DDAVP, Stimate	Diabetes insipidus, hemophilia A, von Willebrand's disease, nocturnal enuresis	Headache, nausea, nasal congestion, abdominal cramps	0.1–0.4 mL/d as a nasal solution as a single dose or in 2–3 divided doses; 0.5–1 mL/d SC, IV; 1 spray per nostril for a total of 300 mg; 0.05 mg PO BID (adjust according to water turnover)
lypressin *lye-press'-in*	Diapid	Diabetes insipidus	Rhinorrhea, nasal congestion, irritation of nasal passages, headache	1–2 sprays in one or both nostrils QID
vasopressin *vay-soe-press'-in*	Pitressin Synthetic	Diabetes insipidus, prevention and treatment of postoperative abdominal distension, to dispel gas interfering with abdominal x-ray examination	Tremor, sweating, vertigo, nausea, vomiting, abdominal cramps, hypersensitivity, headache	Diabetes insipidus: 5–10 U SC, IM; abdominal distension: 5–10 U IM; prior to abdominal x-ray: 10 U IM, SC 2 hr and ½ h before procedure

*The term *generic* indicates the drug is available in generic form.

Nursing Diagnoses Checklist

- ✓ **Anxiety** related to inability to conceive, treatment outcome, other factors
- ✓ **Pain** related to adverse reactions (ovarian enlargement, irritation at the injection site)

NURSING DIAGNOSES

Drug-specific nursing diagnoses are highlighted in the Nursing Diagnoses Checklist. Other nursing diagnoses applicable to these drugs are discussed in depth in Chapter 4.

PLANNING

The expected outcomes of the patient may include an optimal response to drug therapy, identification of adverse reactions, reduction in anxiety, and an understanding of the therapeutic regimen.

IMPLEMENTATION

Promoting an Optimal Response to Therapy

CLOMIPHENE. Clomiphene is an oral tablet prescribed for 5 days and is self-administered in the outpatient setting.

Nursing Alert

If the patient complains of visual disturbances, the drug therapy is discontinued and the physician notified. An examination by an ophthalmologist is usually indicated.

The patient is observed for symptoms of ovarian stimulation (abdominal pain, distension, sudden ovarian enlargement, ascites). Use of the drug is discontinued and the primary care provider notified if symptoms occur.

Menotropins, urofollitropin, and HCG injections are given in the primary health care provider's office or clinic. These drugs are administered intramuscularly (IM) because they are destroyed in the gastrointestinal (GI) tract. Urofollitropin may cause pain and irritation at the injection site. The nurse should rotate sites and examine previous sites for redness and irritation. Female patients taking these drugs are usually examined by the primary health care provider every other day during treatment and at 2-week intervals to detect excessive ovarian stimulation, called **hyperstimulation syndrome** (sudden ovarian enlargement with ascites). The patient may or may not report pain. This syndrome usually develops quickly, during a period of 3 to 4 days, and requires hospitalization of the patient and discontinuation of the drug therapy. Abdominal pain and distention are indicators that hyperstimulation syndrome may be developing.

Managing Anxiety

Patients wishing to become pregnant often experience a great deal of anxiety. In addition, when taking these drugs there is the possibility of multiple births. The success rate of these drugs varies and depends on many factors. The primary health care provider usually discusses the value of this, as well as other approaches, with the patient and her sexual partner. The nurse allows the patient time to talk about her problems or concerns about the proposed treatment program.

Educating the Patient and Family

The nurse should instruct the patient taking the gonadotropins to keep all primary health care provider appointments. Adverse reactions should be reported to the nurse or primary health care provider. The nurse includes the following information when a gonadotropin is prescribed:

MENOTROPINS AND UROFOLLITROPIN

- Before beginning therapy, be aware of the possibility of multiple births and birth defects.
- It is a good idea to use a calendar to track the treatment schedule and ovulation.
- Report bloating, abdominal pain, flushing, breast tenderness, and pain at the injection site.

CLOMIPHENE

- Take the drug as prescribed (5 days) and do not stop taking the drug before the course of therapy is finished unless told to do so by the primary health care provider.
- Notify the primary health care provider if bloating, stomach or pelvic pain, jaundice, blurred vision, hot flashes, breast discomfort, headache, nausea, or vomiting occurs.
- If ovulation has not occurred after the first course, a second or third course of therapy may be used. If the drug is not successful after three regimens, the therapy is considered unsuccessful and use of the drug is discontinued.

EVALUATION

- The therapeutic effect is achieved.
- Adverse reactions are identified and reported to the primary health care provider.
- Anxiety is reduced.
- The patient demonstrates knowledge of treatment and dosage regimen, adverse drug reactions, risks of treatment, and importance of complying with the primary health care provider's recommendations.

Growth Hormone

Growth hormone, also called **somatotropic hormone,** is secreted by the anterior pituitary. This hormone regulates the growth of the individual until somewhere around early adulthood or the time when the person no longer gains height.

ACTION AND USES

Growth hormone is available as the synthetic products somatrem (Protropin) and somatropin (Humatrope). Both are of recombinant DNA origin and are identical to human GH and produce skeletal growth in children. These drugs are administered to children who have not grown because of a deficiency of pituitary GH and must be used before closure of bone epiphyses. Bone epiphyses are the ends of bones, separated from the main bone but joined to its cartilage, that allow for growth or lengthening of the bone. GH is ineffective in patients with closed epiphyses because when the epiphyses close, growth (in height) can no longer occur.

ADVERSE REACTIONS

These hormones cause few adverse reactions when administered as directed. Antibodies to somatropin may develop in a small number of patients, resulting in a failure to experience response to therapy, namely, failure of the drug to produce growth in the child. Some patients may experience hypothyroidism or insulin resistance. Swelling, joint pain, and muscle pain may also occur.

CONTRAINDICATIONS, PRECAUTIONS, AND INTERACTIONS

Somatrem and somatropin are contraindicated in patients with known hypersensitivity to somatropin or sensitivity to benzyl alcohol, and those with epiphyseal closure or underlying cranial lesions. The drug is used cautiously in patients with thyroid disease or diabetes, and during pregnancy (Pregnancy Category C) and lactation. Excessive amounts of glucocorticoids may decrease response to somatropin.

NURSING PROCESS

The Patient Receiving a Growth Hormone

ASSESSMENT

Preadministration Assessment

A thorough physical examination and laboratory and diagnostic tests are performed before a child is accepted into a growth program. Before therapy is started, the nurse takes and records the patient's vital signs, height, and weight.

Ongoing Assessment

Children may increase their growth rate from 3.5 to 4 cm/year before treatment to 8 to 10 cm/year during the first year of treatment. Each time the child visits the primary health care provider's office or clinic (usually every 3–6 months), the nurse measures and records the child's height and weight to evaluate the response to therapy. Bone age is monitored periodically. The bone age monitors bone growth and detects epiphyseal closure, at which time therapy must be stopped.

Nursing Diagnoses Checklist

- ☑ **Body Image Disturbance** related to changes in appearance, physical size, other (specify)
- ☑ **Anxiety** related to failure to grow (parents and child)

NURSING DIAGNOSES

Drug-specific nursing diagnoses are highlighted in the Nursing Diagnoses Checklist. Other nursing diagnoses applicable to these drugs are discussed in depth in Chapter 4.

PLANNING

The expected outcomes of the patient may include an optimal response to drug therapy, management of common adverse drug reactions, reduction in anxiety, and an understanding of the therapeutic regimen.

IMPLEMENTATION

Promoting an Optimal Response to Therapy

Growth hormone is given either IM or subcutaneously (SC). The vial is not shaken but swirled to mix. The solution is clear, and the nurse should not give it if it is cloudy. These drugs are administered IM or SC. The weekly dosage is divided and given in three to seven doses throughout the week. The drug may (if possible) be given at bedtime to most closely adhere to the body's natural release of the hormone.

Periodic testing of growth hormone levels, glucose tolerance, and thyroid functioning may be done at intervals during treatment.

Managing Anxiety and Body Image Disturbance

The parents, and sometimes the children, may be concerned about the success or possible failure of treatment with GH. The child is provided with the opportunity to share fears, concerns, or anger. The nurse acknowledges these feelings as normal and corrects any misconceptions the child or parents may have concerning treatment. Time is allowed for the parents and children to ask questions not only before therapy is started but also during the months of treatment.

Educating the Patient and Family

When the patient is receiving GH, the primary health care provider discusses in detail the therapeutic regimen

for increasing growth (height) with the child's parents or guardians. If the drug is to be given at bedtime and not in the outpatient clinic, the nurse instructs the parents on the proper technique to administer the injections. The parents are encouraged to keep all clinic or office visits. The nurse explains that the child may experience sudden growth and increase in appetite. The nurse instructs the parents to report lack of growth, symptoms of diabetes (eg, increased hunger, increased thirst, or frequent voiding) or symptoms of hypothyroidism (eg, fatigue, dry skin, intolerance to cold).

EVALUATION

- The therapeutic effect is achieved and the child grows in height.
- Adverse reactions are identified and reported to the primary health care provider.
- Anxiety is reduced.
- The parents verbalize understanding of the treatment program.
- The child maintains a positive body image.

Adrenocorticotropic Hormone: Corticotropin

ACTIONS AND USES

Corticotropin (ACTH) is an anterior pituitary hormone that stimulates the adrenal cortex to produce and secrete adrenocortical hormones, primarily the glucocorticoids.

Corticotropin is used for diagnostic testing of adrenocortical function. This drug may also be used for the management of acute exacerbations of multiple sclerosis, nonsuppurative thyroiditis, and hypercalcemia associated with cancer. It is also used as an anti-inflammatory and immunosuppressant drug when conventional glucocorticoid therapy has not been effective (see Display 50-1).

ADVERSE REACTIONS

Because ACTH stimulates the release of glucocorticoids from the adrenal gland, adverse reactions seen with the administration of this hormone are similar to those seen with the glucocorticoids (see Display 50-2) and affect many body systems. The most common adverse reactions include:

- Central nervous system—mental depression, mood swings, insomnia, psychosis, euphoria, nervousness, and headaches;
- Cardiovascular system—hypertension, edema, congestive heart failure, and thromboembolism;
- Gastrointestinal system—nausea, vomiting, increased appetite, weight gain, and peptic ulcer;
- Genitourinary system—amenorrhea and irregular menses;
- Integumentary system—petechiae, ecchymosis, decreased wound healing, hirsutism (excessive growth of body hair), and acne;
- Musculoskeletal system—weakness and osteoporosis;
- Endocrine system—menstrual irregularities, hyperglycemia, and decreased growth in children; and

DISPLAY 50-1 ● Uses of Glucocorticoids

ENDOCRINE DISORDERS
Primary or secondary adrenal cortical insufficiency, congenital adrenal hyperplasia, nonsuppressive thyroiditis, hypercalcemia associated with cancer

RHEUMATIC DISORDERS
Short-term management of acute ankylosing spondylitis, acute and subacute bursitis, acute nonspecific tenosynovitis, acute gouty arthritis, psoriatic arthritis, rheumatoid arthritis, post-traumatic osteoarthritis, synovitis of osteoarthritis, epicondylitis

COLLAGEN DISEASES
Lupus erythematosus, acute rheumatic carditis, systemic dermatomyositis

DERMATOLOGIC DISEASES
Pemphigus, bullous dermatitis herpetiformis, severe erythema multiforme (Stevens-Johnson syndrome), exfoliative dermatitis, mycosis fungoides, severe psoriasis, severe seborrheic dermatitis, angioedema, urticaria, various skin disorders, such as lichen planus or keloids

ALLERGIC STATES
Control of severe or incapacitating allergic conditions not controlled by other methods, bronchial asthma (including status asthmaticus), contact dermatitis, atopic dermatitis, serum sickness, drug hypersensitivity reactions

OPHTHALMIC DISEASES
Severe acute and chronic allergic and inflammatory processes, keratitis, allergic corneal marginal ulcers, herpes zoster of the eye, iritis, iridocyclitis, chorioretinitis, diffuse posterior uveitis, optic neuritis, sympathetic ophthalmia, anterior segment inflammation

RESPIRATORY DISEASES
Sarcoidosis, berylliosis, fulminating or disseminating pulmonary tuberculosis, aspiration pneumonia

HEMATOLOGIC DISORDERS
Idiopathic or secondary thrombocytopenic purpura, hemolytic anemia, red blood cell anemia, congenital hypoplastic anemia

NEOPLASTIC DISEASES
Leukemia, lymphomas

EDEMATOUS STATES
To induce diuresis or remission of proteinuria in the nephrotic state

GASTROINTESTINAL DISEASES
During critical period of ulcerative colitis, regional enteritis, intractable sprue

NERVOUS SYSTEM
Acute exacerbations of multiple sclerosis

DISPLAY 50-2 ● Adverse Reactions Associated With Glucocorticoids

FLUID AND ELECTROLYTE DISTURBANCES
Sodium and fluid retention, congestive heart failure in susceptible patients, potassium loss, hypokalemic alkalosis, hypertension, hypocalcemia, hypotension or shocklike reactions

MUSCULOSKELETAL
Muscle weakness, loss of muscle mass, tendon rupture, osteoporosis, aseptic necrosis of femoral and humoral heads, spontaneous fractures

CARDIOVASCULAR
Thromboembolism or fat embolism, thrombophlebitis, necrotizing angiitis, syncopal episodes, cardiac arrhythmias, aggravation of hypertension

GASTROINTESTINAL
Pancreatitis, abdominal distention, ulcerative esophagitis, nausea, increased appetite and weight gain, possible peptic ulcer with perforation, hemorrhage

DERMATOLOGIC
Impaired wound healing, thin fragile skin, petechiae, ecchymoses, erythema, increased sweating, suppression of skin test reactions, subcutaneous fat atrophy purpura, striae, hyperpigmentation, hirsutism, acneiform eruptions, urticaria, angioneurotic edema

NEUROLOGIC
Convulsions, steroid-induced catatonia, increased intracranial pressure with papilledema (usually after treatment is discontinued), vertigo, headache, neuritis or paresthesia, steroid psychosis, insomnia

ENDOCRINE
Amenorrhea, other menstrual irregularities, development of cushingoid state, suppression of growth in children, secondary adrenocortical and pituitary unresponsive (particularly in times of stress), decreased carbohydrate tolerance, manifestation of latent diabetes mellitus, increased requirements for insulin or oral hypoglycemic agents (in diabetics)

OPHTHALMIC
Posterior subcapsular cataracts, increased intraocular pressure, glaucoma, exophthalmos

METABOLIC
Negative nitrogen balance (due to protein catabolism)

OTHER
Anaphylactoid or hypersensitivity reactions, aggravation of existing infections, malaise, increase or decrease in sperm motility and number

- Miscellaneous—hypersensitivity reactions, hypokalemia, hypernatremia, increased susceptibility to infection, cushingoid appearance (eg, moon face, "buffalo hump," hirsutism), cataracts, and increased intraocular pressure.

CONTRAINDICATIONS, PRECAUTIONS, AND INTERACTIONS

ACTH is contraindicated in patients with adrenocortical insufficiency or hyperfunction, allergy to pork or pork products (corticotropin is obtained from porcine pituitaries), systemic fungal infections, ocular herpes simplex, scleroderma, osteoporosis, and hypertension. Patients taking ACTH also should avoid any vaccinations with live virus.

ACTH is used cautiously in patients with diabetes, diverticulosis, renal insufficiencies, myasthenia gravis, tuberculosis (may reactivate the disease), hypothyroidism, cirrhosis, nonspecific ulcerative colitis, heart failure, seizures, or febrile infections. The drug is classified as a Pregnancy Category C drug and is used cautiously during pregnancy and lactation. ACTH is used cautiously in children because it can inhibit skeletal growth.

When amphotericin B or diuretics are administered with ACTH, the potential for hypokalemia is increased. There may be an increased need for insulin or oral antidiabetic drugs in the patient with diabetes who is taking ACTH. There is a decreased effect of ACTH when the agent is administered with the barbiturates. Profound muscular depression is possible when ACTH is administered with the anticholinesterase drugs. Live virus vaccines taken while taking ACTH may potentiate virus replication, increase vaccine adverse reaction, and decrease the patient's antibody response to the vaccine.

NURSING PROCESS

● The Patient Receiving Corticotropin (ACTH)

ASSESSMENT

Preadministration Assessment

Before administering ACTH, the nurse reviews the patient's chart for the diagnosis, laboratory tests, and other pertinent information. The nurse obtains the patient's weight and assesses skin integrity, lungs, and mental status. The nurse takes and records vital signs. Additional assessments depend on the patient's condition and diagnosis. The primary health care provider may order baseline diagnostic tests, such as chest x-rays, upper GI x-ray, serum electrolytes, complete blood count, or urinalysis.

Ongoing Assessment

The nurse monitors the patient's weight and fluid intake and output daily during therapy. The nurse observes for and reports any evidence of edema, such as weight gain, rales, increased pulse or dyspnea, or swollen extremities. The nurse monitors blood glucose levels for a rise in blood glucose concentration. In addition, the nurse checks stools for evidence of bleeding (dark or tarry in color, positive guaiac). Patients receiving prolonged therapy should have periodic hematologic, serum electrolytes, and serum glucose studies.

Nursing Diagnoses Checklist

- ✓ **Risk for Infection** related to adverse drug effects
- ✓ **Disturbed Thought Processes** related to adverse drug reactions

NURSING DIAGNOSES

Drug-specific nursing diagnoses are highlighted in the Nursing Diagnoses Checklist. Other nursing diagnoses applicable to these drugs are discussed in depth in Chapter 4.

PLANNING

The expected outcomes of the patient may include an optimal response to therapy, identification and management of adverse reactions (see section "Monitoring and Managing Adverse Reactions"), and an understanding of the therapeutic regimen.

IMPLEMENTATION

Promoting an Optimal Response to Therapy

Nursing management depends on the patient's diagnosis, physical status, and the reason for use of the drug. The nurse may need to assess vital signs every 4 hours and observe for the adverse reactions seen with glucocorticoid administration.

This drug may be given by the intravenous (IV), SC, or IM route. During parenteral administration of ACTH, the nurse observes the patient for hypersensitivity reactions. Symptoms of hypersensitivity include a rash, urticaria, hypotension, tachycardia, or difficulty breathing. If the drug is given IM or SC, the nurse observes the patient for hypersensitivity reactions immediately and for about 2 hours after the drug is given. If a hypersensitivity reaction occurs, the nurse notifies the primary health care provider immediately. Long-term use increases the risk of hypersensitivity.

Monitoring and Managing Adverse Reactions

Corticotropin may mask signs of infection, including fungal or viral eye infections.

Nursing Alert

The nurse reports any complaints of sore throat, cough, fever, malaise, sores that do not heal, or redness or irritation of the eyes in the patient taking ACTH.

There may be a decreased resistance and inability to localize infection. The nurse observes the skin daily for localized signs of infection, especially at injection sites or IV access sites. Visitors are monitored to protect the patient against those with infectious illness.

Corticotropin can also cause alterations in the psyche. The nurse must report any evidence of behavior change, such as mental depression, insomnia, euphoria, mood swings, or nervousness. Should alterations in the psyche occur, the nurse encourages communication with the staff and family members, provides a quiet nonthreatening environment, and spends time actively listening as the patient talks. It is important to encourage verbalization of fears and concerns. Anxiety is decreased with understanding of the therapeutic regimen. The nurse allows time for a thorough explanation of the drug regimen and answering of questions.

Educating the Patient and Family

The nurse includes the following in a teaching plan for the patient receiving ACTH.

- Report any adverse reactions.
- Avoid contact with those who have an infection because resistance to infection may be decreased.
- Report any symptoms of infection immediately (eg, sore throat, fever, cough, or sores that do not heal).
- Patients with diabetes—Monitor blood glucose (if self-monitoring is being done) or urine closely and notify the primary health care provider if glucose appears in the urine or the blood glucose level increases significantly. An increase in the dosage of the oral antidiabetic drug or insulin may be needed.
- Notify the primary health care provider of a marked weight gain, swelling in the extremities, muscle weakness, persistent headache, visual disturbances, or behavior change.

EVALUATION

- The therapeutic effect is achieved.
- Adverse reactions are identified, reported to the primary health care provider, and managed using appropriate nursing interventions.
- The patient verbalizes an understanding of the therapeutic regimen and adverse effects requiring notification of the primary health care provider.

POSTERIOR PITUITARY HORMONES

The posterior pituitary gland produces two hormones: vasopressin (antidiuretic hormone) and oxytocin (see Chap. 53). Posterior pituitary hormones are summarized in the Summary Drug Table: Anterior and Posterior Pituitary Hormones.

Vasopressin

ACTIONS AND USES

Vasopressin (Pitressin Synthetic) and its derivatives, namely lypressin (Diapid) and desmopressin (DDAVP), regulate the reabsorption of water by the kidneys. Vasopressin is secreted by the pituitary when body fluids must be conserved. An example of this mechanism may be seen when an individual has severe vomiting and diarrhea with little or no fluid intake. When this and similar conditions are present, the posterior pituitary releases the hormone vasopressin, water in the kidneys is reabsorbed into the blood (ie, conserved), and the urine becomes concentrated. Vasopressin exhibits its greatest activity on the renal tubular epithelium, where it promotes water resorption and smooth muscle contraction throughout the vascular bed. Vasopressin has some vasopressor activity.

Vasopressin and its derivatives are used in the treatment of **diabetes insipidus**, a disease resulting from the failure of the pituitary to secrete vasopressin or from surgical removal of the pituitary. Diabetes insipidus is characterized by marked increase in urination (as much as 10 L in 24 hours) and excessive thirst by inadequate secretion of the antidiuretic hormone or vasopressin. Treatment with vasopressin therapy replaces the hormone in the body and restores normal urination and thirst. Vasopressin may also be used for the prevention and treatment of postoperative abdominal distention and to dispel gas interfering with abdominal roentgenography.

ADVERSE REACTIONS

Local or systemic hypersensitivity reactions may occur in some patients receiving vasopressin. Tremor, sweating, vertigo, nausea, vomiting, abdominal cramps, and water intoxication (overdosage, toxicity) may also be seen.

CONTRAINDICATIONS, PRECAUTIONS, AND INTERACTIONS

Vasopressin is contraindicated in patients with chronic renal failure, increased blood urea nitrogen, and those with allergy to beef or pork proteins.

Vasopressin is used cautiously in patients with a history of seizures, migraine headaches, asthma, congestive heart failure, or vascular disease (may precipitate angina or myocardial infarction) and in those with perioperative polyuria. The drug is classified as a Pregnancy Category C drug and must be used cautiously during pregnancy and lactation.

The antidiuretic effects of vasopressin may be decreased when the agent is taken with the following drugs: lithium, heparin, norepinephrine, or alcohol. Antidiuretic effect may be increased when the drug is used with carbamazepine, clofibrate, or fludrocortisone.

NURSING PROCESS

The Patient Receiving Vasopressin

ASSESSMENT

Preadministration Assessment

Before administering the first dose of vasopressin for the management of diabetes insipidus, the nurse takes the patient's blood pressure, pulse, and respiratory rate. The nurse weighs the patient to obtain a baseline weight for future comparison. Serum electrolyte levels and other laboratory tests may be ordered by the primary health care provider.

Before administering vasopressin to relieve abdominal distention, the nurse takes the patient's blood pressure, pulse, and respiratory rate. The nurse auscultates the abdomen and records the findings. The nurse measures and records the patient's abdominal girth.

Ongoing Assessment

During the ongoing assessment the nurse monitors the blood pressure, pulse, and respiratory rate every 4 hours or as ordered by the primary health care provider. The primary health care provider is notified if there are any significant changes in these vital signs because a dosage adjustment may be necessary.

The dosage of vasopressin or its derivatives may require periodic adjustments. After administration of the drug, the nurse observes the patient every 10 to 15 minutes for signs of an excessive dosage (eg, blanching of the skin, abdominal cramps, and nausea). If these occur, the nurse reassures the patient that recovery from these effects will occur in a few minutes.

Gerontologic Alert

Older adults are particularly sensitive to the effects of vasopressin and should be monitored closely during administration of the drug.

NURSING DIAGNOSES

Drug-specific nursing diagnoses are highlighted in the Nursing Diagnoses Checklist. Other nursing diagnoses applicable to these drugs are discussed in depth in Chapter 4.

Nursing Diagnoses Checklist

- ✓ **Deficient Fluid Volume** related to inadequate fluid intake, need to increase dose of drug, failure to recognize symptoms of dehydration (diabetes insipidus)
- ✓ **Excess Fluid Volume** related to adverse reactions (water intoxication)

PLANNING

The expected outcomes of the patient may include an optimal response to therapy, identification of adverse reactions, and an understanding of the therapeutic regimen.

IMPLEMENTATION

Promoting an Optimal Response to Therapy

Vasopressin may be given IM or SC to treat diabetes insipidus. The injection solution may also be administered intranasally on cotton pledgets, by nasal spray, or dropper. When given parenterally 5 to 10 units administered two to three times daily is usually sufficient. To prevent or relieve abdominal distension, 5 units of the drug is administered initially and may increase to 10 units every 3 or 4 hours IM. When the drug is administered before abdominal roentgenography, the nurse administers 2 injections of 10 units each. The first dose is given 2 hours before x-ray examination and the second dose ½ hour before the testing. An enema may be given before the first dose.

Lypressin is administered intranasally by spraying 1 or 2 sprays in one or both nostrils usually four times per day or when the frequency of urination increases or significant thirst develops. Dosages greater than 10 sprays in each nostril every 3 to 4 hours are not recommended. Patients learn to regulate their dosage based on the frequency of urination and increase of thirst. The nurse instructs the patient to hold the bottle upright with the head in a vertical position when administering the drug.

Desmopressin may be given orally, intranasally, SC, or IV. The oral dose must be determined for each individual patient and adjusted according to the patient's response to therapy. When the drug is administered nasally, a nasal tube is used for administration. The nasal tube delivery system comes with a flexible calibrated plastic tube called a **rhinyle**. The solution is drawn into the rhinyle. One end is inserted into the nostril and the patient (if condition allows) blows the other end to deposit solution deep into the nasal cavity. A nasal spray pump may also be used. Most adults require 0.2 mL daily in two divided doses to control diabetes insipidus. The drug may also be administered via the SC route or direct IV injection.

Monitoring and Managing Adverse Reactions

The adverse reactions associated with vasopressin, such as skin blanching, abdominal cramps, and nausea, may be decreased by administering the agent with one or two glasses of water. Should these adverse reactions occur, the nurse informs the patient that these reactions are not serious and should disappear within a few minutes.

Nursing Alert

Excessive dosage is manifested as water intoxication (fluid overload). Symptoms of water intoxication include drowsiness, listlessness, confusion, and headache (which may precede convulsions and coma). If signs of excessive dosage occur, the nurse should notify the primary health care provider before the next dose of the drug is due because a change in the dosage, the restriction of oral or IV fluids, and the administration of a diuretic may be necessary.

MANAGING FLUID VOLUME. The symptoms of diabetes insipidus include the voiding of a large volume of urine at frequent intervals during the day and throughout the night. Accompanied by frequent urination is the need to drink large volumes of fluid because these patients are continually thirsty. Patients must be supplied with large amounts of drinking water. The nurse is careful to refill the water container at frequent intervals. This is especially important when the patient has limited ambulatory activities. Until controlled by a drug, the symptoms of frequent urination and excessive thirst may cause a great deal of anxiety. The nurse reassures the patient that with the proper drug therapy, these symptoms will most likely be reduced or eliminated.

When the patient has diabetes insipidus, the nurse measures the fluid intake and output accurately and observes the patient for signs of dehydration (dry mucous membranes, concentrated urine, poor skin turgor, flushed dry skin, confusion). This is especially important early in treatment and until such time as the optimum dosage is determined and symptoms have diminished. If the patient's output greatly exceeds intake, the nurse notifies the primary health care provider. In some instances, the primary health care provider may order specific gravity and volume measurements of each voiding or at hourly intervals. The nurse records these results in the chart to aid the primary health care provider in adjusting the dosage to the patient's needs.

MANAGING ABDOMINAL DISTENTION. If the patient is receiving vasopressin for abdominal distention, the nurse explains in detail the method of treating this problem and the necessity of monitoring drug effectiveness (ie, auscultation of the abdomen for bowel sounds, insertion of a rectal tube, measurement of the abdomen).

After administration of vasopressin for abdominal distention, a rectal tube may be ordered. The lubricated end of the tube is inserted past the anal sphincter and taped in place. The tube is left in place for 1 hour or as prescribed by the primary health care provider. The nurse auscultates the abdomen every 15 to 30 minutes and measures the abdominal girth every hour, or as ordered by the primary health care provider.

Educating the Patient and Family

If lypressin or desmopressin is to be used in the form of a nasal spray or is to be instilled intranasally using the nasal tube delivery system, the nurse demonstrates the technique of instillation (see Patient and Family Teaching Checklist: Self-Administering Nasal Vasopressin). The nurse includes illustrated patient instructions with the drug and reviews them with the patient. If possible, the nurse has the patient demonstrate the technique of administration. The nurse should discuss the need to take the drug only as directed by the primary health care provider. The patient should not increase the dosage (ie, the number or frequency of sprays) unless advised to do so by the primary health care provider.

On occasion, a patient may need to self-administer vasopressin by the parenteral route. If so, the nurse instructs the patient or a family member in the preparation and administration of the drug and measurement of the specific gravity of the urine.

The nurse stresses the importance of adhering to the prescribed treatment program to control symptoms. In addition to instruction in administration, the nurse includes the following in a patient and family teaching plan:

- Drink one or two glasses of water immediately before taking the drug.
- Measure the amount of fluids taken each day.
- Measure the amount of urine passed at each voiding and then total the amount for each 24-hour period.
- Avoid the use of alcohol while taking these drugs.
- Rotate injection sites for parenteral administration.
- Contact the primary health care provider immediately if any of the following occur: a significant increase or decrease in urinary output, abdominal cramps, blanching of the skin, nausea, signs of inflammation or infection at the injection sites, confusion, headache, or drowsiness.
- Wear a medical alert tag identifying the disease (diabetes insipidus) and the drug regimen.

Patient and Family Teaching Checklist

Self-Administering Nasal Vasopressin

The nurse:

- ✓ Explains the reason for the drug and prescribed therapy, including drug name, correct dose (number of sprays), and frequency of administration.
- ✓ Describes equipment to be used for intranasal administration.
- ✓ Reviews schedule of administration and prescribed number of sprays to each nostril based on signs and symptoms of disease (diabetes insipidus), such as frequency of urination and increased thirst.
- ✓ Demonstrates step-by-step procedure for instillation and care, with patient performing a return demonstration of procedure.
- ✓ Provides written instructions for procedure.
- ✓ Reassures that symptoms of the disorder will most likely be reduced or eliminated with drug therapy.
- ✓ Instructs in signs and symptoms of fluid overload and the need to notify health care provider should any occur.
- ✓ Emphasizes importance of wearing medical alert tag identifying the disorder and drug therapy.
- ✓ Reinforces the need for continued follow-up to evaluate therapy.

Lypressin

- ✓ Instructs to hold bottle upright with head in vertical position.
- ✓ Discusses importance of taking drug exactly as prescribed (usually 1–2 sprays to one or both nostrils 4 times a day) and not to increase the number of sprays unless directed to do so by prescriber.
- ✓ Warns that dosages greater than 10 sprays in each nostril every 3 to 4 hours are not recommended.

Desmopressin

- ✓ When administering nasally, a nasal tube is used for administration. The nasal tube delivery system comes with a flexible calibrated plastic tube called a rhinyle.
- ✓ The prescribed amount of solution is drawn into the rhinyle. One end is inserted into the nostril, and the patient blows the other end to deposit solution deep into the nasal cavity.
- ✓ A nasal spray pump may also be used.

EVALUATION

- The therapeutic effect is achieved.
- Anxiety is reduced.
- Signs of a fluid volume deficit are absent (diabetes insipidus).
- The patient verbalizes an understanding of the treatment modalities and the importance of continued follow-up care (diabetes insipidus).
- The patient and family demonstrate an understanding of the drug regimen.

- Adverse reactions are identified and reported to the primary health care provider (diabetes insipidus).
- The patient verbalizes the importance of complying with the prescribed therapeutic regimen (diabetes insipidus).

ADRENOCORTICAL HORMONES

The adrenal gland lies on the superior surface of each kidney. It is a double organ composed of an outer cortex and an inner medulla. In response to ACTH secreted by the anterior pituitary, the adrenal cortex secretes several hormones (the glucocorticoids, the mineralocorticoids, and small amounts of sex hormones).

This section of the chapter discusses the hormones produced by the adrenal cortex or the adrenocortical hormones, which are the glucocorticoids and mineralocorticoids. These hormones are essential to life and influence many organs and structures of the body. The **glucocorticoids** and **mineralocorticoids** are collectively called **corticosteroids.**

GLUCOCORTICOIDS

The glucocorticoids influence or regulate functions such as the immune response system, the regulation of glucose, fat and protein metabolism, and control of the anti-inflammatory response. Table 50-1 describes the activity of the glucocorticoids within the body.

ACTIONS AND USES

The glucocorticoids enter target cells and bind to receptors, initiating many complex reactions in the body. Some of these actions are considered undesirable, depending on the indication for which these drugs are being used. Examples of the glucocorticoids include cortisone, hydrocortisone, prednisone, prednisolone, and triamcinolone. The Summary Drug Table: Adrenocortical Hormones: Glucocorticoids and Mineralocorticoids provides information concerning these hormones.

The glucocorticoids are used as replacement therapy for adrenocortical insufficiency, to treat allergic reactions, collagen diseases (eg, systemic lupus erythematosus), dermatologic conditions, rheumatic disorders, shock, and other conditions (see Display 50-1). The anti-inflammatory activity of these hormones make them valuable as anti-inflammatories and as immunosuppressants to suppress inflammation and modify the immune response.

ADVERSE REACTIONS

The adverse reactions that may be seen with the administration of the glucocorticoids are given in Display 50-2. Long- or short-term high-dose therapy may also produce many of the signs and symptoms seen with **Cushing's syndrome,** a disease caused by the overproduction of endogenous glucocorticoids. Some of the signs and symptoms of this Cushing-like (or cushingoid) state include a "buffalo" hump (a hump on the back of

TABLE 50-1 Activity of Glucocorticoids in the Body

FUNCTION WITHIN THE BODY	DESCRIPTION OF BODILY ACTIVITY
Anti-inflammatory	Stabilizes lysosomal membrane and prevents the release of proteolytic enzymes released during the inflammatory process
Regulation of blood pressure	Potentiates vasoconstrictor action of norepinephrine. Without glucocorticoids the vasoconstricting action is decreased, and blood pressure falls.
Metabolism of carbohydrates and protein	Facilitates the breakdown of protein in the muscle, leading to increased plasma amino acid levels. Increases activity of enzymes necessary for glucogenesis producing hyperglycemia, which can aggravate diabetes, precipitate latent diabetes, and cause insulin resistance
Metabolism of fat	A complex phenomena that promotes the use of fat for energy (a positive effect) and permits fat stores to accumulate in the body, causing buffalo hump and moon- or round-shaped face (a negative effect).
Interference with the immune response	Decreases the production of lymphocytes and eosinophils in the blood by causing atrophy of the thymus gland; blocks the release of cytokines, resulting in a decreased performance of T and B monocytes in the immune response. (This action, coupled with the anti-inflammatory action, makes the corticosteroids useful in delaying organ rejection in patients with transplants.)
Stress	As a protective mechanism, the corticosteroids are released during periods of stress (eg, injury or surgery). The release of epinephrine or norepinephrine by the adrenal medulla during stress has a synergistic effect along with the corticosteroids.
Central nervous system disturbances	Affects mood and possibly causes neuronal or brain excitability, causing euphoria, anxiety, depression, psychosis, and an increase in motor activity in some individuals

SUMMARY DRUG TABLE ADRENOCORTICAL HORMONES: CORTICOSTEROIDS AND MINERALOCORTICOIDS

GENERIC NAME	TRADE NAME*	USES	ADVERSE REACTIONS	DOSAGE RANGES
Glucocorticoids				
betamethasone *bay-ta-meth'-a-zone*	Celestone	See Display 50-1	See Display 50-2	Individualize dosage: 0.6–7.2 mg/d PO
betamethasone sodium phosphate *bay-ta-meth'-a-zone*	Celestone Phosphate	See Display 50-1	See Display 50-2	Up to 9 mg/d IM, IV
budesonide *bue-des'-oh-nide*	Entocort EC	Crohn's disease	See Display 50-2	9 mg once daily in AM for 8 wk
cortisone *kor'-ti-sone*	*Generic*	See Display 50-1	See Display 50-2	25–300 mg/day PO
dexamethasone *dex-a-meth'-a-sone*	Decadron, Dexameth, Dexone, Hexadrol, *generic*	Acute self-limited allergic disorder or acute exacerbations of chronic allergic disorders	See Display 50-2	Individualize dosage based on severity of condition and response; give daily dose before 9 AM to minimize adrenal suppression; after long-term therapy, reduce slowly to avoid adrenal insufficiency
dexamethasone acetate *dex-a-meth'-a-sone*	Cortastat-LA, Dalalone-LA, Decadron-LA, Dexasone-LA, Dalalone DP, *generic*	See Display 50-1	See Display 50-2	0.5–9 mg/d 10 mg IV, then 4 mg IM q6h; intra-articular: large joints 4–16 mg; soft tissue: 0.8–1.6 mg
hydrocortisone (cortisol) *hye-droe-kor'-ti-zone*	Cortef, *generic*	See Display 50-1	See Display 50-2	20–240 mg PO in single or divided doses
hydrocortisone sodium phosphate *hye-droe-kor'-ti-zone*	*Generic*	See Display 50-1	See Display 50-2	20–240 mg/d q12h
hydrocortisone sodium succinate *hye-droe-kor'-ti-zone*	A-hydroCort, Solu-Cortef	See Display 50-1	See Display 50-2	Reduce dose based on condition and response but give no less than 25 mg/d
methylprednisolone *meth-ill-pred-niss'-oh-lone*	Medrol, *generic*	See Display 50-1	See Display 50-2	Initial dose: 4–48 mg/d PO; Dosepak 21 day therapy: follow manufacturer's directions; alternate day therapy: twice the usual dose is administered every other morning
methylprednisolone acetate *meth-ill-pred-niss'-oh-lone*	Depoject, DepoMedrol, Depopred, *generic*	See Display 50-1	See Display 50-2	40–120 mg IM; 4–80 mg intra-articular and soft tissue injections
methylprednisolone sodium succinate *meth-ill-pred-niss'-oh-lone*	A-Methapred, Solu-Medrol, *generic*	See Display 50-1	See Display 50-2	10–40 mg IV, IM
prednisolone *pred-niss'-oh-lone*	Prelone, *generic*	See Display 50-1	See Display 50-2	5–60 mg/d PO; acute exacerbations in MS: 200 mg/d for 1 wk, followed by 80 mg every other day for 1 month PO

(*continued*)

SUMMARY DRUG TABLE ADRENOCORTICAL HORMONES: CORTICOSTEROIDS AND MINERALOCORTICOIDS (*Continued*)

GENERIC NAME	TRADE NAME*	USES	ADVERSE REACTIONS	DOSAGE RANGES
prednisolone acetate *pred-niss'-oh-lone*	Key-Pred 50, Predcor-50, *generic*	See Display 50-1	See Display 50-2	4–60 mg/d IM (not for IV use); MS: 200 mg/d for 1 wk, followed by 80 mg/d every other day for 1 month IM
prednisone *pred'-ni-sone*	Deltasone, Meticorten, Orasone, *generic*	See Display 50-1	See Display 50-2	Individualize dosage: initial dose usually between 5 and 60 mg/d PO
triamcinolone *trye-am-sin'-oh-lone*	Aristocort, Atolone, Kenacort *generic*	See Display 50-1	See Display 50-2	4–48 mg/d PO
triamcinolone acetonide *trye-am-sin'-oh-lone*	Kenalog-10, Tac-3, Triam-A, *generic*	See Display 50-1	See Display 50-2	Systemic: 2.5–60 mg/d IM; Intra-articular: 2.5–15 mg
Corticosteroid Retention Enemas				
Corticosteroid intrarectal foam, hydrocortisone acetate intrarectal foam	Cortifoam	Adjunctive therapy in treatment of ulcerative proctitis of the distal portion of the rectum	Local pain or burning, rectal bleeding, apparent exacerbations or sensitivity reactions	1 applicatorful once or twice daily for 2 wk and every second day thereafter
Mineralocorticoid				
fludrocortisone acetate *floo-droe-kor'-te-sone*	Florinef Acetate	Partial replacement therapy for Addison's disease, salt-losing adrenogenital syndrome	See Display 50-2	0.1 mg 3 times a week to 0.2 mg/d PO

*The term *generic* indicates the drug is available in generic form.

the neck), moon face, oily skin and acne, osteoporosis, purple striae on the abdomen and hips, skin pigmentation, and weight gain. When a serious disease or disorder is being treated, it is often necessary to allow these effects to occur because therapy with these drugs is absolutely necessary.

CONTRAINDICATIONS, PRECAUTIONS, AND INTERACTIONS

The glucocorticoids are contraindicated in patients with serious infections, such as tuberculosis and fungal and antibiotic-resistant infections.

The glucocorticoids are administered with caution to patients with renal or hepatic disease, hypothyroidism, ulcerative colitis, diverticulitis, peptic ulcer disease, inflammatory bowel disease, hypertension, osteoporosis, convulsive disorders, or diabetes. The glucocorticoids are classified as Pregnancy Category C drugs and should be used with caution during pregnancy and lactation.

Multiple drug interactions may occur with the glucocorticoids. Table 50-2 identifies select clinically significant interactions.

MINERALOCORTICOIDS

ACTIONS AND USES

The mineralocorticoids consist of aldosterone and desoxycorticosterone and play an important role in conserving sodium and increasing the excretion of potassium. Because of these activities, the mineralocorticoids are important in controlling salt and water balance. Aldosterone is the more potent of these two hormones. Deficiencies of the mineralocorticoids result in a loss of sodium and water and a retention of potassium.

TABLE 50-2 Select Drug Interactions of Glucocorticoids

PRECIPITANT DRUG	OBJECT DRUG	DESCRIPTION
Barbiturates	Corticosteroids	Decreased pharmacologic effects of the corticosteroid may be observed.
Cholestyramine	Hydrocortisone	The effects of hydrocortisone may be decreased.
Contraceptives, oral	Corticosteroids	Corticosteroid concentration may be increased and clearance decreased.
Estrogens	Corticosteroids	Corticosteroid clearance may be decreased.
Hydantoins	Corticosteroids	Corticosteroid clearance may be increased, resulting in reduced therapeutic effects.
Ketoconazole	Corticosteroids	Corticosteroid clearance may be decreased.
Rifampin	Corticosteroids	Corticosteroid clearance may be increased, resulting in decreased therapeutic effects.
Corticosteroids	Anticholinesterases	Anticholinesterase effects may be antagonized in myasthenia gravis.
Corticosteroids	Anticoagulants, oral	Anticoagulant dose requirements may be reduced. Corticosteroids may decrease the anticoagulant action.
Corticosteroids	Digitalis glycosides	Co-administration may enhance the possibility of digitalis toxicity associated with hypokalemia.
Corticosteroids	Isoniazid	Isoniazid serum concentrations may be decreased.
Corticosteroids	Potassium-depleting diuretics	Hypokalemia may occur.
Corticosteroids	Salicylates	Corticosteroids will reduce serum salicylate levels and may decrease their effectiveness.
Corticosteroids	Somatrem	Growth-promoting effect of somatrem may be inhibited.
Corticosteroids	Theophyllines	Alterations in the pharmacologic activity of either agent may occur.

Fludrocortisone (Florinef) is a drug that has both glucocorticoid and mineralocorticoid activity and is the only currently available mineralocorticoid drug.

Fludrocortisone is used for replacement therapy for primary and secondary adrenocortical deficiency. Even though this drug has both mineralocorticoid and glucocorticoid activity, it is used only for its mineralocorticoid effects.

ADVERSE REACTIONS

Adverse reactions may occur if the dosage is too high or prolonged, or if withdrawal is too rapid. Administration of fludrocortisone may cause edema, hypertension, congestive heart failure, enlargement of the heart, increased sweating, or allergic skin rash. Additional adverse reactions include hypokalemia, muscular weakness, headache, and hypersensitivity reactions. Because this drug has glucocorticoid and mineralocorticoid activity and is often given with the glucocorticoids, adverse reactions of the glucocorticoids must be closely monitored as well (see Display 50-2).

CONTRAINDICATIONS, PRECAUTIONS, AND INTERACTIONS

Fludrocortisone is contraindicated in patients with hypersensitivity to fludrocortisone and those with systemic fungal infections. Fludrocortisone is used cautiously in patients with Addison's disease, infection, and during pregnancy (Pregnancy Category C) and lactation. Fludrocortisone decreases the effects of the barbiturates, hydantoins, and rifampin. There is a decrease in serum levels of the salicylates when those agents are administered with fludrocortisone.

NURSING PROCESS

The Patient Receiving a Glucocorticoid or Mineralocorticoid

ASSESSMENT

Preadministration Assessment

Before administering a glucocorticoid or mineralocorticoid, the nurse takes and records the patient's blood

pressure, pulse, and respiratory rate. Additional physical assessments depend on the reason for use and the general condition of the patient. When feasible, the nurse performs an assessment of the area of disease involvement, such as the respiratory tract or skin, and records the findings in the patient's record. These findings provide baseline data for the evaluation of the patient's response to drug therapy. The nurse weighs patients who are acutely ill and those with a serious systemic disease before starting therapy.

Ongoing Assessment

Ongoing assessments of the patient receiving a glucocorticoid, and the frequency of these assessments, depend largely on the disease being treated. The nurse should take and record vital signs every 4 to 8 hours. The nurse weighs the patient daily to weekly, depending on the diagnosis and the primary health care provider's orders. The patient's response to the drug is assessed by daily evaluations. More frequent assessment may be necessary if a glucocorticoid is used for emergency situations. Because these drugs are used to treat a great many diseases and conditions, an evaluation of drug response is based on the patient's diagnosis and the signs and symptoms of disease.

The nurse assesses for signs of adverse effects of the mineralocorticoid or glucocorticoid, particularly signs of electrolyte imbalance, such as hypocalcemia, hypokalemia, and hypernatremia (see Chap. 58). The nurse assesses the patient's mental status for any change, especially if there is a history of depression or other psychiatric problems or if high doses of the drug are being given. The nurse also monitors for signs of an infection, which may be masked by glucocorticoid therapy. The blood of the patient without diabetes is checked weekly for glucose levels because glucocorticoids may aggravate latent diabetes. Those with diabetes must be checked more frequently.

When administering fludrocortisone, the nurse monitors the patient's blood pressure at frequent intervals. Hypotension may indicate insufficient dosage. The nurse weighs the patient daily and assesses for edema, particularly swelling of the feet and hands. The lungs are auscultated for adventitious sounds (eg, rales/crackles).

NURSING DIAGNOSES

Drug-specific nursing diagnoses are highlighted in the Nursing Diagnoses Checklist. Other nursing diagnoses applicable to these drugs are discussed in depth in Chapter 4.

PLANNING

The expected outcomes of the patient include an optimal response to therapy, identification and management of adverse drug effects, and an understanding of the therapeutic regimen.

Nursing Diagnoses Checklist

- ✓ **Risk for Infection** related to adverse drug reactions (impaired wound healing, aggravation of existing infections)
- ✓ **Risk for Injury** related to adverse reactions (muscle atrophy, osteoporosis, spontaneous fractures)
- ✓ **Excess Fluid Volume** related to adverse reactions (sodium and water retention)
- ✓ **Disturbed Body Image** related to adverse reactions (cushingoid appearance)
- ✓ **Disturbed Thought Processes** related to adverse reactions (depression, psychosis, other changes in mental status)

IMPLEMENTATION

Promoting an Optimal Response to Therapy

The glucocorticoids may be administered orally, IM, SC, IV, topically, or as an inhalant. The primary health care provider may also inject the drug into a joint (intra-articular), a lesion (intralesional), soft tissue, or bursa. The dosage of the drug is individualized and based on the severity of the condition and the patient's response.

Nursing Alert

The nurse must never omit the dose of a glucocorticoid. If the patient cannot take the drug orally because of nausea or vomiting, the nurse must notify the primary health care provider immediately because the drug needs to be ordered given by the parenteral route. Patients who are receiving nothing by mouth for any reason must have the glucocorticoid given by the parenteral route.

Daily oral doses are generally given before 9:00 AM to minimize adrenal suppression and to coincide with normal adrenal function. However, alternate-day therapy may be prescribed for patients receiving long-term therapy (see below). Fludrocortisone is given orally and is well tolerated in the GI tract.

Gerontologic Alert

The corticosteroids are administered with caution in older adults because they are more likely to have preexisting conditions, such as congestive heart failure, hypertension, osteoporosis, and arthritis, which may be worsened by the use of such agents. The nurse monitors older adults for exacerbation of existing conditions during corticosteroid therapy. In addition, lower dosages may be needed because of the effects of aging, such as decreased muscle mass, renal function, and plasma volume.

ALTERNATE-DAY THERAPY. The alternate-day therapy approach to glucocorticoid administration is used in the treatment of diseases and disorders requiring long-term therapy, especially the arthritic disorders. This regimen involves giving twice the daily dose of the glucocorticoid every other day. The drug is given only once on the alternate day and before 9 AM. The purpose of alternate-day administration is to provide the patient requiring long-term glucocorticoid therapy with the beneficial effects of the drug while minimizing certain undesirable reactions (see Display 50-2).

Plasma levels of the endogenous adrenocortical hormones vary throughout the day and nighttime hours. They are normally higher between 2 AM and about 8 AM, and lower between 4 PM and midnight. When plasma levels are lower, the anterior pituitary releases ACTH, which in turn stimulates the adrenal cortex to manufacture and release glucocorticoids. When plasma levels are high, the pituitary gland does not release ACTH. The response of the pituitary to high or low plasma levels of glucocorticoids and the resulting release or nonrelease of ACTH is an example of the feedback mechanism, which may also be seen in other glands of the body, such as the thyroid gland. The **feedback mechanism** (also called the feedback control) is the method by which the body maintains most hormones at relatively constant levels within the bloodstream. When the hormone concentration falls, the rate of production of that hormone increases. Likewise, when the hormone level becomes too high, the body decreases production of that hormone.

Administration of a short-acting glucocorticoid on alternate days and before 9 AM, when glucocorticoid plasma levels are still relatively high, does not affect the release of ACTH later in the day, yet it gives the patient the benefit of exogenous glucocorticoid therapy.

THE PATIENT WITH DIABETES. Patients with diabetes who are receiving a glucocorticoid may require frequent adjustment of their insulin or oral hypoglycemic drug dosage. The nurse monitors blood glucose levels several times daily or as prescribed by the primary health care provider. If the blood glucose levels increase or urine is positive for glucose or ketones, the nurse notifies the primary health care provider. Some patients may have latent (hidden) diabetes. In these cases the corticosteroid may precipitate hyperglycemia. Therefore all patients, those with diabetes and those without, should have frequent checks of blood glucose levels.

Monitoring and Managing Adverse Reactions

ADRENAL INSUFFICIENCY. Administration of the glucocorticoids poses the threat of adrenal gland insufficiency (particularly if the alternate-day therapy is not prescribed). Administration of glucocorticoids several times a day and during a short time (as little as 5–10 days) results in shutting off the pituitary release of ACTH because there are always high levels of the glucocorticoids in the plasma (caused by the body's own glucocorticoid production plus the administration of a glucocorticoid drug). Ultimately, the pituitary atrophies and ceases to release ACTH. Without ACTH, the adrenals fail to manufacture and release (endogenous) glucocorticoids. When this happens, the patient has acute adrenal insufficiency, which is a life-threatening situation until corrected with the administration of an exogenous glucocorticoid.

Adrenal insufficiency is a critical deficiency of the mineralocorticoids and the glucocorticoids that requires immediate treatment. Symptoms of adrenal insufficiency include fever, myalgia, arthralgia, malaise, anorexia, nausea, orthostatic hypotension, dizziness, fainting, dyspnea, and hypoglycemia. Death due to circulatory collapse will result unless the condition is treated promptly. Situations producing stress (eg, trauma, surgery, severe illness) may precipitate the need for an increase in dosage of the corticosteroids until the crisis situation or stressful situation is resolved.

Nursing Alert

At no time must glucocorticoid therapy be discontinued suddenly. When administration of a glucocorticoid extends beyond 5 days and the drug therapy is to be discontinued, the dosage must be tapered over several days. In some instances, it may be necessary to taper the dose over 7 to 10 or more days. Abrupt discontinuation of glucocorticoid therapy usually results in acute adrenal insufficiency, which, if not recognized in time, can result in death. Tapering the dosage allows normal adrenal function to return gradually, preventing adrenal insufficiency.

MANAGING INFECTION. The nurse should report any slight rise in temperature, sore throat, or other signs of infection to the primary health care provider as soon as possible because of a possible decreased resistance to infection during glucocorticoid therapy. Nursing personnel and visitors with any type of infection or recent exposure to an infectious disease should avoid patient contact.

MANAGING MENTAL AND EMOTIONAL CHANGES. Mental and emotional changes may occur when the glucocorticoids are administered. The nurse accurately documents mental changes and informs the primary health care provider of their occurrence. Patients who appear extremely depressed must be closely observed. The nurse evaluates mental status, memory, and impaired thinking (eg, changes in orientation, impaired judgment, thoughts of hopelessness, guilt). The nurse allows time for the patient to express feeling and concerns.

MANAGING FLUID AND ELECTROLYTE IMBALANCES. Fluid and electrolyte imbalances, particularly excess fluid volume, are common with corticosteroid therapy. The nurse checks the patient for visible edema, keeps

an accurate fluid intake and output record, obtains a daily weight, and restricts sodium if indicated by the primary health care provider. Edematous extremities are elevated and the patient's position is changed frequently. The nurse informs the primary health care provider if signs of electrolyte imbalance or glucocorticoid drug effects are noted. Dietary adjustments are made for the increased loss of potassium and the retention of sodium if necessary. Consultation with a dietitian may be indicated.

MANAGING FRACTURES. The nurse observes patients receiving long-term glucocorticoid therapy, especially those allowed limited activity, for signs of compression fractures of the vertebrae and pathologic fractures of the long bones. If the patient reports back or bone pain, the nurse notifies the primary health care provider. Extra care is also necessary to prevent falls and other injuries when the patient is confused or is allowed out of bed. If the patient is weak, the nurse assists the patient to the bathroom or when ambulating. Edematous extremities are handled with care to prevent trauma.

MANAGING ULCERS. Peptic ulcer has been associated with glucocorticoid therapy. The nurse reports to the primary care provider any patient complaints of epigastric burning or pain, bloody or coffee-ground emesis, or the passing of tarry stools. Giving oral corticosteroids with food or a full glass of water may minimize gastric irritation.

MANAGING BODY IMAGE DISTURBANCE. A body image disturbance may occur, especially if the patient experiences cushingoid appearance (buffalo hump, moon face), acne, or hirsutism. If continuation of the drug therapy is necessary, the nurse thoroughly explains the cushingoid appearance reaction and emphasizes the necessity of continuing the drug regimen. The nurse assesses the patient's emotional state and helps the patient to express feelings and concerns. The nurse offers positive reinforcement, when possible. The nurse instructs the patient with acne to keep the affected areas clean and use over-the-counter acne drugs and water-based cosmetics or creams.

Educating the Patient and Family

To prevent noncompliance, the nurse must provide the patient and family with thorough instructions and warnings about the drug regimen.

- These drugs may cause GI upset. To decrease GI effects, take the oral drug with meals or snacks.
- Take antacids between meals to help prevent peptic ulcer.

SHORT-TERM GLUCOCORTICOID THERAPY

- Take the drug exactly as directed in the prescription container. Do not increase, decrease, or omit a dose unless advised to do so by the primary health care provider.
- Take single daily doses before 9:00 AM.
- Follow the instructions for tapering the dose because they are extremely important.
- If the problem does not improve, contact the primary health care provider.

ALTERNATE-DAY GLUCOCORTICOID THERAPY (ORAL)

- Take this drug before 9 AM once every other day. Use a calendar or some other method to identify the days of each week the drug is taken.
- Do not stop taking the drug unless advised to do so by the primary health care provider.
- If the problem becomes worse, especially on the days the drug is not taken, contact the primary health care provider.

Most of the teaching points given below may also apply to alternate-day therapy, especially when higher doses are used and therapy extends over many months.

LONG-TERM OR HIGH-DOSE GLUCOCORTICOID THERAPY

- Do not omit this drug or increase or decrease the dosage except on the advice of the primary health care provider.
- Inform other primary health care providers, dentists, and all medical personnel of therapy with this drug. Wear a medical alert tag or other form of identification to alert medical personnel of long-term therapy with a glucocorticoid.
- Do not take any nonprescription drug unless its use has been approved by the primary health care provider.
- Do not take live virus vaccinations (eg, smallpox) because of the risk of a lack of antibody response. This does not include patients receiving the corticosteroids as replacement therapy.
- Whenever possible, avoid exposure to infections. Contact the primary health care provider if minor cuts or abrasions fail to heal, persistent joint swelling or tenderness is noted, or fever, sore throat, upper respiratory infection, or other signs of infection occur.
- If the drug cannot be taken orally for any reason or if diarrhea occurs, contact the primary health care provider immediately. If you are unable to contact the primary health care provider before the next dose is due, go to the nearest hospital emergency department (preferably where the original treatment was started or where the primary health care provider is on the hospital staff) because the drug has to be given by injection.
- Weigh yourself weekly. If significant weight gain or swelling of the extremities is noted, contact the primary health care provider.
- Remember that dietary recommendations made by the primary health care provider are an important part of therapy and must be followed.

- Follow the primary health care provider's recommendations regarding periodic eye examinations and laboratory tests.

INTRA-ARTICULAR OR INTRALESIONAL ADMINISTRATION

- Do not overuse the injected joint, even if the pain is gone.
- Follow the primary care provider's instructions concerning rest and exercise.

MINERALOCORTICOID (FLUDROCORTISONE) THERAPY

- Take the drug as directed. Do not increase or decrease the dosage except as instructed to do so by the primary health care provider.
- Do not discontinue use of the drug abruptly.
- Inform the primary health care provider if the following adverse reactions occur: edema, muscle weakness, weight gain, anorexia, swelling of the extremities, dizziness, severe headache, or shortness of breath.
- Carry patient identification, such as a medical alert tag, so that drug therapy will be known to medical personnel during an emergency situation.
- Keep follow-up appointments to determine if a dosage adjustment is necessary.

EVALUATION

- The therapeutic effect is achieved.
- Adverse reactions are identified, reported to the primary health care provider, and managed appropriately.
- The patient verbalizes an understanding of the dosage regimen.
- The patient verbalizes the importance of complying with the prescribed therapeutic regimen and importance of continued follow-up care.
- The patient and family demonstrate an understanding of the drug regimen.
- The patient demonstrates an understanding of the importance of not suddenly discontinuing therapy (long-term or high-dose therapy).

● *Critical Thinking Exercises*

1. *Judy Cowan, age 28 years, has been prescribed clomiphene to induce ovulation and pregnancy. Judy is very anxious and wants desperately to become pregnant. Her husband, Jim, has come to the clinic with her. Discuss assessments the nurse would consider important before initiating treatment with clomiphene. Discuss information the nurse would include in a teaching plan for Jim and Judy.*
2. *Plan a team conference to discuss the administration of ACTH (corticotropin). Identify three critical points that would be essential to discuss. Explain your rationale for choosing each point.*
3. *Discuss the rationale for administering oral prednisone at 7 AM every other day.*

● *Review Questions*

1. Which of the following adverse reactions would the nurse expect with the administration of clomiphene?
   - **A.** Edema
   - **B.** Vasomotor flushes
   - **C.** Sedation
   - **D.** Hypertension

2. Which of the following assessments would be most important for the nurse to make when a child receiving the growth hormone comes to the primary care provider's office?
   - **A.** Blood pressure, pulse, and respiration
   - **B.** Diet history
   - **C.** Height and weight
   - **D.** Measurement of abdominal girth

3. Which of the following adverse reactions would lead the nurse to suspect cushingoid appearance in a patient taking a corticosteroid?
   - **A.** Moon face, hirsutism
   - **B.** Kyphosis, periorbital edema
   - **C.** Pallor of the skin, acne
   - **D.** Exophthalmos

4. Which of the following statements, if made by the patient, would indicate a possible adverse reaction seen with the administration of vasopressin?
   - **A.** "I am unable to see well at night."
   - **B.** "My stomach is cramping."
   - **C.** "I have a sore throat."
   - **D.** "I am hungry all the time."

5. Adverse reactions seen with the administration of fludrocortisone include: _____.
   - **A.** hyperactivity and headache
   - **B.** sedation, lethargy
   - **C.** edema, hypertension
   - **D.** dyspnea, confusion

● *Medication Dosage Problems*

1. Methylprednisolone 40 mg IM is prescribed. The drug is available in a suspension for injections in a solution of 20 mg/mL. The nurse prepares to administer _____.
2. Prednisolone 60 mg PO is prescribed. The drug is available as a syrup with 15 mg/5 mL. The nurse administers _____.