

# EXAM PREP

# NCLEX-RN®



Third Edition



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CERTIFICATION

WILDA RINEHART  
DIANN SLOAN  
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**EXAM✓PREP**

# **NCLEX®-RN**

Third Edition

**Wilda Rinehart, Diann Sloan, Clara Hurd**

## NCLEX®-RN Exam Prep, Third Edition

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# Dedication

*We would like to thank our families for tolerating our late nights and long hours. Also, thanks to Gene Sloan for his help without pay. Special thanks to all the graduates who have attended Rinehart and Associates Review Seminars. Thanks for allowing us to be a part of your success.*

*We are also delighted that Jessica Rinehart Wentz, RN; Whitney Hurd, RN; and Brad Sloan, RN, chose nursing as their profession above so many other professions.*

# Acknowledgments

Our special thanks to our editors, support staff, and nurse reviewers for helping us to organize our thoughts and experiences into a text for students and practicing professionals. You made the task before us challenging and enjoyable.

# **We Want to Hear from You!**

As the reader of this book, *you* are our most important critic and commentator. We value your opinion and want to know what we're doing right, what we could do better, what areas you'd like to see us publish in, and any other words of wisdom you're willing to pass our way.

We welcome your comments. You can email or write to let us know what you did or didn't like about this book—as well as what we can do to make our books better.

*Please note that we cannot help you with technical problems related to the topic of this book.*

When you write, please be sure to include this book's title and author as well as your name, and email address. We will carefully review your comments and share them with the author and editors who worked on the book.

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# Introduction

Since the first day of your nursing program, you have accumulated stacks of notes and materials that you were asked to learn. There is no way that you can study all of those materials. For this reason, we have developed a concise text that will help you organize your knowledge. This book will help you to prepare for the NCLEX RN using tried-and-true techniques used by the experts. This Introduction discusses the changes that have occurred in the NCLEX exam. You will learn about the future of the exam and how you can be a successful candidate. Whether you are taking the exam for the first time or have taken the exam several times, this book is designed for you.

The *Exam Prep* books help you to understand and appreciate the subject material that you need to know to pass nursing school and the exam. This book includes an in-depth discussion of all topics covered on the NCLEX. We take you on a self-guided tour of all of the areas covered on the NCLEX test plan and give you tips for passing. This book also contains practical tips for your nursing practice. You will find a user-friendly “Fast Facts” quick reference sheet containing lab values, normal fetal heart tones, and much more. Study tips, exam prep tips, case studies, math review, and test banks will help you practice those difficult pharmacology questions and help you manage the questions and alternative items that you will encounter on the exam. This book also includes chapters on the cultural aspects of nursing care and legalities. Each chapter concludes with a series of practice questions to help reinforce your understanding of the topics within the chapter and to help you prepare for the exam.

The nurse is a valued member of the healthcare team. The National Council of State Boards of Nursing (NCSBN) is responsible for allocating the number and type of questions that the nurse must take as well as the percentage of questions in each category. The differences between the test questions for a PN and RN are often subtle. Some examples of these differences are

- ▶ **Client care responsibility:** Because the RN is ultimately responsible for the coordination and management of client care as well as delegation of duties, RN candidates will get more questions on these topics whereas PN candidates will be tested on their knowledge and application of how to care for clients.
- ▶ **Intravenous therapy and medication:** The RN is responsible for initiating peripheral IVs and giving IV Push medication, but the PN is expected to be able to monitor IV lines and medication and know how to recognize problems and the steps to take to correct them. In many states, the licensed practical nurse can also initiate peripheral IV lines.

- ▶ **Blood administration:** The RN is primarily responsible for initiating a blood transfusion, but the PN is expected to know the signs of a transfusion reaction and the action to be taken if such a reaction occurs.
- ▶ **Central line care:** The RN is primarily responsible for central line care, but the PN is expected to know how to care for the central line site and be aware of signs of an air emboli.

If you are unsure of the responsibilities of an RN in the state for which you are applying for licensure, you should contact your local board of nursing. You can find contact information listing at <https://www.ncsbn.org/contactbon.htm>.

Each chapter in the *Exam Prep* is extremely useful to the nurse seeking licensure as a practical nurse or registered nurse.

## Organization

This book is organized by body systems. This method uses a format that most students find helpful for learning material quickly and easily.

- ▶ Each chapter begins with an outline of topics—this is a list of subtopics covered in the chapter.
- ▶ Each chapter has helpful notes, tips, and cautions that will help you study for the exam.
- ▶ Each chapter includes an in-depth discussion of the topics in that unit.
- ▶ Each chapter includes pharmacological agents used in the care of the client.
- ▶ Each chapter includes diagnostic studies used to determine client needs.
- ▶ Each chapter ends with a case study. This allows the student to use critical-thinking skills in the treatment of the client.

## Instructional Features

This book provides multiple ways to learn and reinforce the exam material. Following are some of the helpful methods:

- ▶ **Study strategies:** Study strategies are discussed in a chapter called “Study and Exam Preparation Tips.”
- ▶ **Key terms:** A list of key terms that the student must know appears as a glossary.
- ▶ **Notes, tips, and cautions:** Notes, tips, and cautions contain various kinds of useful or practical information such as tips on nursing practice.

- ▶ **Apply Your Knowledge:** Questions covering the material in that particular chapter are included at the end of each chapter. There are three test banks of 166 items and an additional test bank of management and pharmacology questions. You will also find a CD of test questions to help you practice the NCLEX format. These help you to determine what you need to study further and what you already know.
- ▶ **Suggested Readings and Resources:** At the end of each chapter, this section directs you to additional resources for study. This book is also designed to be a tool used by nursing students and nurses in practice.

## Extensive Practice Test Options

This book provides you with many opportunities to assess your knowledge and practice for the exam. The test options are as follows:

- ▶ **Exam questions:** Each chapter ends with a series of questions relevant to the chapter material.
- ▶ **Case studies:** Each chapter includes a case study in which you can practice applying all the information to a real-life scenario.
- ▶ **Practice exams:** This book includes three complete practice exams that reflect the type of questions you will see on the NCLEX exam. Use them to practice and to help you determine your strengths and weaknesses so that you can return to your weakest areas for further study.
- ▶ **CD exam:** The exam engine included on the CD includes questions from the book as well as additional questions for your review. New alternative format questions have been added to reflect changes in the new test plan. Be sure to use the study mode first and then try the exam mode. The CD allows you to repeat the exam as often as you need, so don't hesitate to try again and again if you need to.

## Final Review

The final review section of the book provides you with two valuable tools for preparing for the exam:

- ▶ **Fast Facts:** This is a condensed version of the information contained in the book and is an extremely useful tool for last-minute review.
- ▶ **Exam questions:** Four complete practice exams are included in this book plus more on the CD-ROM. All questions are written in the style and format used on the actual exam. Use these exams to prepare for the real exam until you are comfortable with your level of knowledge.



## Other Valuable Tools

This book also includes several other valuable tools for preparing for the NCLEX exam:

- ▶ Appendix A, “Things You Forgot,” contains a list of information commonly used by nurses.
- ▶ Appendix B, “Need to Know More?” includes a list of websites and organizations that are helpful resources for the nurse in practice.
- ▶ Appendix C, “Calculations,” provides you with a quick-and-easy guide to medication administration.
- ▶ Appendix D, “Most Commonly Prescribed Medications in the United States,” is a list of commonly prescribed drugs with the generic and brand names and common nursing implications for use.
- ▶ An index provides a complete source of the location of specific information.

## About the NCLEX Exam

The Computer Adaptive Test (CAT) provides a means for individualized testing of each candidate seeking licensure as a professional nurse. Selecting from a large test bank, the computer chooses questions based on the candidate’s ability and competence as demonstrated on the prior question.

For the RN exam, the minimum number of questions is 75 with a maximum of 265. The average candidate’s exam comprises 160 items. You must answer the question that appears on the screen before another question is given, and you cannot skip questions or return to a previous question. It is imperative that you read each question carefully before you select a response. We suggest that you cover the answers with your nondominant hand and read the stem before looking at the answers. RN candidates are allowed six hours to take the exam.

The NCLEX consists of questions from the cognitive levels of knowledge, comprehension, application, and analysis. The majority of questions are written at the application and analysis levels. Questions incorporate the five stages of the nursing process:

- ▶ Assessment
- ▶ Analysis
- ▶ Planning
- ▶ Implementation
- ▶ Evaluation

There are also questions from the four categories of client needs (noted in bold in Table I.1). Client needs are divided into subcategories (noted in italics in Table I.1) that define the content within each of the four major categories tested on the NCLEX. Table I.1 outlines the categories and subcategories of client needs.

**TABLE I.1 NCLEX RN Exam Categories and Subcategories**

<b>Client Needs</b>	<b>Percentage of Items from Each Category/Subcategory</b>
<b>Safe, Effective Care Environment</b>	
<i>Management of Care</i>	17%–23%
Safety and Infection Control	9%–15%
<b>Health Promotion and Maintenance</b>	6%–12%
<b>Psychosocial Integrity</b>	6%–12%
<b>Physiological Integrity</b>	
<i>Basic Care and Comfort</i>	6%–12%
<i>Pharmacological and Parenteral Therapies</i>	12%–18%
<i>Reduction of Risk Potential</i>	9%–15%
<i>Physiological Adaptation</i>	11%–17%

The percentage of questions allotted to each category is determined by the National Council and depends on the results of a survey the council sends out every three years to new graduates. Based on the activity statements, the percentages change accordingly. It is safe to say that as the patient population changes, these categories will also change. This book reflects those changes particularly as they relate to the need for nurses in management roles, cultural diversity, and client criticality.

Computerized adaptive testing offers the candidate several advantages over the former paper-and-pencil exam. The test questions are stored in a large test bank and classified by test plan areas and level of difficulty. Depending on the answer given by the candidate, the computer presents another question that is either more difficult or less difficult. This allows the computer to determine the candidate's knowledge of the subject matter more precisely.

The pass/fail decision is not based on how many questions the candidate answers correctly, but on the difficulty of the questions answered correctly. Even though candidates might answer different questions and different numbers of questions, the test plan remains the same. All NCLEX examinations conform to this test plan. Each time you answer a question correctly, the next question gets harder until you miss a question; then an easier question is given until you answer correctly. This way the computer concludes whether a candidate has met the passing standard. If you are clearly above the passing standard at the minimum number of questions, the computer stops asking questions. If you are clearly below the passing standard, the computer stops asking questions. If your ability estimate is close to the passing standard, the computer continues to ask questions until either the maximum number of questions is asked or time expires. Should time expire, the last 60 questions are reviewed. To pass, the candidate must remain above the passing standard on the last 60 items.

The CAT exam offers another advantage. The candidate can schedule the exam at a time that is convenient and usually receives test results in seven days or sooner. The candidate can retake the exam after 45 days in most states. We suggest that you review this text and others, and, if needed, take a review seminar prior to taking the NCLEX. Allow at least one week to study and prepare for the exam. Remember: You want to take the exam only one time. You should visit the National Council's website at [www.ncsbn.org](http://www.ncsbn.org) for information regarding how to schedule your test. We suggest that you read the application process thoroughly to learn how you can register to take the exam.

## Advice for Preparing for the Exam

Judicious use of this book, either alone or with a review seminar such as the one provided by Rinehart and Associates, will help you achieve your goal of becoming licensed to practice nursing. We suggest that you find a location where you can concentrate on the material each day. A minimum of two hours per day for at least two weeks is suggested. This book provides you with tips, notes, and sample questions. These questions will acquaint you with the types of questions you will see during the exam. The mock exam is formulated with those difficult management and delegation questions that you can score to determine your readiness to test. Pay particular attention to the notes, tips, and warnings throughout the book as well as the "Fast Facts" chapter. Using these elements will help you gain knowledge and reduce your stress as you prepare to take the test.

## Advice for Test Day

From our years of experience in nursing and teaching, we have this advice for you:

- ▶ **Remember to know where you are going:** Be sure that you know the exact location of the exam. It is easy to get caught in traffic, and if you are late, you forfeit the exam time and your money. You will have to reschedule your exam and pay again.
- ▶ **Have your authorization form number and valid forms of ID with you:** If you forget to take your identification, you will have to reschedule and will forfeit your testing time. Remember you will be photographed and fingerprinted prior to entering the testing site, so do not let this upset you. Remember not to use or take any form of electronic communication, such as your cell phone, during the exam. It is best to leave your cell phone in the car during the exam.
- ▶ **Eat a high-protein meal prior to the exam:** You want good food for thought prior to taking the exam. Studies have shown that a meal high in vitamins such as B9 help us think more clearly during stressful times.
- ▶ **Take your time during the test:** Remember, you do not have to complete all the questions.

- ▶ **If you need to take a break, get up and walk around:** The clock will continue to tick, so don't take too much time.
- ▶ **Dress in layers:** The testing site might be cold or warm.

## Hints for Using This Book

Each *Exam Prep* book follows a regular structure, along with cues about important or useful information. Here's the structure of a typical chapter:

- ▶ **Outline of topics:** Lists the topic headings within the chapter.
- ▶ **Headings and subheadings:** These are the main chapter topics and ancillary subtopics, designating the core content for study within the chapter.
- ▶ **Case studies:** This allows the student to use critical thinking skills in a specific client situation. The answers and complete explanations for the case study are included.
- ▶ **Key Concepts:** This section of the chapter includes the following three components for you to review and study to ensure your understanding of the chapter topics:
  - ▶ **Key Terms:** A list of the key terms from the chapter that you should be able to define.
  - ▶ **Diagnostics:** When appropriate, this section lists diagnostics used in the care of the client with a condition covered within the chapter.
  - ▶ **Pharmacological agents used in the care of the client with disorders found in the chapter:** This information is found in a table form and includes the generic name and brand name of the drug by category, the action of the drug, the potential side effects, and the nursing implications and care of the client taking that category of drugs.
- ▶ **Apply Your Knowledge:** Exam questions about the chapter content with answers and explanations are included in each chapter.
- ▶ **Suggested Reading and Resources:** Each chapter concludes with a supplementary resource list (including books, websites, and journals) relevant to the chapter content.

We suggest that you study from the front of the book and proceed in a logical sequence. When you have completed the case study and questions at the end of each chapter, you might feel the need to research using the resource list.

## Contact the Author

We are interested in your study and success, and want you to pass on the first attempt. If after reviewing with this text, you would like to contact us, you can do so at Rinehart and Associates, PO Box 124, Booneville, MS 38829 or visit our website at [www.nclexreview.net](http://www.nclexreview.net).

Remember, knowing the material is important, but being able to apply that knowledge is a must. When you understand the material, passing the NCLEX exam will be easy.

Good luck!

# 4

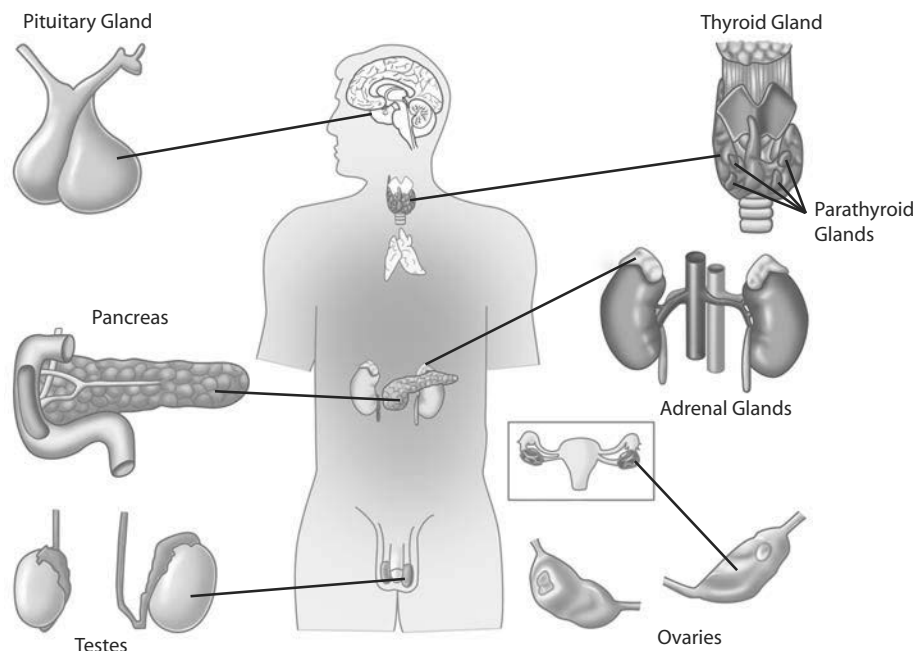
## CHAPTER FOUR

# Care of the Client with Endocrine Disorders

The endocrine system comprises glands distributed throughout the body and is responsible for secretion and regulation of hormones. The endocrine system is made up of the following glands:

- ▶ Pituitary gland
- ▶ Adrenal glands
- ▶ Thyroid gland
- ▶ Pancreas
- ▶ Parathyroid glands
- ▶ Ovaries, testes

Figure 4.1 shows a diagram of the endocrine system.



**FIGURE 4.1** Endocrine system.

Problems with the endocrine system occur when there is too little production or excess production of hormones. The onset of endocrine disorders can appear suddenly and be life-threatening, or can appear gradually.

## Pituitary Gland

The pituitary gland is located in the center of the skull at the base of the brain in an area called the *sella turcica*. The anterior lobe, or *adenohypophysis*, secretes hormones that stimulate the thyroid gland, adrenal cortex, and the gonads. Growth hormone and prolactin are produced by the anterior pituitary gland. The posterior pituitary produces vasopressin or antidiuretic hormone and oxytocin. The neurohypophysis, the posterior portion of the pituitary gland, stores hormones produced by the hypothalamus. The hypothalamus shares a circulatory system with the anterior pituitary gland. This system of nerve fibers connects the hypothalamus to the posterior pituitary and controls how the central nervous system and endocrine system regulate homeostasis of the body. Other functions of the pituitary gland include development of the gonads, regulation of heart rate and rhythm, and assisting other glands in the endocrine system to secrete their hormones.

The diagnosis of pituitary disorders is done by evaluating various hormone levels. Computer tomography (CT) scans, x-rays, and magnetic resonance imaging (MRI) can also identify tumors. Alterations in pituitary function are often reflected as a decrease in pituitary hormone or an increase in pituitary hormone. The sections that follow discuss these problems in greater detail.

## Hypopituitarism

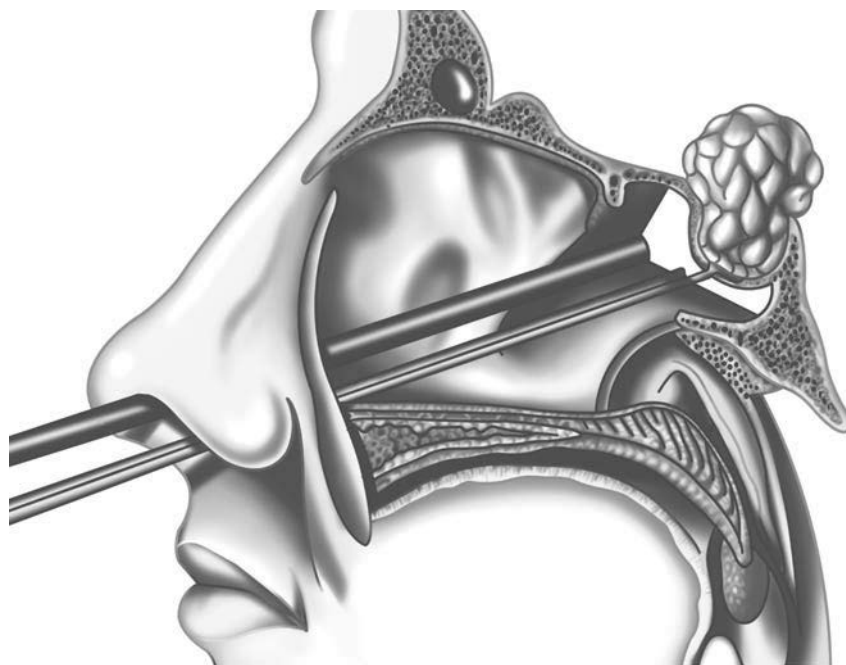
*Hypopituitarism* is a disorder in which there is a deficiency of one or more of the hormones produced in the anterior pituitary. Deficiencies in thyroid-stimulating hormone (TSH) and adrenocorticotrophic hormone (ACTH) often result in hypotension and can be life-threatening. Other problems that occur when there is a lack of pituitary function are failure to develop secondary sex characteristics associated with a lack of gonadotropins, luteinizing hormone (LH), and follicle-stimulating hormone (FSH). A lack of these hormones is not life-threatening but can alter body image and prevent the client from being able to reproduce. Management of hypopituitarism consists of early diagnosis and treatment with hormone supplementation.

## Hyperpituitarism

Hyperpituitarism is a state that occurs with anterior pituitary tumors or hyperplasia of the pituitary gland. Tumors are the most common reason for hyperpituitarism. Women with prolactinomas usually experience anovulation, irregular menses, reduction in sex drive, and lactation. Other signs and symptoms of pituitary tumors include headache, visual disturbances, and altered levels of consciousness. Gigantism (increased levels of growth hormone in the child) or acromegaly (increased levels of growth hormone in the adult) can also result from hyperpituitarism.

Management depends on the type and location of the tumor. Many clients respond well to medical management with bromocriptine mesylate (Parlodel) or cabergoline (Dostinex). These drugs should be given with food to decrease gastrointestinal disturbance. Pregnant clients should not be prescribed Parlodel.

Surgical removal of the tumor can be accomplished by a transsphenoidal approach. This type of surgery is performed by passing an instrument through the sphenoid sinus (see Figure 4.2). Clients return from surgery with nose packing in place. Postoperatively the client should be taught to avoid coughing, sneezing, nose blowing, and bending. Soft toothbrushes should be used for several weeks following surgery. Any discharge from the nose should be checked for glucose because cerebrospinal leakage can occur.



**FIGURE 4.2**  
Transsphenoidal  
surgery for the  
removal of pituitary  
tumors.

X-ray therapy is sometimes used to shrink the tumor. *Radiotherapy*, a stereotactic radiation, is generally preferred over external beam radiation because a higher dose of radiation can be delivered to the tumor with less radiation to normal brain structures. Damage to pituitary structures of the brain can occur with this treatment, so the client must be assessed for signs of altered neurological function or brain infections such as meningitis.

## Disorders of the Posterior Pituitary Gland

Two disorders of the posterior pituitary gland are diabetes insipidus and syndrome of inappropriate antidiuretic hormone (SIADH). These problems can be caused by a deficiency or excess of the hormone vasopressin (antidiuretic hormone).

### Diabetes Insipidus

Diabetes insipidus is a result of either a decrease in antidiuretic hormone synthesis or an inability of the kidneys to respond to ADH. The lack of antidiuretic hormone will result in dehydration with resulting hypotension. The nurse should assess the client's urine for specific gravity. The normal specific gravity is 1.010–1.030. A client with diabetes insipidus will have a specific gravity of less than 1.010.



The diagnosis of diabetes insipidus is confirmed by a 24-hour urine screening for osmolality and a hypertonic saline test. This test is done by administering a normal water load to the client followed by an infusion of hypertonic saline and measuring the urinary output hourly. This test detects ADH release. A decrease in urinary output is a sign of ADH release. Treatment includes chlorpropamide (Diabinese) or clofibrate (Atromid-S) to increase the action of ADH, or if a severe deficiency in ADH exists, the client can be prescribed ADH in the form of vasopressin either nasally or parenterally. The client should be taught to alternate from one nostril to the other because this medication is irritating to the nasal passages.

### **Syndrome of Inappropriate Antidiuretic Hormone**

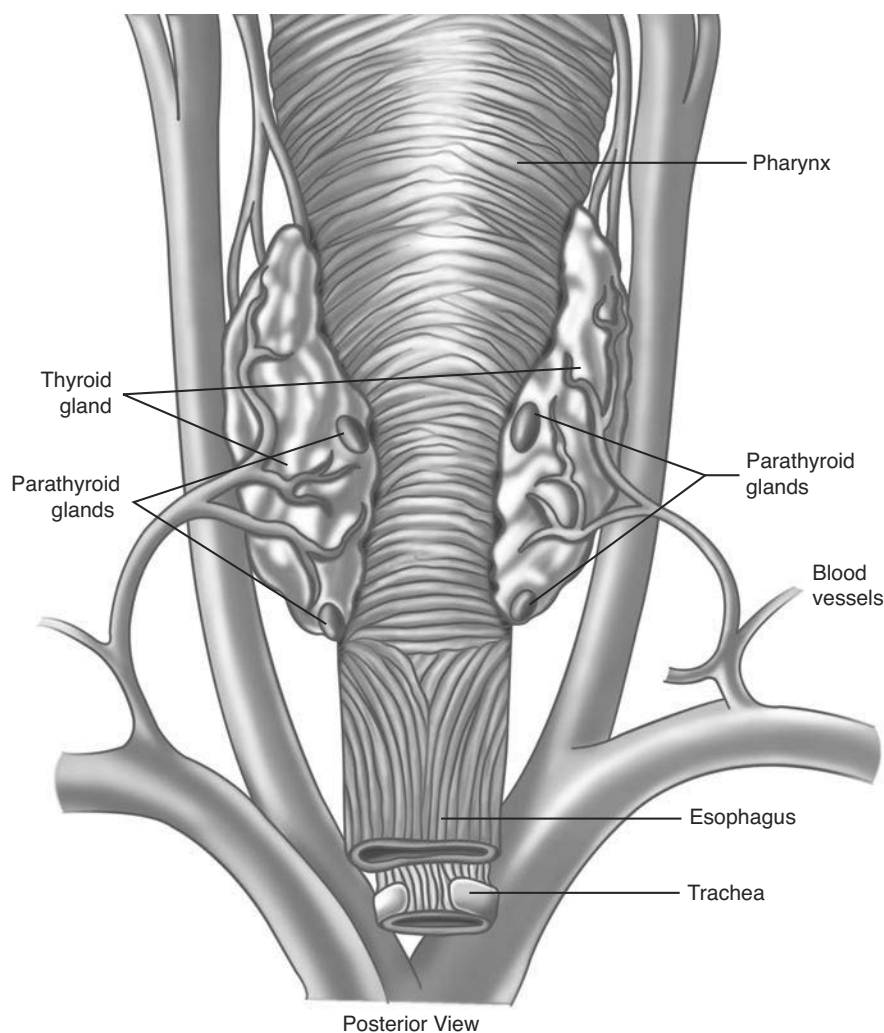
Syndrome of inappropriate antidiuretic hormone (SIADH) is a disorder of the posterior pituitary gland where vasopressin (ADH) is secreted even when plasma osmolality is normal or low. SIADH, or Schwartz-Barter syndrome, occurs when ADH is secreted in the presence of a low plasma osmolality. This alteration results in increased levels of anti-diuretic hormone. High levels of ADH results in excretion of sodium. The incidence is unknown but might be related to cancers, viral and bacterial pneumonia, lung abscesses, tuberculosis, chronic obstructive pulmonary disease, mycoses, positive pressure ventilators, pneumothorax, brain tumors, head trauma, certain medications, and infectious diseases. Signs and symptoms include nausea, vomiting, muscle twitching, changes in level of consciousness, and low sodium levels with increased urine sodium. The treatment for SIADH includes fluid restrictions because fluid further dilutes the serum sodium levels, gradual replacement of sodium, and administration of demeclocycline (Declomycin) and intravenous hypertonic sodium.

## **Thyroid Disorders**

The thyroid is located below the larynx and anterior to the trachea (see Figure 4.3). The thyroid gland produces two iodine-dependent hormones: thyroxine (T<sub>4</sub>) and triiodothyronine (T<sub>3</sub>). A third hormone known as thyrocalcitonin (calcitonin) is produced by the C cells of the thyroid gland in response to calcium levels. The C cell makes calcitonin that helps to regulate calcium levels in the blood. These hormones play a role in regulating the metabolic processes controlling the rate of growth, oxygen consumption, contractility of the heart, and calcium absorption.

### **Hypothyroidism**

Hypothyroidism occurs when thyroid hormone production is inadequate. The thyroid gland often enlarges to compensate for a lack of thyroid hormone, resulting in a goiter. Another cause for development of a goiter is a lack of iodine in the diet. Other causes of primary hypothyroidism include genetic defects that prevent the metabolism of iodine. In the infant, this is known as *cretinism*. Other causes include eating a diet high in goitrogens, such as turnips, cabbage, spinach, and radishes, or taking the medications lithium, phenylbutazone, and para-aminosalicylic acid. Secondary hypothyroidism, known as *myxedema*, is the result of a lack of pituitary production of thyroid-stimulating hormone.



**FIGURE 4.3** Thyroid and parathyroid glands.

Signs and symptoms of hypothyroidism in the adult are as follows:

- ▶ Fatigue and lethargy
- ▶ Decreased body temperature
- ▶ Decreased pulse rate
- ▶ Decreased blood pressure
- ▶ Weight gain
- ▶ Edema of hands and feet
- ▶ Hair loss
- ▶ Thickening of the skin

In severe cases, myxedema coma can occur. Symptoms of myxedema include coma, hypotension, hypothermia, respiratory failure, hyponatremia, and hypoglycemia. Myxedema coma can be brought on by withdrawal of thyroid medication, anesthesia, use of sedatives, narcotics, surgery, or hypothermia.

### Signs and Symptoms of Hypothyroidism in the Infant

As mentioned earlier, hypothyroidism in an infant is called *cretinism*. The following list gives you the signs and symptoms of cretinism:

- ▶ Decreased respirations
- ▶ Changes in skin color (jaundice or cyanosis)
- ▶ Poor feeding
- ▶ Hoarse cry
- ▶ Mental retardation in those not detected or improperly treated

Diagnostic studies for cretinism include evaluation of T3 and T4 levels using test doses of thyroid-stimulating hormone.

### Managing Hypothyroidism

Management of the client with hypothyroidism includes the replacement of thyroid hormone, usually in the form of synthetic thyroid hormone levothyroxine sodium (Synthroid). Clients should be instructed to take Synthroid in the morning one hour prior to meals with water only because food can alter absorption. Soy products should be limited because soy can also alter absorption. The client's history should include other drugs the client is taking. Prior to administering thyroid medications, the pulse rate should be evaluated. If the pulse rate is above 100 in the adult or 120 in the infant, the physician should be notified. The client requires a warm environment due to alteration in metabolic rate affecting temperature. Another problem associated with a slower metabolic rate is constipation. A high-fiber diet is recommended to prevent constipation. Treatment of myxedema coma includes treatment of hypotension, glucose regulation, and administration of corticosteroids.

## Hyperthyroidism

Hyperthyroidism or thyrotoxicosis is caused by excessive thyroid hormone. Because the thyroid gland is responsible for metabolism, the client with hyperthyroidism often experiences increased heart rate, increased stroke volume, weight loss, and nervousness. The cause of hyperthyroidism is multifactorial. Some of these causes are autoimmune stimulation such as Graves' disease, hypersecretion of thyroid-stimulating hormone (TSH), thyroiditis, or neoplasms of the thyroid gland.

*Graves' disease* results from an increased production of thyroid hormone. The most common cause of hyperthyroidism is hyperplasia of the thyroid, commonly referred to as a *toxic diffuse goiter*.

Signs and symptoms of hyperthyroidism include

- ▶ Increased heart rate and pulse pressure
- ▶ Tremors or nervousness
- ▶ Moist skin and sweating
- ▶ Increased activity
- ▶ Insomnia
- ▶ Atrial fibrillation
- ▶ Increased appetite and weight loss
- ▶ Exophthalmus

A *thyroid storm* is an abrupt onset of symptoms of hyperthyroidism due to Graves' disease, inadequate treatment of hyperthyroidism, trauma, infection, surgery, pulmonary embolus, diabetic acidosis, emotional upset, or toxemia of pregnancy. Fever, tachycardia, hypertension, tremors, agitation, anxiety, and gastrointestinal upset occur. The treatment for a thyroid storm includes maintenance of a patent airway and medication to treat hypertensive crises. Propylthiouracil (PTU) and methimazole (Tapazole) are two antithyroid drugs used to treat thyroid storm. These drugs work by blocking the synthesis and secretion of thyroid hormone. Soluble solution of potassium iodine (SSKI) or *Lugol's solution* can be given to stop the release of thyroid hormone already in the gland. This drug can also be given prior to thyroid surgery to prevent a thyroid storm. The client should be taught to take the medication with a fruit juice high in ascorbic acid, such as orange or tomato juice, to increase the absorption of the medication and mask the taste. Taking the medication through a straw can also increase the palatability of the medication. Propranolol (Inderal) or other beta-blocking agents can be given to slow the heart rate and decrease the blood pressure. If fever is present, the client can be treated with a nonaspirin medication such as acetaminophen (Tylenol) or ibuprofen.

Diagnosis of hyperthyroidism involves the evaluation of T3 and T4 levels and a thyroid scan with or without contrast media. These thyroid function studies tell the physician whether the client has an adequate amount of circulating thyroid hormone. A thyroid scan can clarify the presence of an enlargement of tumor of the thyroid gland.

Management of the client with hyperthyroidism includes

- ▶ The use of antithyroid drugs (propylthiouracil or Tapazole)
- ▶ Radioactive iodine, which can be used to test and destroy portions of the gland
- ▶ Surgical removal of a portion of the gland

Prior to thyroid surgery, the client is given Lugol's solution (SSKI)—an iodine preparation—to decrease the vascularity of the gland. Postoperatively, the client should be carefully assessed for the following:

- ▶ Edema and swelling of the airway (the surgical incision is located at the base of the neck anterior to the trachea).

- ▶ Bleeding (check for bleeding behind the neck).
- ▶ Tetany, nervousness, and irritability (complications resulting from damage to the parathyroid). Calcium gluconate should be kept available to treat hypocalcemia.

Because the thyroid gland is located anterior to the trachea, any surgery in this area might result in swelling of the trachea. For that reason, it is imperative that the nurse be prepared for laryngeal swelling and occlusion of the airway. The nurse should keep a tracheostomy set at the bedside and call the doctor if the client has changes in her voice or signs of laryngeal stridor. The nurse should instruct the client to keep her head and neck as straight as possible. Vital signs should be monitored, and the client should be evaluated for signs of hypoparathyroidism. Those signs include tingling around the mouth. The nurse should check for hypocalcemia by checking Chvostek's sign. This is elicited when cranial nerves 7 and 5 are stimulated and result in facial grimacing when the cheek is tapped with the examiner's finger. Trousseau's sign is also an indication of hypocalcemia and is elicited by placing a blood pressure cuff on the arm and watching for carpopedal spasms. Refer to Figures 2.4 and 2.5 in Chapter 2, "Fluid and Electrolyte and Acid/Base Balance," for more information about Chvostek's sign and Trousseau's sign.

## Parathyroid Disorders

The parathyroid glands are four small glands located on the thyroid gland (see Figure 4.3). The primary function of the parathyroid glands is the regulation of calcium and phosphorus metabolism. Diagnosis of parathyroid disorders is based on an evaluation of serum calcium and serum phosphorus levels and 24-hour urine levels of calcium and phosphorus. The normal serum calcium level is approximately 8.5–10.5 mg/dl; the normal phosphorus level is about 2.5–4.5 mEq/L. Radioimmunoassay exams are used to check serum parathormone. Potential disorders of these glands include hypoparathyroidism and hyperparathyroidism.

### Hypoparathyroidism

Hypoparathyroidism is an inadequate production of parathormone and is most often related to the removal of the parathyroid glands during thyroid surgery. Parathyroid hormone (PTH) is responsible for the regulation of calcium and phosphorus levels in the blood. Calcium and phosphorus levels must be maintained within normal limits to have adequate nerve function. Bone density is also maintained by parathormone. Signs and symptoms of hypoparathyroidism include the following:

- ▶ Decreased blood calcium
- ▶ Increased blood phosphorus
- ▶ Neuromuscular hyperexcitability
- ▶ Carpopedal spasms (Trousseau's sign)

- ▶ Positive Chvostek's sign
- ▶ Urinary frequency
- ▶ Mood changes (depression)
- ▶ Dry, scaly skin and thin hair
- ▶ Cataracts
- ▶ Changes in teeth (cavities)
- ▶ Seizures
- ▶ Changes in EKG (prolonged Q-T intervals and inverted T waves)

#### TIP

Here's a way to remember that the facial nerve is cranial nerve 7: Place your hand on the cheek bone and move your finger out toward the ear and down the jaw line. You will note that you have formed the number seven.

Management of the client with hypoparathyroidism involves the administration of IV calcium gluconate and long-term use of calcium salts. If calcium gluconate is administered intravenously, the rate should be monitored carefully because rapid administration can result in cardiac arrhythmias. Phosphate binders such as calcium acetate (Phoslo) can be used to bind with phosphates. This will result in a rise in the calcium level. Vitamin D supplements can be given to increase the absorption of calcium preparations as well as calcium in the diet.

## Hyperparathyroidism

Hyperparathyroidism is the direct opposite of hypoparathyroidism. In this disorder, you find an overproduction of parathormone. Signs and symptoms of hyperparathyroidism include

- ▶ Decreased blood phosphorus.
- ▶ Increased blood calcium.
- ▶ Muscle weakness.
- ▶ Osteoporosis.
- ▶ Bone pain and pathological fractures.
- ▶ Increased urinary output and renal calculi.
- ▶ Nausea and vomiting.
- ▶ Changes in EKG (shortened Q-T interval and signs of heart block). *Heart block* involves an alteration in the conduction system of the heart. In third- and fourth-degree heart block, there is an alteration in the heart's ability to transmit electrical

impulses from the sinus node located in the right atria to the ventricle. This interference in the conduction system can cause a prolonged P-R interval and possibly deletion of atrial contractions.

Managing a client with hyperparathyroidism is accomplished by the removal of the parathyroid. Preoperative management involves the reduction of calcium levels. Postoperative management includes

- ▶ Assessment of the client for respiratory distress
- ▶ Maintaining suction, oxygen, and a tracheostomy set at bedside
- ▶ Checking for bleeding (1–5ml is normal)
- ▶ Checking the serum calcium and serum phosphorus levels

To prevent the need for lifelong treatment with calcium, the client might have a parathyroid transplant—implantation of one or more parathyroid glands to another part of the body. If this is not possible, a total parathyroidectomy might be performed. If this is the situation, or if inadequate production of parathormone is found, the client will require lifelong supplementation with calcium and vitamin D.

## Diabetes Mellitus

There are two types of diabetes: type 1 and type 2. Type 1, also called *insulin-dependent diabetes mellitus (IDDM)* or *juvenile-onset diabetes*, is a condition where the islets of Langerhans in the pancreas do not produce needed insulin. Insulin is necessary for food to be metabolized. Antibodies have been found in the majority of clients with type 1 diabetes. These antibodies are proteins in the blood that are part of the client's immune system. It is believed that type 1 diabetes is in part genetically transmitted from parent to child. At stressful times in life, such as when infection is present, pregnancy or environmental toxins might trigger abnormal antibody responses that result in this autoimmune response. When this happens, the client's body stops producing insulin. Type 1 diabetes tends to occur in young, lean individuals, usually before 30 years of age; however, it can occur in older individuals. These individuals are referred to as *latent autoimmune diabetes in adults (LADA)*. Diabetes occurs in about 6% of Caucasians, 10% of African Americans, 20–50% of Native Americans, and 15% of Hispanics.

Type 2 diabetes was referred to as *non-insulin-dependent, adult-onset diabetes mellitus (ADDM)*. However, in recent years, more and more children have been diagnosed with ADDM. This trend can be attributed to obesity and sedentary lifestyle. In ADDM, the cells of the body, particularly fat and muscle cells, become resistant to insulin. This leads to increased insulin production with increased insulin resistance. Tests have also shown that this increased insulin resistance leads to a steady decline in beta cell production further worsening glucose control. This problem along with *gluconeogenesis*, a process in which the liver continues to produce glucose, leads to further hyperglycemia, metabolic acidosis, and deterioration of the client's health.

Signs and symptoms associated with diabetes mellitus include

- ▶ **Weight loss:** Insulin is required for carbohydrates to be converted into useable glucose; a lack of insulin results in a lack of glucose with cellular starvation.
- ▶ **Ketonuria:** The breakdown of fats leads to the production of ketones that causes characteristic fruity breath.
- ▶ **Polyphagia:** Cellular starvation causes the diabetic to increase food consumption.
- ▶ **Polyuria:** The kidneys attempt to regulate pH by increasing urinary output of ketones and glucose.
- ▶ **Polydipsia:** The loss of large amounts of fluid leads to metabolic acidosis and dehydration. To compensate for the fluid loss, the client drinks large amounts of water.
- ▶ **Delayed wound healing:** Increased blood sugar contributes to poor wound healing.
- ▶ **Elevated blood glucose:** Normal is 70–110 mg/dl. Uncorrected or improperly managed diabetes mellitus leads to coma and death.

Diagnosis of diabetes mellitus is made by checking blood glucose levels. Several diagnostic tests that can be performed to determine the presence and extent of diabetes are as follows:

- ▶ **Glucose tolerance test:** The glucose tolerance test is the most reliable diagnostic test for diabetes. Prior to the glucose tolerance test, the client should be instructed to eat a diet high in carbohydrates for three days and remain NPO after midnight the day of the test. The client should come to the office for a fasting blood glucose level, drink a solution high in glucose, and have the blood tested at one and two hours after drinking the glucose solution (glucola) for a test of glucose in the serum. A diagnosis of diabetes is made when the venous blood glucose is greater than 200 mg/dl two hours after the test.
- ▶ **Fasting blood glucose levels:** The normal fasting blood glucose is 70–110 mg/dl. A diagnosis of diabetes can be made if the fasting blood glucose level is above 140 mg/dl or above on two occasions. A blood glucose level of 800 mg/dl or more, especially if ketones are present, indicates a diagnosis of *hyperosmolar hyperglycemic nonketotic syndrome (HHNKS)*.
- ▶ **Two-hour post-prandial:** Blood testing for glucose two hours after a meal.
- ▶ **Dextrostix:** Blood testing for glucose.
- ▶ **Glycosylated hemoglobin assays (HbA1c):** The best indicator of the average blood glucose for approximately 90–120 days. A finding greater than 7% indicates non-compliance.



- ▶ **Glycosylated serum proteins and albumin levels:** Become elevated in the same way that HbA1c does. Because serum proteins and albumin turn over in 14 days, however, glycosylated serum albumin (GSA) can be used to indicate blood glucose control over a shorter time.
- ▶ **Urine checks for glucose:** Ketonuria occurs if blood glucose levels exceed 240 mg/dl.
- ▶ **Antibodies:** Checked to determine risk factors for the development of type 1 diabetes. Measurement of the cells' antibodies can also determine the rate of progression to diabetes.

Management of the client with diabetes mellitus includes the following:

- ▶ **Diet:** The diet should contain a proper balance of carbohydrates, fats, and proteins.
- ▶ **Exercise:** The client should follow a regular exercise program. He should not exercise if his blood glucose is above 240 mg/dl. He should wait until his blood glucose level returns to normal.
- ▶ **Medications:** Oral antidiabetic agents or insulin. Medications used to treat diabetes mellitus include sulfanylurea agents, alpha-glucosidase inhibitors, nonsulfanylurea agents, D-phenylalanine derivatives, and thiazolidinediones. Insulins are also used to treat clients with type 1 diabetes. Insulin can be administered subcutaneously, intravenously, or by insulin pump. An insulin pump administers a metered dose of insulin and can provide a bolus of insulin as needed. Byetta is an injectable medicine used to improve blood sugar control in adults with type 2 diabetes. This drug can be used with metformin (Glucophage) or other sulfonylureas. Other more recent medications used to treat type II diabetes mellitus are Januvia (sitagliptin), Onglyza (saxagliptin), Prandin (repaglinide), Starlix (nateglinide), and Victoza (liraglutide).

#### NOTE

Januvia and Byetta have been linked to the occurrence of pancreatic cancer.

#### NOTE

Regular insulin is the only insulin that can be administered intravenously. See the section "Pharmacological Agents Used to Treat Clients with Endocrine Disorders" for a discussion of the antidiabetic drugs.

## Hyperglycemia

When there is lack of the hormone insulin, the glucose can't move from the outside of the cell to the inside of the cell where it can be used. It is very important that the nurse be aware of the signs of hyperglycemia to teach the client and family. Signs and symptoms of hyperglycemia are as follows:

- ▶ Headache
- ▶ Nausea/vomiting
- ▶ Coma

- ▶ Flushed, dry skin
- ▶ Glucose and acetone in urine

#### TIP

The following statements are a couple of helpful hints for dealing with diabetes mellitus clients:

- ▶ **Hot and dry; blood sugar high:** This means that if the diabetic's skin is hot and she is dehydrated, her blood glucose level is likely high. Another hint is "Red and hot, need a shot". This indicates to the nurse the skin might be red and hot to touch if the blood glucose level is extremely high.
- ▶ **Cold and clammy; need some candy:** This means that if the diabetic's skin is cold and clammy, her blood glucose level is low and she needs a glucose source.

## Hypoglycemia

When there is a lack of glucose, cell starvation occurs. This results in hypoxemia and cell death. Signs and symptoms of hypoglycemia are as follows:

- ▶ Headache
- ▶ Irritability
- ▶ Disorientation
- ▶ Nausea/vomiting
- ▶ Diaphoresis
- ▶ Pallor
- ▶ Weakness
- ▶ Convulsions

#### CAUTION

If the client fails to eat her regular bedtime snack, she might experience Somogyi effect. This abrupt drop in the client's blood glucose level during the night is followed by a false elevation. The treatment of Somogyi effect is to teach the client to eat a bedtime snack consisting of a protein source, such as peanut butter and a glass of milk.

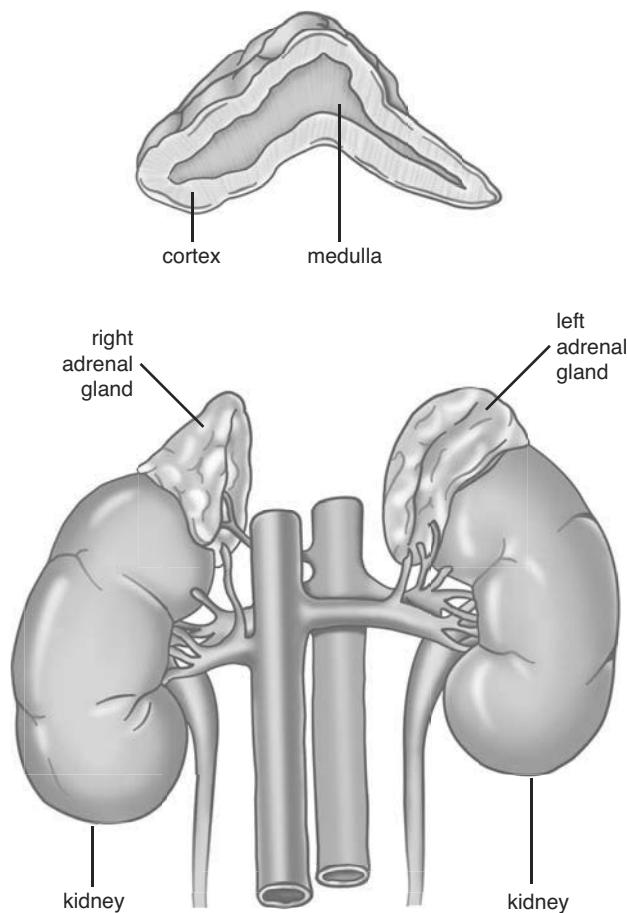
## Managing Hyperglycemia and Hypoglycemia

Management of hypoglycemia includes giving glucose. Glucagon, a 50% glucose solution, is an injectable form of glucose given in emergency. Cake icing, orange juice, or a similar carbohydrate can be administered if the client is still conscious. The best bedtime snack is milk and a protein source, such as peanut butter and crackers. Fluid and electrolyte regulation is also a part of the treatment of both hyperglycemia and hypoglycemia.

Unchecked hyperglycemia leads to microangiopathic and macroangiopathic changes. These lead to retinopathies, nephropathy, renal failure, cardiovascular changes, and peripheral vascular problems.

## Adrenal Gland

The adrenal gland is a vascular gland located at the top of the kidney. It comprises the cortex (outer portion) and the medulla (inner portion), as illustrated in Figure 4.4. The action of the adrenal gland consists of production of mineralocorticoids that help control the body's levels of minerals such as sodium and potassium. Glucocorticoids, androgens, and estrogens are made in the zona fasciculata and zona reticularis. The cortex produces the adrenal steroids and corticosteroids. The major mineralocorticoid produced in the cortex is aldosterone. As previously discussed, this mineralocorticoid helps to control reabsorption of sodium and potassium that the kidneys excrete. Other regulatory mechanisms controlled by the cortex are renin and adrenocorticotrophic hormone (ACTH). The most prominent glucocorticoid secreted by the adrenal cortex is cortisol. This hormone helps to regulate the body's stress response, metabolism of food, emotional stability, and the immune response. Small amounts of androgens and estrogen are secreted by the adrenal cortex.



**FIGURE 4.4** Adrenal gland.

The adrenal medulla is a sympathetic nerve ganglion that stimulates the sympathetic nervous system. This stimulation results in elevations in catecholamines such as norepinephrine and epinephrine. These chemicals help to control response to stress. The

“fight or flight” response results in changes in pulse rate, blood pressure, and central nervous system response.

## Adrenal Gland Disorders

Adrenal disorders result in many problems. Some of these include fatigue, weakness, suppression of the immune response, muscle and bone loss, and many others. This section covers some of the most common types of adrenal disorders along with their causes and treatments.

### Primary Aldosteronism (Conn’s Syndrome)

Conn’s syndrome is a disease of the adrenal glands that involves an excessive production of aldosterone. The most common reasons for development of Conn’s syndrome are a tumor of the adrenal gland or benign hyperplasia of the adrenal gland, but the syndrome can also be related to use of thiazide diuretics or high levels of angiotensin II caused by poor renal perfusion. Signs and symptoms of Conn’s syndrome include an elevated serum sodium level, decreased potassium serum levels, and hypertension with a related headache. Positive Trousseau’s and Chvostek’s signs might be present. Diagnosis of Conn’s is made by checking the serum levels for sodium and potassium and aldosterone levels. X-rays, CT scans, and an MRI confirm the presence of tumors. Treatment includes a low-sodium diet, potassium supplementation, and control of hypertension. Spironolactone (Aldactone)—a potassium-sparing diuretic—is prescribed to lower aldosterone levels and lower blood pressure. Surgical intervention is done when tumors are identified. Prognosis is good if the client is accurately diagnosed. If the client fails to receive an accurate diagnosis, the disease can lead to a stroke, heart attack, or renal disease.

Pheochromocytoma is a catecholamine-producing adrenal tumor that leads to a marked elevated blood pressure. Treatment includes treatment of malignant hypertension with drugs such as sodium nitroprusside (Nipride) or clonidine (Catapres). Removal of the tumor primarily corrects the hypertension. The client’s blood pressure must be stabilized prior to surgery. This is usually done by administration of an alpha-adrenergic-blocking agent such as phenoxybenzamine hydrochloride (Dibenzyline).

### Adrenocortical Insufficiency (Addison’s Disease)

Addison’s disease can occur as a result of long-term use of steroids or the rapid cessation of corticosteroids. It can also be caused by sepsis, surgical stress, or hemorrhage of the adrenal glands (Waterhouse-Friderichsen syndrome).

Signs and symptoms associated with Addison’s disease include

- ▶ Weakness.
- ▶ Bronze-like pigmentation of the skin.
- ▶ Decreased glucose levels.
- ▶ Decreased blood pressure.

- ▶ Anorexia.
- ▶ Sparse axillary hair.
- ▶ Urinary frequency.
- ▶ Depression.
- ▶ Addisonian crises. The symptoms of Addisonian crises are severe hypotension, cyanosis, and shock. This constitutes an emergency situation. The nurse should call the doctor immediately to obtain orders for medications to treat shock.

Diagnosis of Addison's disease involves an evaluation of serum sodium and chloride levels. Evaluation of ketosteroids and 17-hydroxycorticoids is also done. Adrenal function is evaluated by administering adrenocorticoid-stimulating hormone (ACTH) and checking for changes in cortisol levels.

Management of the client with Addison's disease includes the use of intravenous cortisone and plasma expanders to achieve and maintain the blood pressure. When stable, the client can be given intramuscular cortisol in the form of dexamethasone (Decadron) or orally in the form of prednisolone (Prednisone). The client with Addison's disease requires lifelong maintenance with cortisone. The client should be instructed to take the medication exactly as prescribed and to avoid sudden cessation of the drug.

### **Adrenocortical Hypersecretion (Cushing's Disease)**

The terms *Cushing's disease* and *Cushing's syndrome* are often used interchangeably although they are not the same. Cushing's syndrome or primary Cushing's syndrome can be caused by tumors of the adrenal cortex. Secondary Cushing's syndrome (Cushing's disease) often is caused by pituitary hypothalamus or adrenal cortex problems that result in an increased ACTH (adrenocorticotrophic hormone). Long-term administration of glucocorticoids or *iatrogenic Cushing's syndrome* will also produce elevated levels of cortisone and symptoms associated with hypersecretion.

Diagnosis is made by checking serum cortisone, calcium, potassium, sodium, and glucose levels. Altered ACTH and 17 ketosteroid levels are also seen with Cushing's. A positive ACTH suppression test can be performed to check for changes in cortisone levels when ACTH is administered.

Signs and symptoms associated with Cushing's disease include

- ▶ Pendulous abdomen
- ▶ Buffalo hump
- ▶ Moon faces
- ▶ Hirsutism (facial hair)
- ▶ Ruddy complexion (dark red)
- ▶ Increased BP
- ▶ Hyperglycemia

- ▶ Osteoporosis
- ▶ Decreased serum potassium and decreased serum chloride
- ▶ Increased 17-hydroxycorticoids
- ▶ Decreased eosinophils and decreased lymphocytes

Management of the client with Cushing's is accomplished by removing the cause—hyperplasia of the gland. Surgery can be required. A low-sodium diet, regulation of fluid and electrolytes, and administration of a potassium-sparing diuretic such as aldactone (Spironolactone) help to decrease the symptoms. Because elevated glucose levels are common in the client with Cushing's syndrome, the client often requires frequent checks of glucose levels and administration of insulin or oral antidiabetic medications.

### Case Study

A 76-year-old male is admitted from home. His blood sugar on admission is 53mg/dl. He is awake and able to swallow.

1. List your interventions.
2. The client's blood sugar levels are normally below 180 but have been between 288 and 312 over the last 48 hours. He has injected his usual 7 a.m. dose of 15 U of NPH, his 7 p.m. dose of 10 U of NPH insulin, and an additional four to six units of regular insulin each time he has checked his capillary blood sugar levels. He performs a blood sugar test before each meal and at bedtime. The client denies increased caloric intake, alteration in amount or type of exercise, increased stress, or signs of illness.

It is now 10:30 a.m., and when you test the blood sugar, you find that it is 55mg/dl.

The client states that he is starting to feel a little "shaky." List your interventions.

3. The client is being treated for diabetic ketoacidosis. His capillary blood sugar level has just decreased to 249mg/dl. He is receiving continuous intravenous insulin at 10 U/hour that is piggy-backed to isotonic saline (0.9% sodium chloride). List your interventions.
4. You are the nurse assigned to oversee care of the client's diabetes since his admission for treatment of an infection. At 8:30 a.m., the nursing assistant reports that the client is feeling bad and is refusing morning care. His fever has increased to 102.8° F; his mouth and skin are dry; his urine output has been 250cc/hour since 6 a.m.; his respirations are deeper and 22/minute; and his current capillary blood glucose level reflects an increase to 308mg/dl. When notified, the physician orders 6 U of regular insulin to be given intramuscularly, additional diagnostic testing, and a new IV antibiotic. List your interventions.

### Answers to Case Study

1. Administer a rapid-acting sugar, such as orange juice or hard candy.

Check the blood sugar in 15 minutes; if no change, give another dose of simple sugar. After the blood sugar goes above 70, administer a longer-acting meal such as crackers and milk if a meal is not due to be served. Ask about storage, expiration dates, and use of old and new vials of insulin to determine potency.

(continues)

*(continued)*

Check his blood glucose machine for accuracy.

Check for signs of illness.

- 2.** Treat the blood sugar problem with simple sugar and then a more complex meal.

Because medications can alter blood glucose levels, ask about the consumption of medications that he normally has not taken.

Evaluate injection sites for tissue damage that would hinder absorption.

- 3.** Call the doctor to get an IV changed to one containing dextrose to prevent hypoglycemia. The insulin rate can be changed also.

Make continuous hourly assessments of signs of hypoglycemia or hyperglycemia and changes in the client's condition as his blood sugar continues to stabilize. Some clients who are accustomed to higher blood sugar levels might experience signs of hypoglycemia at a higher blood sugar level than someone whose blood sugar level is maintained at a more normal level.

- 4.** The injection of insulin needs to be given stat. Intramuscular insulin will absorb more rapidly. Repeat the blood sugar every 15–30 minutes, and reassess the client for improvement or further signs of dehydration and acidosis. If cultures are ordered, specimens are collected before the new antibiotic is administered.

# Key Concepts

This chapter discussed alterations in the endocrine system. The nursing student should use these key concepts to answer questions as they relate to the care of this client. Remembering the pathophysiology of the disease process, the treatment, and the laboratory values will help you to be able to answer questions in the physiologic integrity portion of the NCLEX exam.

## Key Terms

- ▶ Acromegaly
- ▶ Adrenocortical hyperplasia
- ▶ Aldosterone
- ▶ Androgens
- ▶ Addison's
- ▶ Adrenal cortex
- ▶ Adrenalectomy
- ▶ Bromocriptine (Parlodel)
- ▶ Buffalo hump
- ▶ Corticosteroids
- ▶ Cortisol
- ▶ CT scan
- ▶ Cushing's disease
- ▶ Diabetes insipidus
- ▶ Dostinex (carbergoline)
- ▶ Estrogen
- ▶ FSH (follicle-stimulating hormone)
- ▶ Gigantism
- ▶ Gland
- ▶ Gonadotrophins
- ▶ Hirsutism
- ▶ Hormones
- ▶ Human growth hormone
- ▶ Hypopituitarism
- ▶ Hypothalamus



- ▶ Luteinizing hormone
- ▶ MRI (magnetic resonance imaging)
- ▶ Ovaries
- ▶ Parlodel (bromocriptine)
- ▶ Parathyroid gland
- ▶ Pituitary gland
- ▶ Prednisone
- ▶ Progesterone
- ▶ Prolactin
- ▶ Prolactinoma
- ▶ Thymus
- ▶ Thyroid gland
- ▶ Transsphenoidal hyposection

## Diagnostics

The exam reviewer should be knowledgeable of the preparation and care of clients receiving exams to diagnose endocrine disorders. While reviewing these diagnostic exams, the exam reviewer should be alert for information that would be an important part of nursing care for these clients. The pertinent labs and exams are as follows:

- ▶ Laboratory test to determine hormone levels
- ▶ X-rays to detect tumors
- ▶ Computer tomography to detect tumors
- ▶ Magnetic imaging to detect tumors

## Pharmacological Agents Used to Treat Clients with Endocrine Disorders

An integral part of care to clients with endocrine disorders is pharmacological intervention. These medications provide an improvement or cure of the clients' endocrine problems. The nursing exam reviewer needs to focus on the drugs in Table 4.1. Included in this table are the most common drugs used to treat endocrine disorders. These medications are not inclusive of all the agents used to treat endocrine disorders; therefore, you will want to keep a current pharmacology text handy for reference.

**TABLE 4.1 Pharmacological Agents Used in the Treatment of Clients with Endocrine Disorders**

Drug	Action	Side Effect	Nursing Care
Cortisone, hydro-cortisone, prednisone, and fludrocortisone (Florinet)	For replacement of a lack of cortisole or to suppress the immune response in a client suffering from allergic reaction, those with organ transplantation, or to suppress untoward effects of medications	Nausea and vomiting, weight gain, decreased immunity.	Instruct the client to take the medication with meals. Instruct the client to report the signs or symptoms of excessive drug therapy: signs of Cushing's syndrome.
Propylthiouracil (PTU, Propyl-Thracil)	Used to treat hyperthyroidism	Slow heart rate, fatigue, drowsiness headache, neuritis, nausea, vomiting, diarrhea, and myelosuppression.	Measured dosage should be spread over 24 hours to prevent hormone release from the thyroid.
Methimazole (Tapazole)	Antithyroid medication	Same as above.	Monitor vital signs, weigh the client weekly, observe for throat soreness, fever, headache, and skin ulcers.
Iodine product, strong iodine (Lugol's solution)	Used to decrease the potential for a thyroid storm, which is an abrupt release of thyroid hormone	Same as above.	Bitter to taste, give with fruit juice.
SSKI (saturated solution of potassium iodide)	Used to treat and prevent thyroid storm	Same as above plus: metallic taste, stomatitis, salivation, coryza, hyperthyroid adenoma, irregular heart rate, and mental confusion.	Signs of hypothyroidism might necessitate discontinuation.
Potassium iodide tablets, solution, and syrup	Used to treat iodide deficiency that can lead to a goiter	Same as above.	Take after meals to increase absorption.
Lithium carbonate (Lithobid, Carbolith, Lithizine)	Used to treat hyperthyroidism	Dizziness, lethargy, drowsiness, fatigue, slurred speech, psychomotor retardation, incontinence, EEG changes, arrhythmias, hypotension, impaired vision, thyroid enlargement, dry mouth, abdominal pain, pruitus, and thinning hair.	Observe for hypothyroidism. Instruct the client to drink 8–12 glassfuls of fluids per day. Instruct the client to maintain adequate sodium intake to prevent toxicity.
Propanolol (Inderal, Detensol)	A beta blocker used to treat hyperthyroidism	Bradycardia, edema, lethargy, and bone marrow suppression.	Monitor pulse rate, CBC, and for signs of congestive heart failure. Take with food to decrease GI upset.
Atenolol (Tenormin)	Same as above	Same as above.	Same as above.

*(continues)*

**TABLE 4.1** *Continued*

<b>Drug</b>	<b>Action</b>	<b>Side Effect</b>	<b>Nursing Care</b>
Levothyroxine (Levo-T, Levothroid, Levoxyl, Levothyroxine Sodium, Synthroid)	Used to treat hypothyroidism	Tachycardia, nausea, vomiting, diarrhea, and insomnia.	Check pulse rate routinely.
Bromocriptine (Alphagen, Parlodel)	Used to treat parkinsonism or for prolactinomas	Hypotension, nausea, vomiting, blurred vision, dry mouth, urticaria, and fatigue.	Watch for orthostatic hypotension. Should not be used by pregnant clients. Dizziness, headaches, abnormal vision, constipation, hot flashes, and parathesia. Check serum prolactin levels <20mcg/liter in women or <1 5 mg.
<b>Sulfonylureas</b>			
Carbergoline (Dostinex)	Used to treat prolactinomas; inhibits prolactin secretion	May cause headaches, depression, nervousness, and fatigue. Dysmenorrhea and facial flushing has also occurred.	Do not use with clients with liver disease.
Glimepiride (Amaryl)	Used to treat hyperglycemia; works by increasing effects of client's own insulin	Hypoglycemia, watch for renal function.	Teach the client to watch for hypoglycemia, GI disturbance, allergic skin reactions, and photosensitivity. Take once daily before meals.
Glyburide (Micronase, Diabeta, glynase)	Same as above	Same as above, plus may cause gastrointestinal disturbance.	Watch for hypoglycemia. Take in divided doses.
Glipizide (Glucotrol, Glucotrol XL)	Same as above	Same as above.	Watch for hypoglycemia. Take before breakfast. Doses above 15mg should be divided. Glucotrol XL is long-acting, given one time per day.
<b>Antidiabetic Medications — Meglitinides</b>			
Repaglinide (Prandin)	Used to treat hyperglycemia	May lead to hypoglycemia.	Watch for hypoglycemia. If NPO, withhold medication.
<b>Antidiabetic Medications — Biguanides</b>			
Metformin (Glucophage)	Used to treat hyperglycemia; works by decreasing carbohydrate breakdown in the GI tract	Renal impairment, gastrointestinal upset, nausea, and vomiting.	Watch for hypoglycemia. Can cause GI disturbance, B-12 deficiencies, lactic acidosis, malaise, and respiratory distress. Contraindicated in renal disease clients, liver disease, and congestive heart failure. Clients going for radiographic studies should have glucophage withheld for 48 hours or until renal function returns.

TABLE 4.1 *Continued*

Drug	Action	Side Effect	Nursing Care
<b>Antidiabetic Medications—Thiazolidinedione</b>			
Rosiglitazone (Avandia)	Used to treat hyperglycemia; works by decreasing carbohydrate breakdown in the GI tract	Abdominal pain, nausea, vomiting, anorexia, and hypoglycemia.	Watch for hypoglycemia. Clients with liver or renal disease should not take this drug. Monitor liver enzymes. It might decrease effects of oral contraceptives. Watch for signs of congestive heart failure.
Alpha-glucosidase inhibitor—Acarbose (Precose)	Used to treat hyperglycemia associated with diabetes	Flatulence, diarrhea, and abdominal discomfort.	Watch for hypoglycemia. Take with first bite of food. Contraindicated in clients with liver disease, inflammatory bowel disease, or renal disease.
Invokana (canagliflozin)	Used to treat hyperglycemia associated with diabetes. Works by decreasing renal reabsorption of glucose and increasing renal excretion of glucose.	Check renal function	Watch for hypoglycemia; Hypotension can occur with use. Watch for signs of hyperkalemia. Might cause a rise in cholesterol.
<b>Insulins</b>			
Lispro (Humalog)	Onset five minutes, so have food available; peak 30–60 minutes; duration 2–4 hours; used to treat uncontrolled diabetes	Hypoglycemia	Watch for hypoglycemia.
Regular insulin	Onset 30–60 minutes; peak 2–4 hours; duration 6–8 hours	Hypoglycemia	Watch for hypoglycemia.
<b>Intermediate-Acting Insulins</b>			
NPH	Onset 1–2 hours; peak 6–12 hours; duration 18–24 hours	Hypoglycemia	Watch for hypoglycemia.
Humulin N	Same as above	Hypoglycemia	Watch for hypoglycemia.
Humulin L	Same as above	Hypoglycemia	Watch for hypoglycemia.
<b>Long-Acting Insulins</b>			
Ultra Lente	Onset 5–8 hours; peak 14–20 hours; duration 30–36 hours	Hypoglycemia	Watch for hypoglycemia.
Lantus	No peak; duration 24–36 hours	Hypoglycemia	Watch for hypoglycemia. Do not mix with other insulins. Usually given at night; however, the FDA has recently approved administration during the day.

(continues)

**TABLE 4.1** *Continued*

Drug	Action	Side Effect	Nursing Care
<b>Combination Insulins</b>			
Humulin 70/30	Onset 30 minutes; peak 4–8 hours; durations 22–24 hours	Hypoglycemia	Watch for hypoglycemia.
Humulin 50/50	Onset 30 minutes; peak 4–8 hours; durations 22–24 hours	Hypoglycemia	Watch for hypoglycemia.
Exubera	An inhaled form of insulin recently released and approved by the FDA; delivers insulin directly into the lungs; rapid onset; duration several hours	Hypoglycemia	Watch for hypoglycemia.

**NOTE**

Sublingual insulin and insulin patches have been developed but are not at present widely used.

## Apply Your Knowledge

The nurse reviewing for the licensure exam must be able to apply knowledge to meet client needs. Utilization of information found in this chapter will help the graduate to answer questions found on the NCLEX.

## Exam Questions

- The client is admitted to the hospital with a prolactinoma. Which symptom is not associated with a pituitary tumor?
  - Amenorrhea
  - Headache
  - Blurred vision
  - Weight loss
- Which of the following is the drug commonly used to treat a prolactinoma?
  - Gemcitabine (Gemzar)
  - Gefitinib (Iressa)
  - Cabergoline (Dostinex)
  - Ganciclovir (Cytovene)

3. The client is admitted with Hashimoto's thyroiditis. The nurse is aware that he will exhibit signs of which of the following?
  - A. Hyperthyroidism
  - B. Hypothyroidism
  - C. Hypoparathyroidism
  - D. Hyperparathyroidism
4. Management of hyperthyroidism might include a prescription for which of the following?
  - A. Propylthiouracil (PTU)
  - B. Fludrocortisone (Florinef)
  - C. Levothyroxine (Synthroid)
  - D. Glipizide (Glucotrol)
5. The client is admitted to the recovery room following a thyroidectomy. Which of the following actions by the nurse indicates understanding of care of the client with a thyroidectomy?
  - A. The nurse offers extra blankets.
  - B. The nurse places a tracheostomy tube at the bedside.
  - C. The nurse insists that the client refrain from talking.
  - D. The nurse administers pain medication every four hours.
6. The nurse is checking for hypoparathyroidism. To check for hypoparathyroidism, the nurse can check for the positive presence of which of the following signs?
  - A. Kernig's
  - B. Chadwick
  - C. McBurney's
  - D. Chvostek's
7. A client with Cushing's disease often complains of which of the following?
  - A. Anorexia
  - B. Difficulty swallowing
  - C. Hirsutism
  - D. Hot flashes

8. The most indicative test for diabetes mellitus is which of the following?
  - A. Two hour post-prandial
  - B. Dextrostix
  - C. Glucose tolerance test
  - D. Hemoglobin A-1C
9. The diabetic is being maintained on rosiglitazone (Avandia). Which lab test should be checked frequently?
  - A. TSH levels (thyroid-stimulating hormone levels)
  - B. AST levels (aspartate aminotransferase levels)
  - C. HCG levels (human gonadotropin levels)
  - D. LDH levels (lactic dehydrogenase levels)
10. The nurse is preparing to administer NPH insulin to the diabetic client. The nurse is aware that the onset of NPH insulin is which of the following?
  - A. Five minutes
  - B. Thirty minutes
  - C. Ninety minutes
  - D. Four hours

## Answers to Exam Questions

1. Answer D is correct. Prolactinoma tumors are tumors arising from hyperplasia of the pituitary gland that are prolactin hormone-based. Amenorrhea and anovulation are associated with prolactinomas because the pituitary gland assists with stimulation of the ovaries and ovulation, so answer A is incorrect. Because the pituitary is located in the center of the skull, adjacent to the brain, answers B and C are associated with increased intracranial pressure. Answer D is incorrect because weight *gain* can occur, not weight *loss*.
2. Answer C is correct. Dostinex is used to shrink the prolactin-based tumor. Answers A and B are antineoplastic drugs. Answer D is an antiviral medication.
3. Answer B is correct because in Hashimoto's thyroiditis, antibodies against thyroid hormone are produced, which leads to a decrease in thyroid hormone release. For this reason answers A, C, and D are incorrect.
4. Answer A is correct. Propylthiouracil (PTU) is an antithyroid medication. Answer B is incorrect because this is a cortisone preparation. Answer C is incorrect because this drug is used for hypothyroidism. Answer D is incorrect because this drug is used to treat diabetes.

5. Answer B is correct. The thyroid is located anterior to the trachea; therefore, laryngeal stridor and airway obstruction is a risk following a thyroidectomy. Answer A is incorrect because this action is not necessary. The need for extra blankets is associated with hypothyroidism, but is not directly associated with thyroid surgery. Answer C is incorrect because the client can talk. Answer D is incorrect because pain medication should be offered as needed, not every four hours.
6. Answer D is correct. The test for Chvostek's sign is performed by tapping the facial nerve (C7) and the trigeminal nerve (C5) and observing for grimacing. Answer A is incorrect because Kernig's sign is nuchal (neck) rigidity associated with meningitis. Answer B is incorrect because Chadwick's sign is a bluish vagina associated with hormonal changes. Answer C is incorrect because McBurney's sign is rebound tenderness associated with appendicitis.
7. Answer C is correct. Hirsutism is facial hair. This is associated with hypersecretion of cortisol. Answers A, B, and D are not associated with Cushing's disease.
8. Answer C is correct. The most indicative test of diabetes is the glucose tolerance test. Answers A and B are used to detect an elevated blood glucose level, but are not the best to detect diabetes. Answer D is incorrect because this test detects compliance.
9. Answer B is correct. Liver enzymes such as AST should be assessed along with renal function (creatinine levels) and cardiac function. Answer A is not correct because this medication does not alter thyroid function. Answer C is not correct because HCG levels are not affected by rosiglitazone (Avandia). This hormone is associated with pregnancy. Answer D is incorrect because an elevated LDH is associated with muscle trauma. It is, however, elevated in a myocardial infarction.
10. Answer C is correct. NPH insulin onset is 90–120 minutes. Answer A is incorrect because Novalog insulin onset is 5–10 minutes. B is incorrect because regular insulin onset is 15–30 minutes. D is incorrect and is not associated with the onset of any insulin.

## Suggested Reading and Resources

- ▶ American Diabetes Association: <http://www.diabetes.org>.
- ▶ Ignataricus, Donna D., and M. Linda Workman. *Medical-Surgical Nursing: Critical Thinking for Collaborative Care*. 5<sup>th</sup> ed. St. Louis: El Sevier, 2013.
- ▶ LeMone, P., and K. Burke. *Medical-Surgical Nursing: Critical Thinking in Client Care*. 5<sup>th</sup> ed. Upper Saddle River, NJ: Pearson Prentice Hall, 2011.



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