

EXAM ✓ CRAM

NCLEX-RN®



Fifth Edition

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CERTIFICATION

WILDA RINEHART
DIANN SLOAN
CLARA HURD

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EXAM ✓ CRAM

NCLEX-RN[®]

Fifth Edition

Wilda Rinehart, Diann Sloan, Clara Hurd

800 East 96th Street, Indianapolis, Indiana 46240 USA

NCLEX-RN® Exam Cram, Fifth Edition

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Indexer

Angie Martin

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Vanessa Evans

Page Layout

Studio Galou

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About the Authors

Wilda Rinehart Gardner received an Associate Degree in Nursing in 1973 from Northeast Mississippi Community College in Booneville, Mississippi. After working as a staff nurse and charge nurse, she became a public health nurse and served in that capacity for a number of years. In 1975, she received her certification as a family planning nurse practitioner from the midwifery program at the University of Mississippi Medical Center in Jackson, Mississippi. She completed her BSN in 1979 and MSN in 1980 from Mississippi University for Women. She retired after 26 years as nursing instructor at Northeast Mississippi Community College where she taught medical-surgical nursing and maternal newborn nursing. From 1982 to 2012, she operated Rinehart and Associates Nursing Review to assist graduate nurses to pass the National Council of Licensure Exam. She also worked as a curriculum consultant with nursing faculty in the improvement of test construction. Ms. Rinehart has served as a convention speaker in several states in the southeast and has been a reviewer of medical-surgical and obstetric texts.

Dr. Diann Sloan received an Associate Degree in Nursing from Northeast Mississippi Community College, a Bachelor of Science degree in Nursing from the University of Mississippi, and a Master of Science degree in Nursing from Mississippi University for Women. In addition to her nursing degrees, she holds a Master of Science in Counseling Psychology from Georgia State University and a Doctor of Philosophy in Counselor Education, with minors in both Psychology and Educational Psychology, from Mississippi State University. She has completed additional graduate studies in healthcare administration at Western New England College and the University of Mississippi. Dr. Sloan has taught pediatric nursing, psychiatric mental health nursing, and medical-surgical nursing in both associate degree and baccalaureate nursing programs. Dr. Sloan has conducted test construction workshops for both RN and PN faculty and is coauthor of the Pearson Online Review.

Clara Hurd received an Associate Degree in Nursing from Northeast Mississippi Community College in Booneville, Mississippi (1975). Her experiences in nursing are clinically based, having served as a staff nurse in medical-surgical nursing. She has worked as an oncology, intensive care, orthopedic, neurological, and pediatric nurse. She received her Bachelor of Science degree in Nursing from the University of North Alabama in Florence, Alabama, and her Master of Science degree in Nursing from the Mississippi University for Women in Columbus, Mississippi. Ms. Hurd is a certified nurse educator. She currently serves as a nurse educator consultant and an independent contractor. Ms. Hurd has taught in both associate degree and baccalaureate degree nursing programs. She was a faculty member of Mississippi University for Women; Austin Peay State University in Clarksville, Tennessee; Tennessee State University in Nashville, Tennessee; and Northeast Mississippi Community College. Ms. Hurd joined Rinehart and Associates in 1993. She has worked with students in preparing for the National Council Licensure Exam and with faculty as a consultant in writing test items. Ms. Hurd has also been a presenter at nursing conventions on various topics, including item-writing for nursing faculty. Her primary professional goal is to prepare the student and graduate for excellence in the delivery of healthcare.

About the Technical Editor

Steven M. Picray is a medical surgical registered nurse in a major metropolitan hospital. He has also been a Baptist pastor and a computer programmer. He has a bachelor's and master's degrees in Theology, a B.S.N., and is currently pursuing his master's degree in nursing to become a nurse practitioner.

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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.

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Introduction

Welcome to the NCLEX-RN® Exam Cram

Congratulations on your decision to become an RN. With so much material to review, it might be difficult to organize your studies. This book will help you get ready to take and pass the Licensure Exam for Registered Nurses. This introduction discusses the NCLEX® exam in general and how the *Exam Cram* can help you prepare for the test. It doesn't matter whether this is the first time you're going to take the exam or if you have taken it previously; this book gives you the necessary information and techniques to obtain licensure.

Exam Cram books help you understand and appreciate the subjects and materials you need to pass. The books are aimed at test preparation and review. They do not teach you everything you need to know about the subject of nursing. Instead they present you with materials you are likely to encounter on the exam. Using a simple approach, we will help you understand the need-to-know information. First, you will learn medical-surgical content, psychiatric content, obstetric content, and pediatric content, with an emphasis on pharmacology, skills, and treatment of these disorders. In a well-organized format, you will learn the pathophysiology of the most common problems affecting clients, the treatment of these disorders, and the nursing care.

The NCLEX-RN® 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, diagnosis, planning, implementation, and evaluation) and the four categories of client needs. Client needs are divided into subcategories that define the content within each of the four major categories. These categories and subcategories are

- ▶ Safe, effective care environment:
 - ▶ Management of care: 17–23%
 - ▶ Safety and infection control: 9–15%
- ▶ Health promotion and maintenance: 6%–12%
- ▶ Psychosocial integrity: 6%–12%
- ▶ Physiological integrity:
 - ▶ Basic care and comfort: 6%–12%
 - ▶ Pharmacological and parenteral therapy: 12%–18%
 - ▶ Reduction of risk: 9%–15%
 - ▶ Physiological adaptation: 11%–17%

Taking the Computerized Adaptive Test

Computerized Adaptive Testing offers the candidate several advantages. The graduate can schedule the exam at a time that is convenient for him. The Pearson VUE Testing group is responsible for administering the exam. Because you might not be familiar with the Pearson testing centers, we recommend that you arrive at least 30 minutes early. If you are late, you will not be allowed to test. Bring two forms of identification with you, one of which must be a picture ID. Be sure that your form of identification matches your application. You will be photographed and fingerprinted on entering the testing site, so don't let this increase your stress. The allotted time is six hours. The candidate can receive results within approximately seven days (in some states even sooner). Remember that the exam is written at approximately the 10th-grade reading level, so keep a good dictionary handy during your studies.

The Cost of the Exam

The candidate wishing to write the licensure exam must fill out two applications: one to the National Council and one to the state in which she wants to be licensed. A separate fee must accompany each application. State

licensing fees vary from state to state. Licensure applications can be obtained on the National Council's website at www.ncsbn.org. Several states are members of the multistate licensure compact. This means that, if you are issued a multistate license, you pay only one fee. This information can be obtained by visiting the National Council's website as well.

How to Prepare for the Exam

Judicious use of this book, either alone or with other books such as the *NCLEX® Exam Prep* book by the same authors will help you achieve your goal of becoming a registered nurse. As you review for the NCLEX® Exam, 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. We have provided you with exam alerts, tips, notes, and sample questions—both multiple-choice and alternative items. These questions will acquaint you with the types of questions you will see during the exam. We have also formulated a mock exam with those difficult management and delegation questions that you can score to determine your readiness to test. Pay particular attention to the exam alerts and the Cram Sheet. Using them will help you gain and retain knowledge and reduce your stress as you prepare to test.

Contact the Nursing Board in Your Area

Because nursing standards sometimes vary by state due to differing legal concerns at the state level, you should check the National Council of State Boards of Nursing for your area at <https://www.ncsbn.org/contact-bon.htm>.

How to Use This Book

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

- ▶ **Opening hotlists**—Each chapter begins with a list of terms and concepts you must learn and understand before you can know the subject matter. The hotlists are followed by an introductory section that sets the stage for the rest of the chapter.
- ▶ **Topical coverage**—After the opening hotlists, each chapter covers a series of topics related to the chapter's subject title. Throughout this section, we highlight topics or concepts that are likely to appear in the exam.

Even though the book is structured to the exam, these flagged items are often particularly important:

- ▶ **Exam alerts**—An exam alert stresses concepts, terms, or activities that are likely to relate to one or more test questions. For that reason, we think any information in an alert is worthy of unusual attentiveness on your part. A special exam alert layout is used like this:

EXAM ALERT

This is what an exam alert looks like. Remember to pay particular attention to these items!

- ▶ **Notes**—Throughout each chapter, additional information is provided that, although not directly related to the exam itself, is still useful and will aid your preparation. A sample note is shown here:

NOTE

This is how notes are formatted. Notes direct your attention to important pieces of information that relate to nursing and nursing certification.

- ▶ **Tips**—A tip might tell you another way of accomplishing something in a more efficient or time-saving manner. An example of a tip is shown here:

TIP

This is how tips are formatted. Keep your eyes open for these, and you'll learn some interesting nursing tips!

- ▶ **Exam prep questions**—Although we talk about test questions and topics throughout the book, the section at the end of each chapter presents a series of mock test questions and explanations of both correct and incorrect answers.
- ▶ **Practice exams**—Practice Exam I and Practice Exam II provide additional practice questions. Use these to gauge your learning and to build the confidence needed to move forward to the real exam.
- ▶ **Companion Website**—The Companion Website includes a testing engine with many practice questions that you should use repeatedly to practice your test-taking skills and to measure your level of learning. You should be able to correctly answer more than 90% of the questions on the practice tests before taking the real exam.
- ▶ **Cram Sheet**—At the very beginning of the book is a tear card we call the Cram Sheet. This is a helpful tool that gives you distilled, compressed facts. It is a great tool for last-minute study and review.

About the Book

The topics in this book have been structured using the systems approach to nursing. We believe that the simple way to learn the disease process, treatments, and diagnostic studies is the best way. You will review material from each system and the related skills, diagnostics, diets, and so on with each system as we move through the content. You will also consider cultural and religious concerns when caring for the client experiencing threats or deprivations.

Aside from being a test preparation book, this book is also useful if you are brushing up on your nursing knowledge. It is an excellent quick reference for the licensed nurse.

Contact the Authors

The authors of this text are interested in you and want you to pass on the first attempt. If, after reviewing with this text, you would like to contact the authors, you can do so by contacting feedback@pearsonitcertification.com.

Self-Assessment

Before you take the exam, you might have some concerns, such as

- ▶ **Am I required to answer all 265 questions to pass?** No. If you run out of time, the computer looks at the last portion of the exam and determines whether you are consistently above or below the pass point.
- ▶ **What score do I have to make to pass the NCLEX-RN® Exam?** There is not a set score. When you were in nursing school, you might have been required to score 75% or 80% to pass and progress onto the next level. The licensure exam is not scored in percentages. The computer is looking for consistency above or below the pass point. When the candidate shows this consistency, the computer stops asking questions.
- ▶ **How do they develop the test plan?** Every three years a survey is sent out to approximately 4,000 newly licensed nurses. These nurses are asked questions based on the “Activity Statement” for nursing practice. Based on the results of the survey, the test plan is set by the National Council and members of the Licensure Committee. These members are appointed from representative states.

- ▶ **What types of questions will I be asked?** The questions are either multiple-choice or *alternative items*. Alternative items can be identifying a picture, putting on ear phones and identifying sounds such as breath sounds, identifying grafts, filling-in-the-blanks, identifying-a-diagram, placing-in-sequence, or checking-all-that-apply. Some examples of alternative items are:
 - ▶ Figure the 8-hour intake and output.
 - ▶ Identify the area where the mitral valve is heard the loudest.
 - ▶ Place in sequence the tasks you would use in the skill of washing your hands.
 - ▶ Work the math problem.
 - ▶ Check all that apply to the care of the client after a cardiac catheterization.
- ▶ **Will I have a calculator for math problems?** Yes, a drop-down calculator is provided.
- ▶ **Will I have something to write on in the testing area?** Yes, a dry erase board or paper will be provided. Don't worry about the test givers thinking that you are cheating. They clean and secure the area after each candidate.
- ▶ **What if I get sick and cannot take my exam?** You have a period of time allowed during which you can cancel your appointment and reschedule. If, however, you do not contact the Pearson VUE group in that allotted time and do not attend to take the exam, you forfeit your money and have to reapply.
- ▶ **Can I carry a purse or bag into the testing center?** No, there will be lockers for your use in the testing center. (Also, dress warmly because the area is usually cool.) Any suspicious behavior can cause you to forfeit the opportunity to complete your test so be sure to leave any paper or notes in your car.
- ▶ **Can I take breaks?** Yes, there are optional breaks throughout the test.
- ▶ **If I should fail, when could I retest?** The required time to wait before you can rewrite is 45 days in most states; however, some states require that you wait 90 days. Should you be unsuccessful, you should contact the state where you want to obtain licensure for its required retest time.

Companion Website

Register this book to get access to the Pearson IT Certification test engine and other study materials, plus additional bonus content. Check this site regularly for new and updated postings written by the author that provide further insight into the more troublesome topics on the exam. Be sure to check the box that you would like to hear from us to receive updates and exclusive discounts on future editions of this product or related products.

To access this companion website, follow the steps below:

1. Go to www.pearsonITcertification.com/register and log in or create a new account.
2. Enter the ISBN: 9780789757524.
3. Answer the challenge question as proof of purchase.
4. Click on the "Access Bonus Content" link in the Registered Products section of your account page, to be taken to the page where your downloadable content is available.

Please note that many of our companion content files can be very large, especially image and video files.

If you are unable to locate the files for this title by following the steps at left, please visit www.pearsonITcertification.com/contact and select the “Site Problems/Comments” option. Our customer service representatives will assist you.

Pearson IT Certification Practice Test Engine and Questions

The companion site includes the Pearson IT Certification Practice Test engine—software that displays and grades a set of exam-realistic multiple-choice questions. Using the Pearson IT Certification Practice Test engine, you can either study by going through the questions in Study Mode, or take a simulated exam that mimics real exam conditions.

The installation process requires two major steps: installing the software and then activating the exam. The website has a recent copy of the Pearson IT Certification Practice Test engine. The practice exam—the database of exam questions—is not on this site.

NOTE

The cardboard case in the back of this book includes a piece of paper. The paper lists the activation code for the practice exam associated with this book. Do not lose the activation code. Also included on the paper is a unique, one-time use coupon code for the purchase of the Premium Edition eBook and Practice Test.

Install the Software

The Pearson IT Certification Practice Test is a Windows-only desktop application. You can run it on a Mac using a Windows Virtual Machine, but it was built specifically for the Windows platform. The minimum system requirements are:

- ▶ Windows 10, Windows 8.1, or Windows 7
- ▶ Microsoft .NET Framework 4.5 Client
- ▶ Pentium class 1 GHz processor (or equivalent)
- ▶ 512 MB RAM
- ▶ 650 MB disc space plus 50 MB for each downloaded practice exam
- ▶ Access to the Internet to register and download exam databases

The software installation process is pretty routine compared to other software installation processes. If you have already installed the Pearson IT Certification Practice Test software from another Pearson product, there is no need for you to reinstall the software. Simply launch the software on your desktop and proceed to activate the practice exam from this book by using the activation code included in the access code card sleeve in the back of the book.

The following steps outline the installation process:

1. Download the exam practice test engine from the companion site.
2. Respond to Windows prompts as with any typical software installation process.

The installation process will give you the option to activate your exam with the activation code supplied on the paper in the cardboard sleeve. This process requires that you establish a Pearson website login. You will need this login in order to activate the exam, so please do register when prompted. If you already have a Pearson website login, there is no need to register again. Just use your existing login.

Activate and Download the Practice Exam

Once the exam engine is installed, you should then activate the exam associated with this book (if you did not do so during the installation process), as follows:

- Step 1:** Start the Pearson IT Certification Practice Test software from the Windows **Start** menu or from your desktop shortcut icon.
- Step 2:** To activate and download the exam associated with this book, from the **My Products** or **Tools** tab, select the **Activate** button.
- Step 3:** At the next screen, enter the activation code from the paper inside the cardboard holder in the back of the book. Once entered, click the **Activate** button.
- Step 4:** The activation process will download the practice exam. Click **Next**, and then click **Finish**.

Once the activation process is completed, the **My Products** tab should list your new exam. If you do not see the exam, make sure you have selected the **My Products** tab on the menu. At this point, the software and practice exam are ready to use. Simply select the exam and click the **Open Exam** button.

To update a particular exam that you have already activated and downloaded, simply select the **Tools** tab and select the **Update Products** button. Updating your exams will ensure you have the latest changes and updates to the exam data.

If you wish to check for updates to the Pearson Cert Practice Test exam engine software, simply select the **Tools** tab and select the **Update Application** button. This will ensure you are running the latest version of the software engine.

Testing Your Exam Readiness

First and foremost, you obviously must have completed or be very close to completing your RN classes at the college level. The better you did in your college work, the better your chances are of doing well on this exam. However, there are no guarantees on the NCLEX-RN® exam, so you should prepare specifically for this exam using your college class work as a foundation.

Whether you attend a formal review seminar or use written material such as this book, or a combination of both, preparation is essential. Costing as much as \$400 a try—pass or fail—you want to do everything you can to pass on your first attempt. Spend time each day studying and taking exam questions. The more questions you take, the more prepared you will be. I recommend that you score at least 90% on our practice questions consistently before you attempt to take the exam. With these facts in mind, let's get ready to take the NCLEX-RN® exam. Good luck!

13

CHAPTER THIRTEEN

Caring for the Client with Disorders of the Cardiovascular System

Terms you'll need to understand

- ✓ Aneurysms
- ✓ Angina pectoris
- ✓ Angioplasty
- ✓ Arteriosclerosis
- ✓ Blood pressure
- ✓ Buerger's disease
- ✓ Cardiac catheterization
- ✓ Cardiac tamponade
- ✓ Cardiopulmonary resuscitation
- ✓ Cholesterol
- ✓ Conduction system of the heart
- ✓ Congestive heart failure
- ✓ Coronary artery bypass graft
- ✓ Defibrillation
- ✓ Diastole
- ✓ Electrocardiogram
- ✓ Heart block
- ✓ Hypertension
- ✓ Implantable cardioverter
- ✓ Myocardial infarction
- ✓ Pacemaker
- ✓ Raynaud's
- ✓ Systole
- ✓ Thrombophlebitis
- ✓ Varicose veins
- ✓ Ventricular fibrillation
- ✓ Ventricular tachycardia

Nursing skills you'll need to master

- ✓ Performing cardiopulmonary resuscitation (CPR)
- ✓ Monitoring central venous pressure
- ✓ Monitoring blood pressure
- ✓ Interpreting electrocardiography (ECG)

The cardiovascular system is comprised of the heart and blood vessels and is responsible for the transport of oxygen and nutrients to organ systems of the body. The heart is a cone-shaped organ made up of four chambers. The right side of the heart receives deoxygenated venous blood from the periphery by way of the superior and inferior venae cavae. The left side of the heart receives blood from the lungs and pumps the oxygenated blood to the body. The blood vessels are divided into arteries and veins. Arteries transport oxygenated blood, and veins transport deoxygenated blood. In this chapter, you will discover diseases that affect the cardiovascular system, the treatment of these diseases, and the effects on the client's general health status.

Hypertension

Blood pressure is the force of blood exerted on the vessel walls. *Systolic pressure* is the pressure during the contraction phase of the heart and is evaluated as the top number of the blood pressure reading. *Diastolic pressure* is the pressure during the relaxation phase of the heart and is evaluated as the lower number of the blood pressure reading. A diagnosis of hypertension is made by a blood pressure value greater than 140/90 obtained on two separate occasions with the client sitting, standing, and lying. In clients with diabetes, a reading of 130/85 or higher is considered to be hypertension.

Accuracy of the BP reading depends on the correct selection of cuff size. The bladder of the blood pressure cuff size should be sufficient to encircle the arm or thigh. According to the American Heart Association, the bladder width should be approximately 40% of the circumference or 20% wider than the diameter of the midpoint of the extremity. A blood pressure cuff that's too small yields a false high reading, whereas a blood pressure cuff that's too large yields a false low reading.

Hypertension is classified as either primary or secondary. Primary hypertension, or essential hypertension, develops without apparent cause; secondary hypertension develops as a result of another illness or condition. Symptoms associated with secondary hypertension are improved by appropriate treatment of the contributing illness. Blood pressure fluctuates with exercise, stress, changes in position, and changes in blood volume. Medications such as oral contraceptives and bronchodilators can also cause elevations in blood pressure. Often the client with hypertension will have no symptoms at all or might complain of an early morning headache and fatigue. This silent killer, if left untreated, can lead to coronary disease, renal disease, strokes, and other life-threatening illnesses.

Management of hypertension includes a program of diet and exercise. If the client's cholesterol level is elevated, a low-fat, low-cholesterol diet is ordered. The total serum cholesterol levels should be less than 200 mg/dl, and serum triglycerides should be less than 150 mg/dl. Current studies show consumption of folic acid can help to lower homocysteine levels. Lowered homocysteine levels may contribute to lowering of blood pressure. Foods such as meats, eggs, and

canola oil are rich in monounsaturated fat. Safflower and sunflower oils are high in polyunsaturated oils. These oils are recommended for individuals at risk for coronary disease. The client is taught to avoid palm oil and coconut oil. If a change in diet does not lower the client's cholesterol level, the doctor might prescribe hyperlipidemic medications such as simvastatin (Zocor), gemfibrozil (Lopid), or ezetimibe (Zetia).

Medications Used to Treat Hypertension

Should diet and exercise prove unsuccessful in lowering the blood pressure, the doctor might decide to prescribe medications such as diuretics or antihypertensives. Table 13.1 includes examples of medications used to treat hypertension.

TABLE 13.1 Hypertension Drugs

Drug Category	Drug Types
Diuretics	Thiazide: Chlorothiazide (Diuril), hydrochlorothiazide (Esidrix, HydroDiuril) Loop diuretics: Furosemide (Lasix), ethacrynic acid (Edecrin) Potassium-sparing diuretics: Spironolactone (Aldactone), triamterone (Dyrenium)
Beta blockers	Propranolol (Inderal), atenolol (Tenormin), nadolol (Corgard)
Calcium channel blockers	Nifedipine (Procardia), verapamil (Calan), diltiazem hydrochloride (Cardizem)
Angiotensin converting	Captopril (Capoten), enalapril (Vasotec), lisinopril (Zestril, Prinivil) enzyme inhibitors
Angiotensin receptor blockers	Candesartan (Altacand), losartan (Cozaar), telmisartan (Micardis)

These drugs can be used alone or in conjunction with one another. Diuretics and vasodilators are often given in combination to lower blood pressure through diuresis and vasodilation. Hypertensive crisis exists when the diastolic blood pressure reaches 140. Malignant hypertension is managed with administration of IV Nitropress, nitroglycerine, Nipride, Lasix, and other potent vasodilators such as Procardia.

Heart Block

The normal conduction system of the heart is comprised of the sinoatrial (SA) node located at the junction of the right atrium and the superior vena cava. This area contains the pacing cells that initiate the contraction of the heart. The SA node is considered to be the main pacer of the heart rate. The atrioventricular (AV) node is located in the interventricular septum and receives the impulse and transmits it on to the Bundle of His, which extends down through the ventricular septum and merges with the Purkinje fibers in the lower portion of the ventricles. Figure 13.1 shows an anatomical drawing of the human heart.

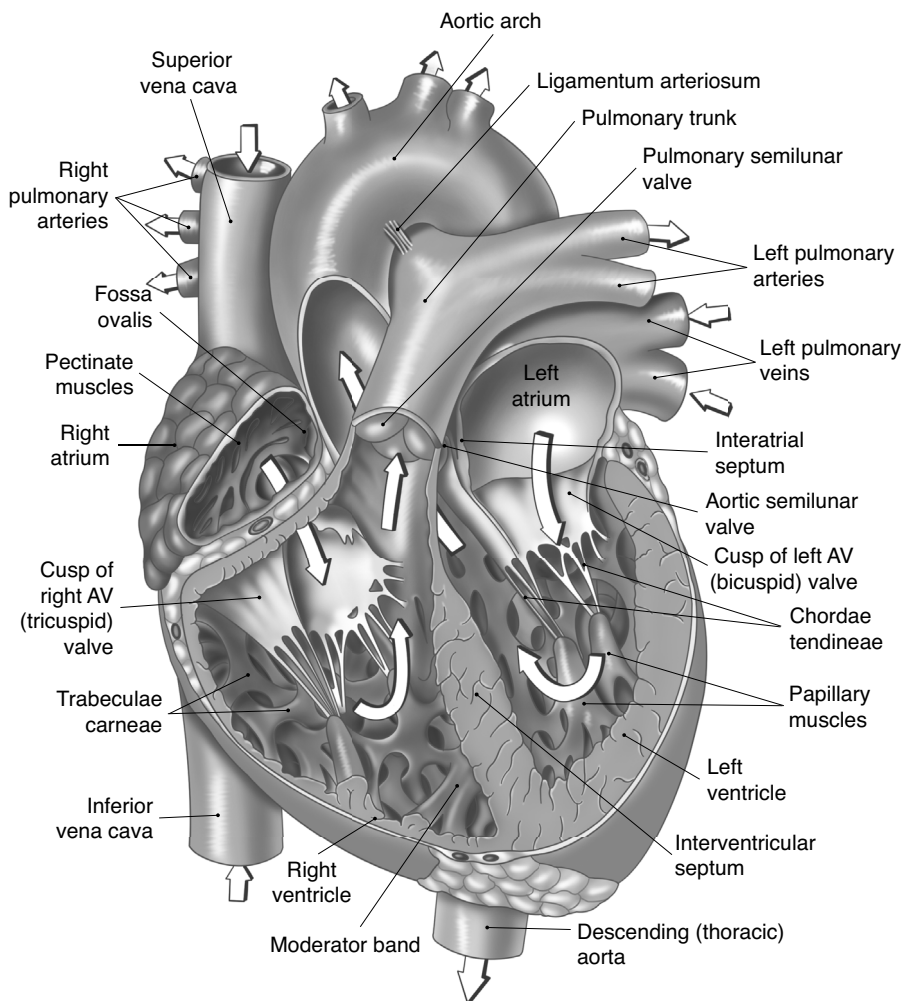


FIGURE 13.1
Anatomical drawing of the heart.

Heart block is a condition in which the conduction system of the heart fails to conduct impulses normally. Heart block can occur as a result of structural changes in the conduction system, such as tumors, myocardial infarctions, coronary artery disease, infections of the heart, or toxic effects of drugs such as digoxin. First-degree AV block occurs when the SA node continues to function normally, but transmission of the impulse fails. Because of the conduction dysfunction and ventricular depolarization, the heart beats irregularly. These clients are usually asymptomatic and all impulses eventually reach the ventricles. Second-degree heart block is a block in which impulses reach the ventricles, but others do not. In third-degree heart block or complete heart block, none of the sinus impulses reach the ventricle. This results in erratic heart rates where the sinus node and the atrioventricular nodes are beating independently. The result of this type of heart block can be hypotension, seizures, cerebral ischemia, or cardiac arrest. Detection of a heart block is made by assessing the electrocardiogram. See Figure 13.2 for a graph depicting a normal electrocardiogram.

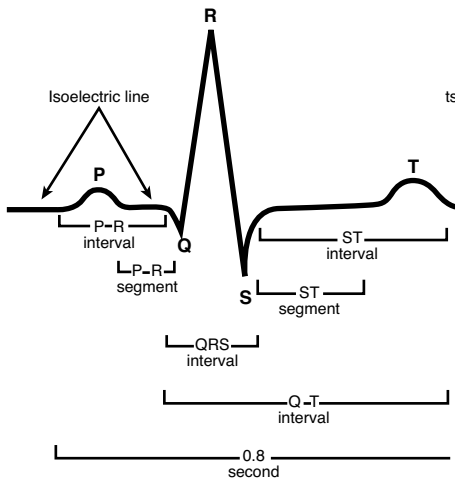


FIGURE 13.2 A normal electrocardiogram.

The P wave as shown in the graph is the SA node firing, the QRS complex is the contraction phase of the heart, and the T wave is the repolarization of the heart.

Toxicity to Medications

Toxicity to medications, such as Digoxin, can be associated with heart block. Clients taking Digitalis should be taught to check their pulse rate and to return to the physician for regular evaluation of their Digitalis level. The therapeutic level for Digoxin is 0.5–2.0 ng/ml. If the client's blood level of Digoxin exceeds 2.0 ng/ml, the client is considered to be toxic. Clients with Digoxin toxicity often complain of nausea, vomiting, and seeing halos around lights. The nurse should teach the client to check his heart rate prior to taking Digoxin. A resting pulse rate of less than 60 bpm in the adult client should alert the nurse to the possibility of toxicity. Treatment for Digoxin toxicity includes checking the potassium level because hypokalemia can contribute to Digoxin toxicity. The physician often will order potassium be given IV or orally and that the Digoxin be held until serum levels return to normal. Other medications, such as Isuprel or Atropine, and Digibind (Digoxin Immune Fab), are frequently ordered to increase the heart rate.

Malfunction of the Conduction System

Because a malfunction of the conduction system of the heart is the most common cause for heart block, a pacing mechanism is frequently implanted to facilitate conduction. Pacemakers can be permanent or temporary and categorized as demand or set. A *demand* pacemaker initiates an impulse if the client's heart rate falls below the prescribed beats per minute. A *set* pacemaker overrides the heart's own conduction system and delivers an impulse at the rate set by the physician. Frequently, pacemakers are also combined with an internal defibrillation device.

Permanent Pacemakers/Internal Defibrillators: What the Client Should Know

Clients with internal defibrillators or pacemakers should be taught to avoid direct contact with electrical equipment. Clients should be instructed to

- ▶ Wear a medic alert stating that a pacemaker/internal defibrillator is implanted. Identification will alert the healthcare worker so that alterations in care can be made.
- ▶ Take the pulse for one full minute and report the rate to the physician.
- ▶ Avoid applying pressure over the pacemaker/internal defibrillator. Pressure on the defibrillator or pacemaker can interfere with the electrical leads.
- ▶ Inform the dentist of the presence of a pacemaker/internal defibrillator because electrical devices are often used in dentistry.
- ▶ Avoid having a magnetic resonance imaging (MRI). Magnetic resonance interferes with the electrical impulse of the implant.
- ▶ Avoid close contact with electrical appliances, electrical or gasoline engines, transmitter towers, antitheft devices, metal detectors, and welding equipment because they can interfere with the electrical conduction of the device.
- ▶ Be careful when using microwaves. Microwaves are generally safe for use, but the client should be taught to stand approximately five feet away from the device while cooking.
- ▶ Report fever, redness, swelling, or soreness at the implantation site.
- ▶ If a vibration or beeping tone is noted coming from the internal defibrillator, immediately move away from any electromagnetic source. Stand clear from other people because shock can affect anyone touching the client during defibrillation.
- ▶ Report dizziness, fainting, weakness, blackouts, or a rapid pulse rate. The client will most likely be told not to drive a car for several months after the internal defibrillator is inserted to evaluate any dysrhythmias.
- ▶ Report persistent hiccupping because this can indicate misfiring of the pacemaker/internal defibrillator.

Myocardial Infarction

When there is a blockage in one or more of the coronary arteries, the client is considered to have had a myocardial infarction. Factors contributing to diminished blood flow to the heart include arteriosclerosis, emboli, thrombus, shock, and hemorrhage. If circulation is not quickly restored to the heart, the muscle becomes necrotic. Hypoxia from ischemia can lead to

vasodilation of blood vessels. Acidosis associated with electrolyte imbalances often occurs, and the client can slip into cardiogenic shock. The most common site for a myocardial infarction is the left ventricle. Classic signs of a myocardial infarction include substernal pain or a feeling of heaviness in the chest. However it should be noted that women, elderly clients, and clients with diabetes may fail to report classic symptoms. Women might tell the nurse about pain she is experiencing beneath the shoulder or in the back, anxiety, or a feeling of apprehension and nausea.

The most commonly reported signs and symptoms associated with myocardial infarction include

- ▶ Sub-sternal pain or pain over the precordium of a duration greater than 15 minutes. Diabetics may have diminished pain sensations.
- ▶ Pain that is described as heavy, vise-like, and radiating down the left arm
- ▶ Pain that begins spontaneously and is not relieved by nitroglycerin or rest
- ▶ Pain that radiates to the jaw and neck
- ▶ Pain that is accompanied by shortness of breath, pallor, diaphoresis, dizziness, nausea, and vomiting
- ▶ Increased heart rate, decreased blood pressure, increased temperature, and increased respiratory rate

CAUTION

Angina pectoris occurs when there is a temporary lack of oxygen to the myocardium. The pain associated with angina is relieved by nitroglycerine. The client should be taught to take one nitroglycerine tablet sublingually every five minutes. If the first tablet does not relieve the pain, a second can be taken, and if the pain is still not relieved, a third can be taken. If, however, the pain is not relieved after taking three tablets, one every five minutes, the client should come directly to the hospital or call an ambulance. The client should be taught to replenish his supply every six months and protect the pills from light by leaving them in the brown bottle. The cotton should be removed from the bottle because it will decrease the tablets' effectiveness.

Most physicians recommend that the client take one 365 mg chewable aspirin at the first sign of chest pain. Aspirin has an anticoagulant effect and decreases the clotting associated with heart attacks.

The nurse must always wear gloves when applying nitroglycerine cream or patches to the client. Clip hair with scissors or shave, but do not abrade area.

Diagnosis of Myocardial Infarction

The diagnosis of a myocardial infarction is made by looking at both the electrocardiogram and the cardiac enzymes. The following are the most commonly used diagnostic tools for determining the type and severity of the attack:

- ▶ Electrocardiogram (ECG), which frequently shows dysrhythmias
- ▶ Serum enzymes and isoenzymes

Other tests that are useful in providing a complete picture of the client's condition are white blood cell count (WBC), sedimentation rate, and blood urea nitrogen (BUN).

The best serum enzyme diagnostic is the creatine kinase (CK-MB) diagnostic. This enzyme is released when there is damage to the myocardium. The Troponin T and I are specific to striated muscle and are often used to determine the severity of the attack. C-reactive protein (CRP) levels are used with the CK-MB to determine whether the client has had an acute MI and the severity of the attack. Lactic acid dehydrogenase (LDH) is a nonspecific enzyme that is elevated with any muscle trauma.

Management of Myocardial Infarction Clients

Management of myocardial infarction clients includes monitoring of blood pressure, oxygen levels, and pulmonary artery wedge pressures. Because the blood pressure can fall rapidly, medication such as dopamine is prescribed. Other medications are ordered to relieve pain and to vasodilate the coronary vessels—for example, morphine sulfate IV is ordered for pain. There are presently many thrombolytics, such as streptokinase, on the market. These medications will most likely be ordered to lysis clots that might be present in the coronary vessels. Early diagnosis and treatment significantly improve the client's prognosis.

Clients suffering a myocardial infarction can present with dysrhythmias. Ventricular dysrhythmias such as ventricular tachycardia or fibrillation lead to standstill and death if not treated quickly.

Ventricular Tachycardia

Ventricular tachycardia is a rapid rhythm absence of a p-wave. Usually the rate exceeds 140–180 bpm. A lethal arrhythmia that leads to ventricular fibrillation and standstill, ventricular tachycardia is often associated with valvular heart disease, heart failure, hypomagnesium, hypotension, and ventricular aneurysms. Figure 13.3 shows a diagram demonstrating ventricular tachycardia.

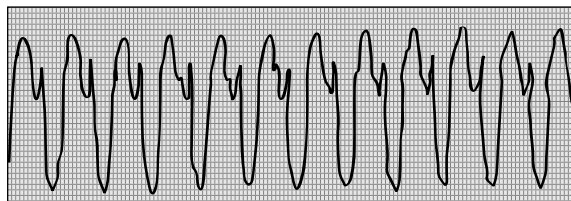


FIGURE 13.3 Evidence of ventricular tachycardia.

Ventricular tachycardia is treated with oxygen and medication. Examples of medications used to treat ventricular tachycardia are Amiodarone (Cordarone), procainamide (Pronestyl), or magnesium sulfate. These drugs are given to slow the rate and stabilize the rhythm. Lidocaine has long been established for the treatment of ventricular tachycardia; however, it should not be used in an acute MI client. Heparin is also ordered to prevent further thrombus formation but is not generally ordered with clients taking streptokinase.

Ventricular Fibrillation

Ventricular fibrillation (V-fib) is the primary mechanism associated with sudden cardiac arrest. This disorganized, chaotic rhythm results in a lack of pumping activity of the heart. Without effective pumping, no blood is sent to the brain and other vital organs. If this condition is not corrected quickly, the client's heart stops beating and asystole is seen on the ECG. The client quickly becomes faint, loses consciousness, and becomes pulseless. Hypotension or a lack of blood pressure and heart sounds are present. Figure 13.4 shows a diagram of the chaotic rhythms typical with V-fib.

Ventricular Fibrillation
(V Fib)

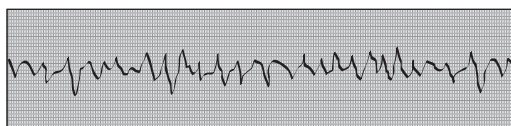


FIGURE 13.4
Ventricular fibrillation diagram.

Treatment of ventricular fibrillation is to defibrillate the client starting with 200 Joules. Three quick, successive shocks are delivered with the third at 360 Joules. If a defibrillator is not readily available, a precordial thump can be delivered. Oxygen is administered and antidysrhythmic medications such as epinephrine, amiodarone, procainamide, lidocaine, or magnesium sulfate are ordered. If cardiac arrest occurs, the nurse should initiate cardiopulmonary resuscitation and be ready to administer first-line drugs such as epinephrine.

NOTE

Clients with atrial fibrillation can lead to a CVA (cerebrovascular accident). These clients are often treated with anticoagulants to prevent clotting.

Cardiac catheterization is used to detect blockages associated with myocardial infarctions and dysrhythmias. Cardiac catheterization, as with any other dye procedure, requires a permit. This procedure can also accompany percutaneous transluminal coronary angioplasty. Prior to and following this procedure, the nurse should

- ▶ Assess for allergy to iodine or shellfish.
- ▶ Maintain the client on bed rest with the leg straight.
- ▶ Maintain pressure on the access site for at least five minutes or until no signs of bleeding are noted. Many cardiologists use a device called Angio Seals to prevent bleeding at the insertion site. The device creates a mechanical seal anchoring a collagen sponge to the site. The sponge absorbs in 60–90 days.
- ▶ Use pressure dressing and/or ice packs to control bleeding.

- ▶ Check distal pulses because diminished pulses can indicate a hematoma and should be reported immediately.
- ▶ Force fluids to clear dye from the body.

If the client is not a candidate for angioplasty, a coronary artery bypass graft might be performed. The family should be instructed that the client will return to the intensive care unit with several tubes and monitors. The client will have chest tubes and a mediastinal tube to drain fluid and to reinflate the lungs. If the client is bleeding and blood is not drained from the mediastinal area, fluid accumulates around the heart. This is known as *cardiac tamponade*. If this occurs, the myocardium becomes compressed and the accumulated fluid prevents the filling of the ventricles and decreases cardiac output.

A Swan-Ganz catheter for monitoring central venous pressure, pulmonary artery wedge pressure monitor, and radial arterial blood pressure monitor are inserted to measure vital changes in the client's condition. An ECG monitor and oxygen saturation monitor are also used. Other tubes include a nasogastric tube to decompress the stomach, an endotracheal tube to assist in ventilation, and a Foley catheter to measure hourly output.

Following a myocardial infarction, the client should be given small, frequent meals. The diet should be low in sodium, fat, and cholesterol. Adequate amounts of fluid and fiber are encouraged to prevent constipation, and stool softeners are also ordered. Post-MI teaching should stress the importance of a regular program of exercise, stress reduction, and cessation of smoking. Because caffeine causes vasoconstriction, caffeine intake should be limited. The client can resume sexual activity in six weeks or when he is able to climb a flight of stairs without experiencing chest pain. Medications such as sildenafil (Viagra) or tadalafil (Cialis) are discouraged and should not be taken within 24 hours of taking a nitrate because taking these medications in combination can result in hypotension. Clients should be taught not to perform the Valsalva maneuver or bend at the waist to retrieve items from the floor. The client will probably be discharged on an anticoagulant such as enoxaparin (Lovenox) or sodium warfarin (Coumadin).

CAUTION

Anticoagulants such as heparin are used. The nurse should check the partial thromboplastin time (PTT). PTT levels vary. The normal control level is approximately 30–60 seconds (this range tends to vary dependent on the laboratory methods used). The therapeutic bleeding time should be from one and a half to two times the control. The medication should be injected in the abdomen two inches from the umbilicus using a tuberculin syringe. Do not aspirate or massage. The antidote for heparin derivatives is protamine sulfate. Lovenox (enoxaparin) is a heparin derivative. There is no specific bleeding time used for Lovenox, but the platelet count should be checked prior to administration of Lovenox. The nurse should not expel the air from the syringe prior to injection of the medication.

Inflammatory Diseases of the Heart

Inflammatory and infectious diseases of the heart often are a result of systemic infections that affect the heart. Inflammation and infection might involve the endocardium, pericardium, valves, or the entire heart.

Infective Endocarditis

Infective endocarditis, also known as *bacterial endocarditis*, is usually the result of a bacterial infection, collagen diseases, or cancer metastasis. As a result, the heart is damaged and signs of cardiac decompensation results. The client commonly complains of shortness of breath, fatigue, and chest pain. On assessment, the nurse might note distended neck veins, a friction rub, or a cardiac murmur.

Treatment involves treating the underlying cause with antibiotics, anti-inflammatory drugs, and oxygen therapy. Bed rest is recommended until symptoms subside. If the valve is severely damaged by infection, a valve replacement might have to be performed. Replacement valves are xenograft (bovine [cow] or porcine [pig]), cadaver, or mechanical. If the client elects to have a mechanical valve replacement, he will have to take anticoagulants for life. Following surgery, the nurse must be alert for signs of complications. These include decreased cardiac output or heart failure, infection, and bleeding. The physician often will prescribe digoxin, anticoagulants, cortisone, and antibiotics postoperatively.

NOTE

A porcine valve will probably be rejected by the client who is Jewish. A bovine valve will probably be rejected by the client who is Hindu.

Pericarditis

Pericarditis is an inflammatory condition of the pericardium, which is the membrane sac around the heart. Symptoms include chest pain, difficulty breathing, fever, and orthopnea. Clients with chronic constrictive pericarditis show signs of right-sided congestive heart failure. During auscultation, the nurse will likely note a pericardial friction rub. Laboratory findings might show an elevated white cell count. ECG changes consist of an S-T segment and T wave elevation. The echocardiogram often shows pericardial effusion.

Treatment includes use of nonsteroidal anti-inflammatory drugs to relieve pain. The nurse should monitor the client for signs of pericardial effusion and cardiac tamponade that include jugular vein distention, *paradoxical pulses* (systolic blood pressure higher on expiration than on inspiration), decreased cardiac output, and muffled heart sounds. If fluid accumulates in an

amount that causes cardiac constriction, the physician might decide to perform a pericardiocentesis to relieve the pressure around the heart. Using an echocardiogram or fluoroscopic monitor, the physician inserts a large-bore needle into the pericardial sac. After the procedure, the nurse should monitor the client's vital signs and heart sounds. In severe cases, the pericardium might be removed.

NOTE

If the client has a history of pericarditis or endocarditis and is scheduled for dental work or surgery, he/she may be placed on prophylactic antibiotics to prevent exacerbation of his/her condition.

CAUTION

A blood test called International normalizing ratio (INR) is often done to determine therapeutic level of oral anticoagulants. Prior to treatment the normal level is 1-2. The therapeutic range is 2-3. If the level exceeds 7, the nurse should observe the client for spontaneous bleeding.

Buerger's Disease

Buerger's disease (thromboangilitis obliterans) results when spasms of the arteries and veins occur primarily in the lower extremities. These spasms result in blood clot formation and eventually destruction of the vessels. Symptoms associated with Buerger's include pallor of the extremities progressing to cyanosis, pain, and paresthesia. As time progresses, trophic changes occur in the extremities. Management of the client with Buerger's involves the use of Buerger-Allen exercises, vasodilators, and oxygenation. The client should be encouraged to stop smoking because smoking makes the condition worse.

Thrombophlebitis

Thrombophlebitis occurs when there is an inflammation of a vein with formation of a clot. Most thrombophlebitis occurs in the lower extremities, with the saphenous vein being the most common vein affected. Homan's sign is an assessment tool used for many years by health-care workers to detect deep vein thrombi. It is considered positive if the client complains of pain on dorsiflexion of the foot. Homan's sign should not be performed routinely because it can cause a clot to be dislodged and lead to pulmonary emboli. If a diagnosis of thrombophlebitis is made, the client should be placed on bed rest with warm, moist compresses to the leg. An anticoagulant is ordered, and the client is monitored for complications such as cellulitis. If cellulitis is present, antibiotics are ordered.

Antithrombotic stockings or sequential compression devices are ordered to prevent venous stasis. When antithrombotic stockings are applied, the client should be in bed for a minimum of 30 minutes prior to applying the stockings. The circumference and length of the extremity should be measured to prevent rolling down of the stocking and a tourniquet effect.

Raynaud's Syndrome

Raynaud's syndrome occurs when there are vascular spasms brought on by exposure to cold. The most commonly affected areas are the hands, nose, and ears. Management includes preventing exposure, stopping smoking, and using vasodilators. The client should be encouraged to wear mittens when outside in cold weather.

Aneurysms

An *aneurysm* is a ballooning of an artery. The greatest risk for these clients is rupture and hemorrhage. Aneurysms can occur in any artery in the body and can be due to congenital malformations or arteriosclerosis or be secondary to hypertension. The following are several types of aneurysms:

- ▶ **Fusiform**—This aneurysm affects the entire circumference of the artery.
- ▶ **Saccular**—This aneurysm is an outpouching affecting only one portion of the artery.
- ▶ **Dissecting**—This aneurysm results in bleeding into the wall of the vessel.

Frequently, the client with an abdominal aortic aneurysm complains of feeling her heart beating in her abdomen or lower back pain. Any such complaint should be further evaluated. On auscultation of the abdomen, a bruit can be heard. Diagnosis can be made by ultrasound, arteriogram, or abdominal x-rays.

If the aneurysm is found to be approximately six centimeters or more, surgery should be scheduled. During surgery the aorta is clamped above and below and a donor vessel is anastomosed in place. When the client returns from surgery, pulses distal to the site should be assessed and urinary output should be checked. Some clients might be treated with stent placement to reinforce the weakened artery. These stents are threaded through an incision in the femoral artery. The stent holds the artery open and provides support for the weakened vessel. See Figure 13.5 for a diagram of an abdominal aortic aneurysm.

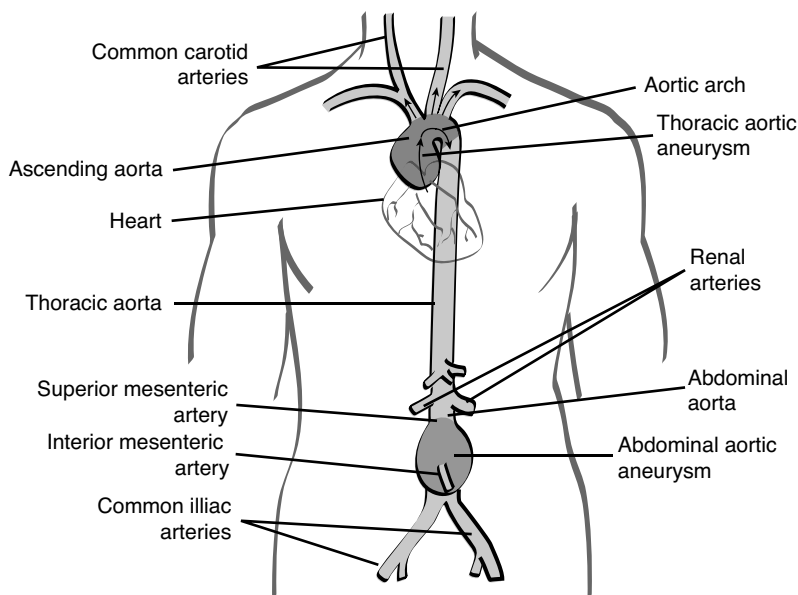


FIGURE 13.5
Abdominal aortic aneurysm.

CAUTION

Avoid palpating the abdomen of the client with a suspected abdominal aortic aneurysm.

Congestive Heart Failure

When fluid accumulation occurs and the heart is no longer able to pump in an efficient manner, blood can back up. Most heart failure occurs when the left ventricle fails. When this occurs, the fluid backs up into the lungs, causing pulmonary edema. The signs of pulmonary edema are frothy, pink-tinged sputum; shortness of breath; and orthopnea. When right-sided congestive heart failure occurs, the blood backs up into the periphery. Pitting can be evaluated by pressing on the extremities and noting the degree of pitting, how far up the extremity the pitting occurs, and how long it takes to return to the surface. Treatment for congestive heart failure includes use of diuretics, inotropic drugs such as milrinone (Primacor), and cardiotonics such as nesiritide (Natreacor). Morphine might also be ordered.

Diagnostic Tests for Review

The following diagnostic tests should be reviewed prior to taking the NCLEX exam:

- ▶ **CBC**—A complete blood count tells the nurse the level of oxygenation of the blood, particularly the hemoglobin and hematocrit.

- ▶ **Chest x-ray**—Chest x-rays and other x-rays tell the nurse whether the heart is enlarged or aneurysms are present.
- ▶ **Arteriogram**—Arteriography reveals the presence of blockages and abnormalities in the vascular system.
- ▶ **Cardiac catheterization**—A cardiac catheterization reveals blockages, turbulent flow, and arteriosclerotic heart disease.
- ▶ **ECG interpretation**—Indicates abnormalities in the rate and rhythm of the conduction system of the heart.
- ▶ **Central venous pressure monitoring**—CVP indicates fluid volume status.
- ▶ **B-type natriuretic peptide (BNP)**—Used to diagnose heart failure in clients with acute dyspnea. It is used to differentiate dyspnea found in those with lung disorders from those with congestive heart failure.
- ▶ **Stress test**—A stress test can be done using a treadmill. The client is asked to walk at a rapid rate to increase the work load on the heart. The client's blood pressure and heart rhythm is then observed for abnormal changes. A non-treadmill stress test is used when the client is unable to walk on the treadmill machine. This test is used to determine ischemia. A radionuclide such as Thallium or Cardiolite is injected at the peak of exercise. A creatinine should be checked to determine renal function. The client should be questioned regarding allergies to iodine or shellfish.

Pharmacology Categories for Review

The following pharmacology categories should be reviewed prior to taking the NCLEX exam:

- ▶ Diuretics
- ▶ Cardiotonics
- ▶ Antihypertensives
- ▶ Anticoagulants
- ▶ Thrombolytics
- ▶ Inotropic
- ▶ Analgesics

Exam Prep Questions

1. The client presents to the clinic with a serum cholesterol of 275 mg/dl and is placed on rosuvastatin (Crestor). Which instruction should be given to the client?
 - A. Report muscle weakness to the physician.
 - B. Allow six months for the drug to take effect.
 - C. Take the medication with fruit juice.
 - D. Ask the doctor to perform a complete blood count prior to starting the medication.
2. The client is admitted to the hospital with a hypertensive crisis. Diazoxide (Hyperstat) is ordered. During administration the nurse should:
 - A. Utilize an infusion pump.
 - B. Check the blood glucose level.
 - C. Place the client in Trendelenburg position.
 - D. Cover the solution with foil.
3. A six-month-old client with a ventricular septal defect is receiving Lanoxin elixir for regulation of his heart rate. Which finding should be reported to the doctor?
 - A. A blood pressure of 126/80
 - B. A blood glucose of 110 mg/dl
 - C. A heart rate of 60 bpm
 - D. A respiratory rate of 30 per minute
4. The client admitted with angina is given a prescription for nitroglycerine. The client should be instructed to:
 - A. Replenish her supply every three months.
 - B. Take one every 15 minutes if pain occurs.
 - C. Leave the medication in the brown bottle.
 - D. Crush the medication and take it with water.

5. A 54-year-old male is admitted to the cardiac unit with chest pain radiating to the jaw and left arm. Which enzyme would be most specific in the diagnosis of a myocardial infarction?
- A. Aspartate aminotransferase
 - B. Lactic acid dehydrogenase
 - C. Hydroxybutyric dehydrogenase
 - D. Creatine phosphokinase
6. The client is instructed regarding foods that are low in fat and cholesterol. Which diet selection is lowest in saturated fats?
- A. Macaroni and cheese
 - B. Shrimp with rice
 - C. Turkey breast
 - D. Spaghetti and meatballs
7. The client is admitted with left-sided congestive heart failure. In assessing the client for edema, the nurse should check the:
- A. Feet
 - B. Neck
 - C. Hands
 - D. Sacrum
8. The nurse is checking the client's central venous pressure. The nurse should place the zero of the manometer at the:
- A. Phlebostatic axis
 - B. Point of maximum impulse (PMI)
 - C. Erb's point
 - D. Tail of Spence
9. The physician orders lisinopril (Zestril) and furosemide (Lasix) to be administered concomitantly to the client with hypertension. The nurse should:
- A. Question the order.
 - B. Administer the medications.
 - C. Administer them separately.
 - D. Contact the pharmacy.

10. The best method of evaluating the amount of peripheral edema is:
- A. Weighing the client daily
 - B. Measuring the extremity
 - C. Measuring the intake and output
 - D. Checking for pitting

Answer Rationales

1. Answer A is correct. The client taking antilipidemics should be encouraged to report muscle weakness because this is a sign of rhabdomyolysis. The medication takes effect within one month of beginning therapy, so answer B is incorrect. The medication should be taken with water. Fruit juice, particularly grapefruit juice, can decrease the drug's effectiveness, so answer C is incorrect. Liver function studies, not a CBC, should be checked prior to beginning the medication, so answer D is incorrect.
2. Answer B is correct. Hyperstat is given IV push for hypertensive crisis. It often causes hyperglycemia. The glucose level will drop rapidly after the medication is administered. Answer A is incorrect because this medication is given IV push. The client should be placed in dorsal recumbent position, not Trendelenburg, so answer C is incorrect. Answer D is incorrect because the medication is ordered IV push.
3. Answer C is correct. A heart rate of 60 in the six-month-old receiving Lanoxin elixir (digoxin) should be reported immediately because bradycardia is associated with digoxin toxicity. The blood glucose, blood pressure, and respirations are not associated with administration of Lanoxin, so answers A, B, and D are incorrect.
4. Answer C is correct. The client should leave the medication in the brown bottle because light deteriorates the medication. The supply should be replenished every six months, so answer A is incorrect. One tablet should be taken every five minutes times three, so answer B is incorrect. If the pain does not subside, the client should report to the emergency room. The medication should be taken sublingually and should not be crushed, so answer D is incorrect.
5. Answer D is correct. CK-MB (creatine phosphokinase muscle bond isoenzyme) is the most specific for a myocardial infarction. Troponin is also extremely reliable. Answers A, B, and C are nonspecific to myocardial infarctions, so they are incorrect.
6. Answer C is correct. Turkey contains the least amount of fat and cholesterol. Cheese, shrimp, and beef should be avoided by the client on a low cholesterol, low fat diet; therefore, answers A, B, and D are incorrect.
7. Answer B is correct. The neck veins should be assessed for distension in the client with congestive heart failure. Edema of the feet and hands do not indicate central circulatory overload, so answers A and C are incorrect. Edema of the sacrum is an indication of right-sided congestive heart failure, so answer D is incorrect.

8. Answer A is correct. The nurse should place the zero of the manometer at the phlebostatic axis (located at the fifth intercostal space mid-axillary line) when checking the central venous pressure. Answers B, C, and D are incorrect methods for determining the central venous pressure.
9. Answer B is correct. Zestril is an ACE inhibitor and is frequently given with a diuretic such as Lasix. There is no need to question the order, give the drugs separately, or contact the pharmacy, so answers A, C, and D are incorrect.
10. Answer B is correct. The best method for evaluating the amount of peripheral edema is measuring the extremity. A paper tape measure should be used rather than plastic or cloth, and the area should be marked with a pen. This provides the most objective assessment. Answers A, C, and D are not the best methods for evaluating the amount of peripheral edema, therefore they are incorrect.

Suggested Reading and Resources

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- ▶ Deglin, J., and Vallerand, A., *Davis Drug Guide for Nurses*. 14th ed., Philadelphia: F.A. Davis, 2015.
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