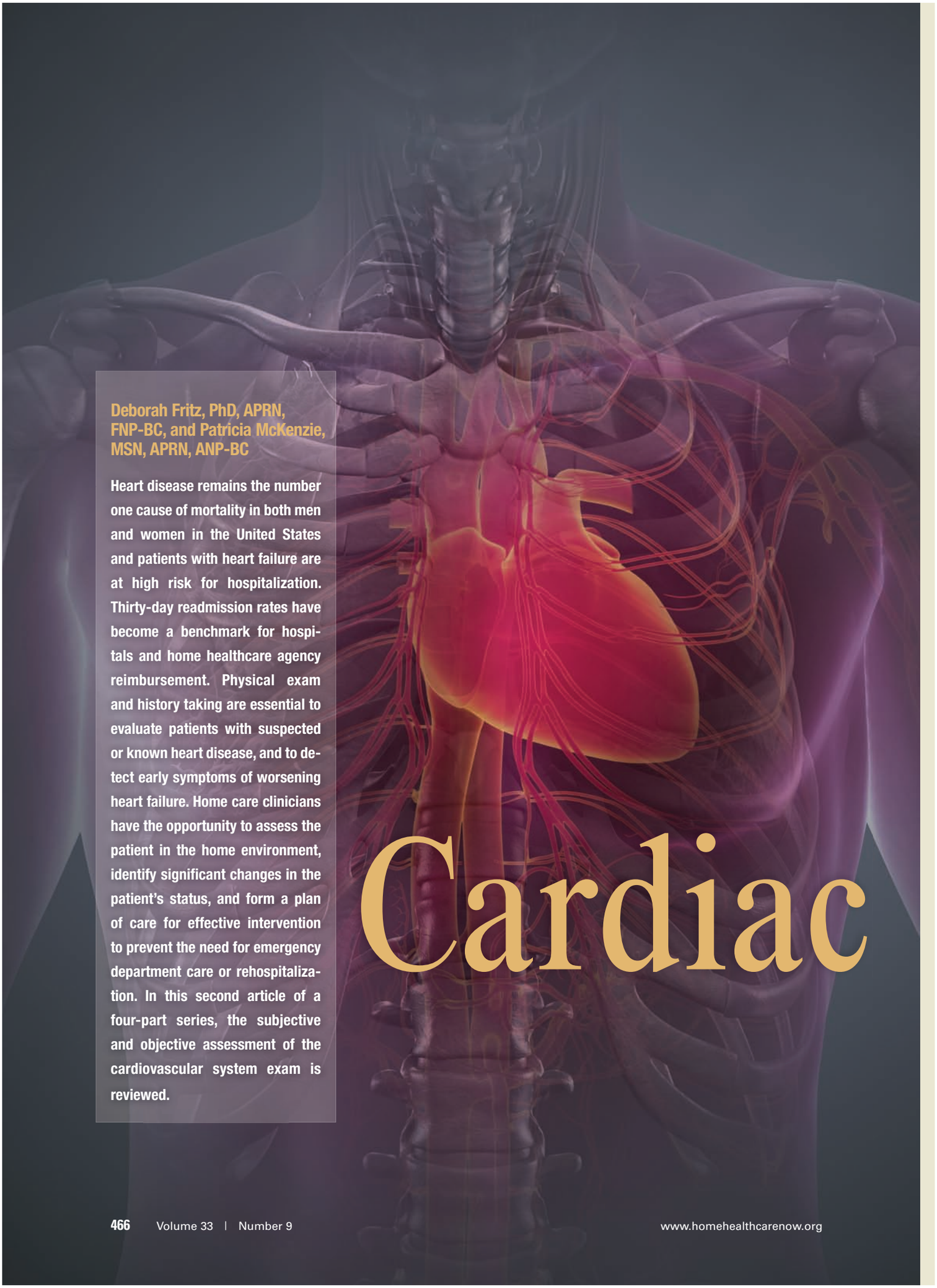

Cardiac

Deborah Fritz, PhD, APRN, FNP-BC, and Patricia McKenzie, MSN, APRN, ANP-BC

Heart disease remains the number one cause of mortality in both men and women in the United States and patients with heart failure are at high risk for hospitalization. Thirty-day readmission rates have become a benchmark for hospitals and home healthcare agency reimbursement. Physical exam and history taking are essential to evaluate patients with suspected or known heart disease, and to detect early symptoms of worsening heart failure. Home care clinicians have the opportunity to assess the patient in the home environment, identify significant changes in the patient's status, and form a plan of care for effective intervention to prevent the need for emergency department care or rehospitalization. In this second article of a four-part series, the subjective and objective assessment of the cardiovascular system exam is reviewed.

CE 2.0 HOURS
Continuing Education

Assessment

Cardiovascular Assessment

Traditionally, home healthcare clinicians provide care in the home without the benefit of a colleague to validate findings or provide a second opinion, and without the benefit of additional tests. It is imperative that home healthcare clinicians are skilled and confident in their ability to perform a focused history and physical examination in order to establish an appropriate plan of care. The plan of care will only be effective if it is based on an accurate and complete assessment of the patient. Diligent practice is necessary to improve examination technique and efficiency.

Heart disease remains the number one cause of mortality in both men and women in the United States (Centers for Disease Control and Prevention, 2015). The prevalence of cardiovascular disease (CVD) is highest among those aged 65 years or older due to buildup of atherosclerotic plaques in the arteries (Morbidity and Mortality Weekly Report, 2012). As patients with CVD live longer, optimal health and functional status are critical goals. Physical exam and history taking are essential to evaluate patients with suspected or known heart disease. In addition, early symptoms of worsening heart failure can be identified during physical exam.

Patients with heart failure as a consequence of CVD are at high risk for hospitalization. Thirty-day readmission rates have become a benchmark for hospitals and home healthcare agency reimbursement rates (Centers for Medicare and Medicaid Services, 2013). Many times it is home healthcare clinicians who first see the patient after discharge to home. These clinicians have the opportunity to assess the patient in the home environment, identify significant changes in the patient's status, and form a plan of care for effective intervention to prevent the need for emergency department care or rehospitalization (Deniger et al., 2015).

Subjective Data

A focused assessment of the cardiac system includes a review for common or concerning symptoms: Chest pain—assess location, when it occurs, intensity, type, duration, with or without exertion, radiation, associated symptoms (shortness of breath, sweating, nausea, palpitations, anxiety), and alleviating factors. Palpitations—assess for sensation of skipping, racing, fluttering, pounding or stopping of the heart. Shortness of breath or dyspnea—assess whether it occurs: with lying down and is relieved by sitting up (orthopnea); upon awakening 1 to 2 hours after going to sleep and is relieved by sitting up or standing (paroxysmal nocturnal dyspnea); with bending over (bendopnea); or occurs with the presence of cough. Swelling or edema—assess whether it is worse in morning or evening, and whether it improves with elevation.

Ask about risk factors such as: family or personal history of heart disease including hypertension, smoking status, diet (BMI—obesity, lipids, salt intake), alcohol and illicit drug use, physical activity, and type 2 diabetes (Bickley, 2012; Mansen & Gabiola, 2015). These are also risk factors for peripheral artery disease. Gather information regarding usual activity such as prolonged standing, walking, or sitting and family or personal history of thrombophlebitis, bleeding disorders, or easy bruising. In addition, ask whether they experience pain in the legs during activity (intermittent

claudication), numbness/tingling, aching, or cramping; swelling in calves, legs, or feet. Ask the patient if they have had skin changes such as cold skin, pallor or redness, hair loss, veins visible, or lower leg ulceration (Bickley; Mansen & Gabiola).

Geriatric Considerations

Age-related cardiac changes include reduced arterial compliance and left ventricular diastolic dysfunction. Atypical symptoms lead to delays in treatment. Silent or unrecognized myocardial infarction occurs frequently in patients greater than 85 years of age. While elderly patients may present with chest pain, primary complaints for myocardial infarction are often dyspnea, diaphoresis, nausea/vomiting, or syncope (Mehta et al., 2014). In older adults inquire about confusion, dizziness, syncope, or orthostatic hypotension as these symptoms may indicate reduced blood supply to the brain related to heart or circulatory changes (Mansen & Gabiola, 2015). Also, ask about depressive symptoms—a very large longitudinal study to assess the effects of depression on coronary heart disease in older adults indicated depression and poor exercise capacity predicted functional decline (Sin et al., 2015). The authors suggest that treating depression symptoms may be as important as treating CVD severity.

Patients with heart failure as a consequence of CVD are at high risk for hospitalization.

Objective Data

Accurate measurements of your patient's height/weight trends and vital signs provide valuable information about cardiovascular function. Perform and analyze the blood pressure readings, pulse rate and quality, and respiratory rate near the same time. If two or more abnormal values are found, this can provide clues to the source of the problem. For example, if the blood pressure is low and the pulse is rapid and thready, this may be indicative of shock or a low perfusion state. If you obtain an abnormal value, repeat the measurement again to ensure its accuracy.

Normal readings vary with the patient's age. Systolic blood pressure increases with age due to increased rigidity of the blood vessel walls, temperature decreases with age, and respiratory rate often increases with age or underlying pathology. Consider that abnormal values for one patient may be normal for another. Knowing a patient's baseline measurements, underlying medical conditions and medication regimen is important in analyzing your findings. For accuracy and consistency, the blood pressure cuff must be the appropriate size. If the cuff is too large, the readings will be artificially low. If the cuff is too small, the readings will be artificially high. The difference between the apical pulse and radial pulse is called the pulse deficit. This is an indirect measurement of the ability of each cardiac contraction to eject sufficient blood into the peripheral circulation (Bickley, 2012; Mansen & Gabiola, 2015).

Height and weight are important for evaluating nutritional status and assessing fluid loss or gain. Weight loss over months or years can be a clue to advancing CVD and be a sign of muscle wasting and poor nutrition (Longo et al., 2012). Abrupt (overnight, days, or weeks) weight loss or gain is helpful in assessing fluid status. An abrupt weight gain may be an indication of worsening heart failure, whereas abrupt weight loss may be an indication of over diuresis. Weight should be measured first thing in the morning, after urination but before dressing or eating. Note: weight can vary depending on the time of day it is measured, the scale used, and the amount of clothing being worn by the patient during measurement.

Inspection

Inspection begins when you first encounter the patient. Look for general appearance: body habitus (thin, obese), level of alertness (anxious, somnolent, lethargic), skin color, turgor, texture, temperature, and diaphoresis. Observe mucous membranes for pallor and extremities for clubbing of fingers or cyanosis. While the patient is sitting or lying flat, observe pulsations, retractions, heaves (a strong outward thrust of the chest wall during systole), and symmetry of movement. Locate the point of maximal impulse normally found in the left fifth intercostal space, medial to the left midclavicular line, which corresponds to the apex of the heart. Displacement to the left can indicate an enlarged heart. It is more noticeable in children and adults with thin chest walls. If examining a woman with large breasts, displace the breast during the examination. Examine the patient's extremities to assess arterial or venous disorders and symmetry,

noting skin color, hemosiderin staining, edema, weeping, lesions, scars, or clubbing, and pattern and distribution of body hair (Bickley, 2012).

Examine the blood vessels in the neck. The carotid artery should have a local, brisk pulsation that does not decrease when the patient is upright or inhales, or during palpation. The internal jugular vein should have a softer, undulating pulsation that changes in response to positioning, breathing, and palpation. The internal jugular veins provide information about blood volume and pressure in the right side of the heart. To measure the jugular venous pulse, position patient on his back and elevate the head of the bed 30 to 45 degrees, with the patient's head turned slightly away from you. Measure the highest pulsation above the sternal notch (Figure 1). It should not be more than 1.5 inches (4 cm) above the sternal notch. If it is higher, it indicates elevation in central venous pressures and jugular vein distention (Bickley, 2012).

Palpation

While palpation of the chest is often overlooked as a source of information regarding the cardiovascular system, the findings can be helpful in making an accurate assessment. Palpate over the precordium to find the apical impulse (Figure 2). Also note any thrills, heaves, or fine vibrations. You can use one hand to palpate the patient's carotid artery and the other to palpate the apical impulse to confirm that it is the apical impulse and not a muscle spasm or other pulsation. Compare the timing and regularity of the impulses. The apical pulse should coincide with the carotid pulse. Note the size, location, intensity, amplitude, and duration of the apical impulse. It should be a gentle pulsation in an area about one-half to three-fourths inch (1.5–2 cm) in diameter. Obesity or a thick chest wall may hamper the assessment. Any other pulsation in the chest is considered abnormal. The exception is if the patient is thin, you may palpate the aortic arch pulsation in the sternoclavicular area or an abdominal aorta pulsation in the epigastric area.

Figure 1. Measuring JVD. From Bickley, Bates' Guide to Physical Examination and History-Taking 9th edition. Reprinted by permission of Wolters Kluwer Health.

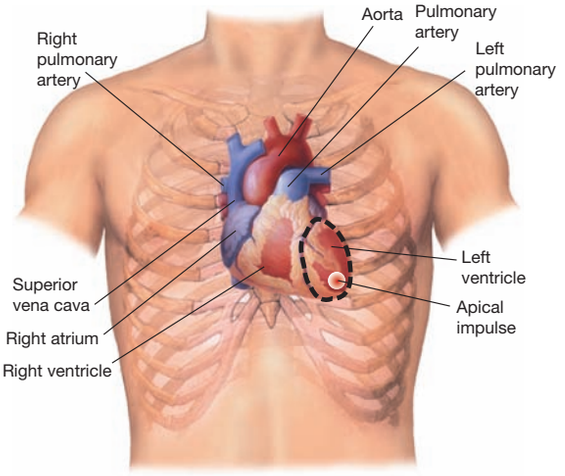

Figure 2. Precordium landmarks. From Bickley, Bates' Guide to Physical Examination and History-Taking 9th edition. Reprinted by permission of Wolters Kluwer Health.

Palpate the patient's legs and arms to assess skin temperature, texture, turgor, and edema. Edema is graded on a four-point scale. From 1+ if the examiner's finger leaves a slight imprint to +4 if the examiner's finger leaves a deep imprint that only slowly returns to normal. Check capillary refill by assessing the nail beds on the fingers and toes. Refill time should be 3 seconds or less. Palpate the temporal, carotid, brachial, radial, femoral, popliteal, posterior tibial, and dorsalis pedis pulses using the pads of the index and middle fingers (Figure 3). All pulses should be regular in rhythm and equal in strength.

Percussion

Percussion is not as useful as other methods of assessment in evaluating the cardiovascular system, but it may help locate the cardiac borders. Percuss along the anterior axillary line and continue toward the sternum along the fifth intercostal space. The sound changes from resonance to dullness over the left border of the heart, normally at the midclavicular line. The right border of the heart is aligned with the sternum and cannot be percussed. Percussion is difficult in obese patients because of the adipose tissue overlying the chest or in the female patients because of breast tissue.

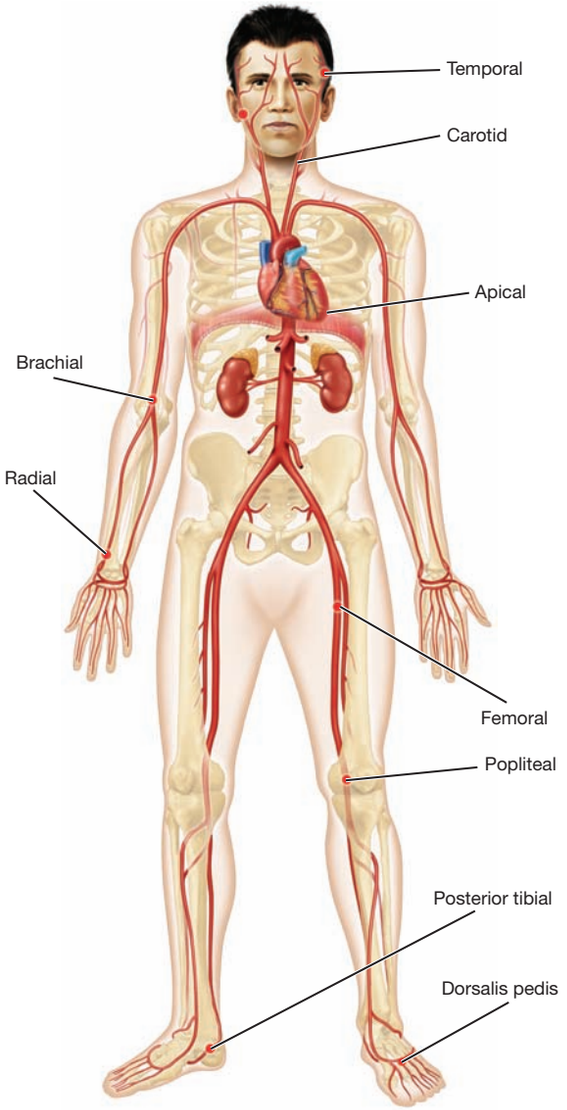

Figure 3. Arterial Pulses. Adapted from McConnell, et al.

Auscultation

Skillful auscultation of the heart can provide a great deal of information that is useful in evaluating a patient's clinical status and planning care. Unfortunately, healthcare providers feel the least competent with auscultation of heart sounds. This may be due to teaching techniques, which do not reinforce repetitive listening skills and application in the clinical setting (Reimer-Kent, 2013). For a home healthcare provider to become competent and confident in cardiac auscultation, practice, practice, and more practice is required. The following are several free sites on the Internet for repetitive auscultation training for heart sounds and murmurs: http://depts.washington.edu/physdx/heart/demo.html; www.easyauscultation.com; www.practicalclinicalskills.com/auscultation-training-by-repetition.aspx.

First begin with a stethoscope that has snug-fitting earplugs and tubing no longer than 15 inches with an internal diameter one-eighth of an inch or less. The stethoscope should have a diaphragm and a bell. To auscultate, hold the diaphragm firmly against the patient's skin to hear high-pitched sounds. Low-pitched sounds are best heard using the bell, held lightly against the skin, just enough to form a seal. If the bell is held more firmly, it causes the skin to act as a diaphragm and, therefore, the low-pitch sounds are missed by the examiner. A quiet environment is essential to hear heart sounds and evaluate accurately. This may require that a TV be turned down or muted during the exam. Other background noises such as fans, appliances, lawn mowers, and additional conversations may need to be addressed to adequately and accurately auscultate cardiac sounds. Privacy issues should also be addressed, as the area to be auscultated should be exposed. Auscultation should not be performed over clothing or bandages. Be aware that hair on the patient's chest may cause friction under the bell or diaphragm, which can mimic abnormal sounds such as a friction rub. This can be minimized by lightly wetting the hair before auscultation. It may be helpful for the examiner to close his or her eyes to focus attention on what is being heard and identify the characteristics of one sound at a time.

Cardiac auscultation should be conducted with the patient in three positions. These are sitting up, lying on the left side, and lying on the back with the head of the bed raised 30 to 45 degrees. Murmurs and pericardial friction rubs are best heard with the patient sitting up and leaning forward. Use a zigzag pattern over the precordium starting at the base of the heart and working downward (Figure 4). Use the bell to listen as you go in one direction, then use the diaphragm as you auscultate in the other direction. Listen over the entire precordium, not just over the valves (Bickley, 2012; Mansen & Gabiola, 2015).

Listening for S1, S2, S3, S4

Normal heart sounds, S1 (the first heart sound or "lub") and S2 (the second heart sound or "dub"), are generated by events in the cardiac cycle. S1 is associated with the closure of the mitral and tricuspid

valves and is best heard at the apex of the heart. This signals the onset of systole. S2 is best heard at the base of the heart and corresponds to the closure of the pulmonic and aortic valves. It is a shorter, higher-pitched, louder sound than S1 and signals the onset of diastole. These sounds are radiated to specific areas of the chest wall. Auscultation sites are identified by the names of heart valves but are not located directly over the valves. Rather, these sites are located along the pathway blood takes as it flows through the heart chambers and valves (Figure 4). A third heart sound, S3, is commonly heard in patients with a high cardiac output and in children. It is called a ventricular gallop when it occurs in adults. S3 may be a cardinal sign of heart failure. S3 is best heard at the apex when the patient is lying on his left side. It is often compared to the "y" sound in "Ken-tuck-y." It is low-pitched and occurs when the ventricles fill rapidly. It follows the S2 in early ventricular diastole and probably results from vibrations caused by abrupt ventricular distention and resistance to filling. Recent studies find a correlation between S3 finding upon admission and a poor outcome (Chakkalakal et al., 2013; Minami et al., 2015).

A fourth heart sound, S4 is considered an adventitious sound and is called an atrial gallop (or presystolic gallop). It is heard best over the tricuspid or mitral areas with the patient on his left side. It may be heard in patients who are elderly, those with hypertension, aortic stenosis, or a history of myocardial infarction. S4 is commonly described as sounding like "Ten-nes-see," and occurs just before S1, after atrial contraction. This sound results from vibrations caused by forceful atrial ejection of blood into the ventricles that do not move or expand as much as they should (Mansen & Gabiola, 2015).

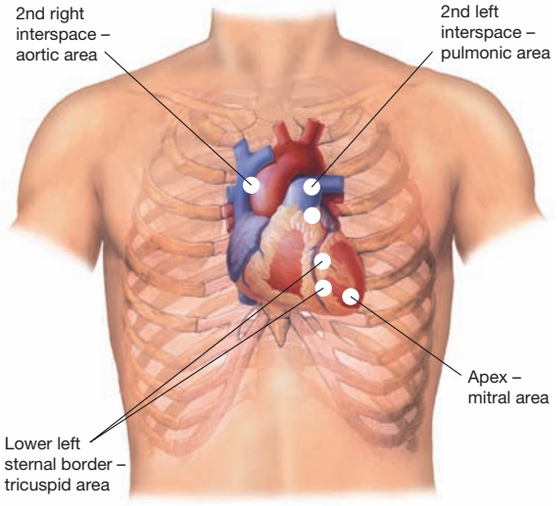

Figure 4. Auscultation pattern/heart sounds. From Bickley, Bates' Guide to Physical Examination and History-Taking 9th edition. Reprinted by permission of Wolters Kluwer Health.

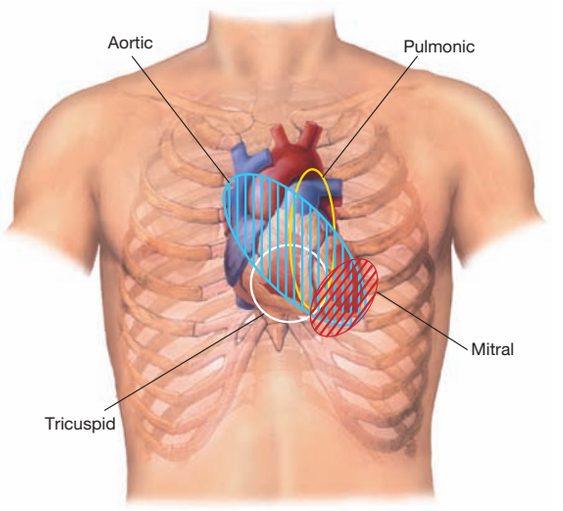

Figure 5. Heart sounds/murmurs. From Bickley, Bates' Guide to Physical Examination and History-Taking 9th edition. Reprinted by permission of Wolters Kluwer Health.

Listening for Murmurs

Murmurs occur when there is turbulent blood flow caused by structural defects in the heart's chambers or valves. Turbulence can be caused by changes in the viscosity of blood or the speed of blood flow. Listen for murmurs over the same precordial areas used in auscultation for heart sounds (Figure 5). Murmurs have various characteristics and are described using many terms. Some commonly used terms include rumbling; blowing; low, medium, and high-pitched. A murmur can also be described as crescendo (increases in intensity) or decrescendo (decreases in intensity). Murmurs can be described according to where they occur in the cardiac cycle. For example, it may be heard during early or late diastole or systole. It can also be heard throughout systole and is described as pansystolic or holosystolic. One example is the murmur that occurs with mitral insufficiency when blood regurgitates into the left atrium. The regurgitation produces a high-pitched, blowing pansystolic murmur best heard in the 5th intercostal space, midclavicular line (or the apex of the heart), and radiates to the left axillary line. Aortic stenosis is a condition in which the aortic valve has calcified and restricts blood flow and causes the blood to be turbulent and under high

Table 1. Grading the Intensity of Murmurs

Grade	Description
Grade I	barely audible
Grade II	audible but quiet and soft
Grade III	moderately loud, without a thrust or thrill
Grade IV	loud, with a thrill
Grade V	very loud, with a thrust or a thrill
Grade VI	loud enough to be heard before placing the stethoscope on the chest wall

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pressure as it crosses the stiffened leaflets through a narrowed opening. This causes a midsystolic, low-pitched, harsh crescendo-decrescendo murmur that radiates from the valve to the carotid artery. The murmur shifts from crescendo to decrescendo and back. Again, identifying even the most common murmurs takes practice with repetitive listening to hone skills. Murmurs are graded based on the intensity of the sound (Table 1) (Bickley, 2012).

Auscultation of the vascular system should be completed in an orderly manner using the bell of the stethoscope. Follow the same sequence used in palpating the arterial pulses: carotid, brachial, radial, femoral, popliteal, posterior tibial, and dorsalis pedis pulses (Figure 3). A bruit sounds like buzzing or blowing. It is a murmur-like sound with a vascular origin. If you hear a bruit during arterial auscultation, the patient may have occlusive arterial disease or an arteriovenous fistula. If a bruit is heard over the carotid artery, it could indicate arteriosclerotic plaque formation. Abnormal pulsations over the upper abdomen could indicate the presence of an abdominal aortic aneurysm. The femoral and popliteal pulses should be checked for a bruit or other abnormal sounds (Bickley, 2012; Mansen & Gabiola, 2015).

Gender Considerations

The anterior chest, mitral valve, and apical impulse are areas considered "gender sensitive" (Chakkalakal et al., 2013). A study conducted on the effect of patient gender on physician performance of the cardiac exam revealed significant differences in the performance of palpation of the apical impulse and auscultation of the mitral valve area for female versus male patients. The presence of an S3 in patients with acute chest pain and patients presenting with acute decompensated heart failure has been associated with a poor prognosis (Chakkalakal et al.; Minami et al., 2015). It was found that medical residents were less likely to correctly auscultate the mitral valve region (where an S3 is usually heard) in women versus men (Chakkalakal et al.). ☗

Deborah Fritz, PhD, APRN, FNP-BC, is a Family Nurse Practitioner, St. Louis Veterans Administration Medical Center, St. Louis, Missouri.

Patricia McKenzie, MSN, APRN, ANP-BC, Adult Nurse Practitioner, Home Based Transitional Care Team, Heart Failure Veterans Affairs Health Care System, St. Louis, MO.

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Address for correspondence: Deborah Fritz, MSN, APRN, ANP-BC, 915 North Grand Blvd., St. Louis, MO 63106 (Deborah.fritz@va.gov).

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REFERENCES

Bickley, L. (2012). *Bates' Guide to Physical Examination and History Taking* (9th ed.). Lippincott Williams & Wilkins.

Centers for Disease Control and Prevention. (2015). *Vital statistics data*. Retrieved from http://www.cdc.gov/nchs/data_access/Vitalstatsonline.htm

Centers for Medicare and Medicaid Services. (2013). *Readmission reductions program*. Retrieved from http://www.cms.gov/Medicare/Medicaid-Fee-for-Service-Payment/AcuteInPatientPPS/Readmission-Reduction-Program.html

Chakkalakal, R. J., Higgins, S. M., Bernstein, L. B., Lundberg, K. L., Wu, V., Green, J., …, Doyle, J. P. (2013). Does patient gender impact resident physicians' approach to the cardiac exam? *Journal of General Internal Medicine, 28*(4), 561-566.

Deniger, A., Troller, P., & Kennelty, K. (2015). Geriatric transitional care and readmissions review. *Journal for Nurse Practitioners, 11*(2), 248-252.

Longo, D., Kasper, D., Jameson, J., Fauci, A., Hauser, S., & Loscalzo, J. (2012). *Harrison's Principles of Internal Medicine* (18th ed.). McGraw Hill Medical.

Mansen, T., & Gabiola, J. (2015). *Patient-Focused Assessment*. Pearson Education, Inc.

McConnell, T, Hull, K. (2010). *Human Form, Human Function*. Philadelphia, PA: Wolters Kluwer Health and Pharma.

Mehta, N., Chokshi, N. P., & Kirkpatrick, J. N. (2014). Cardiac imaging in the geriatric population: What do we think we know, and what do we need to learn? *Progress in Cardiovascular Disease, 57*(2), 204-214.

Minami, Y., Kajimoto, K., Sato, N., Aokage, T., Mizuno, M., Asai, K., …, Takano, T. (2015). Third heart sound in hospitalised patients with acute heart failure: Insights from the ATTEND study. *International Journal of Clinical Practice, 69*(8), 820-828. doi:10.1111/ijcp.12603

Morbidity and Mortality Weekly Report. (2012). *Prevalence of coronary heart disease—United States, 2006-2010*. Retrieved from http://www.cdc.gov/mmwr/preview/mmrhtml/mm6040al.html. Accessed May 31, 2015.

Reimer-Kent, J. (2013). Heart sounds: Are you listening? Part 1. *Canadian Journal of Cardiovascular Nursing, 23*(2), 3-6.

Sin, N. L., Yaffe, K., & Whooley, M. A. (2015). Depressive symptoms, cardiovascular disease severity, and functional status in older adults with coronary heart disease: The heart and soul study. *Journal American Geriatric Society, 63*(1), 8-15.