Focused Cardiovascular Assessment

This course has been awarded 1.0 (one) contact hour

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Purpose and Objectives

This course discusses specific cardiovascular history questions and exam techniques for the adult patient. Physical exam techniques such as inspection, palpation, percussion, and auscultation will be highlighted. Additionally, throughout the course the participant will learn how alterations in cardiovascular assessment findings could indicate potential cardiovascular problems.

After successful completion of this course, you will be able to:

1. Outline a systemic approach to cardiovascular assessment.
2. Discuss history questions that will help with a focused cardiovascular assessment.
3. Recognize abnormal cardiovascular assessment findings associated with inspection, auscultation, percussion, and palpation.

Introduction

Cardiovascular disease is the leading cause of death for both men and women among most racial and ethnic groups in the U.S, including African Americans, Hispanics, and whites (CDC, 2017). A thorough cardiovascular assessment will help to identify significant factors that can influence cardiovascular health. About half of the US population has at least one heart disease risk factor, which include: high blood pressure, high cholesterol, or smoking history (CDC, 2017); therefore, a cardiovascular exam should be a part of every abbreviated and complete health assessment.

A focused cardiovascular assessment is usually indicated after a comprehensive assessment indicates a potential cardiovascular problem. The focused cardiovascular assessment is also indicated when an interval assessment or patient report demonstrates a change in status from a previous assessment, when a new symptom emerges, or the patient develops any distress.

An advantage of the focused assessment is that it allows the healthcare provider to ask about symptoms and move quickly to conducting a focused physical exam. Based upon the results of the assessment, the healthcare provider may choose how often to perform interval assessments to monitor the patient's identified problem. Keep in mind that all assessments should consider patient's privacy and foster open, honest patient communication (Jarvis, 2015).

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History

The purpose of the cardiovascular health history is to provide information about a patient's cardiovascular symptoms and how they developed. A complete cardiovascular history will provide indications to potential or underlying cardiovascular illnesses or disease states.

Obtaining a cardiovascular history will guide the clinician through a focused physical exam. In addition to obtaining data about the patient's cardiovascular status, the healthcare provider should obtain information about additional factors that can impact physical status including spiritual needs, cultural idiosyncrasies, and functional living status (Jarvis, 2015).

Throughout the history taking, it is important to identify modifiable risk factors such as sedentary activity level, smoking, depression, diabetes, high cholesterol, obesity, and high blood pressure, which can contribute to compromised cardiovascular health (Institute for Clinical Systems Improvement, 2013).

Communication during the history and physical must be respectful and performed in a culturally-sensitive manner. Privacy is vital, and the healthcare professional needs to be aware of posture, body language, and tone of voice while interviewing the patient (Jarvis, 2015). Take into consideration that a patient's ethnicity and culture may affect the history that the patient provides.

Past Health History

It is important to ask questions about a patient's past health history. The past health history should elicit information about the following issues:

- Hypertension
- Elevated blood cholesterol or triglycerides, including test results
- Heart murmurs
- Congenital heart disease
- Rheumatic fever or unexplained joint pains as a child or youth
- Recurrent tonsillitis
- Anemia
- Previous treatment/testing for heart disease
    - Last electrocardiogram (ECG or EKG)
    - Stress tests
    - Cardiac catheterizations
    - ECHO
    - Cardiac surgeries
    - Medications
- Any previous hospitalizations and the treatments received while in the hospital. (Jarvis, 2015)

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Current Lifestyle and Psychosocial Status

Current lifestyle and psychosocial issues to explore when conducting a focused cardiovascular health history include:

- **Nutrition**: Have the patient describe their daily diet. Ask about their usual weight and any recent weight gain or weight loss.
- **Smoking**: Ask the patient if they smoke cigarettes or other tobacco. Ascertain the pack per year smoking history. This is done by multiplying the number of years the patient has smoked with the number of packs per day they have smoked (Cancer Treatment Centers of America, 2015).

Smokers Pack per Day History

- 2 packs per day x 10 years = 20 pack-year history
- 1 pack per day x 20 years = 20 pack-year history
- 3 packs per day x 7 years = 21 pack-year history

- **Alcohol**: Ask how much alcohol the patient normally drinks per day or per week. Ask about when the last drink was and the usual number of drinks per episode.
- **Exercise:** Ask about the patient's activity level and usual amount of exercise done daily or weekly. Ask what type of exercise they participate in.
- **Drugs:** Ask the patient about all medication they take including anti-hypertensives, beta-blockers, calcium channel blockers, digoxin, diuretics, aspirin, anticoagulants, over-the-counter drugs, herbal supplements, or street drugs (Shaw, 2012).

Family History

Family history is an important factor used in identifying a patient’s risk for certain cardiovascular diseases (Jarvis, 2015).

Ask the patient about any cardiovascular family history such as hypertension, obesity, diabetes, coronary artery disease, or sudden death.

Test Yourself

Which of the following diseases is associated with cardiovascular disease?

A. Hypothyroidism
B. Lung cancer
C. Diabetes
D. Inflammatory bowel disease

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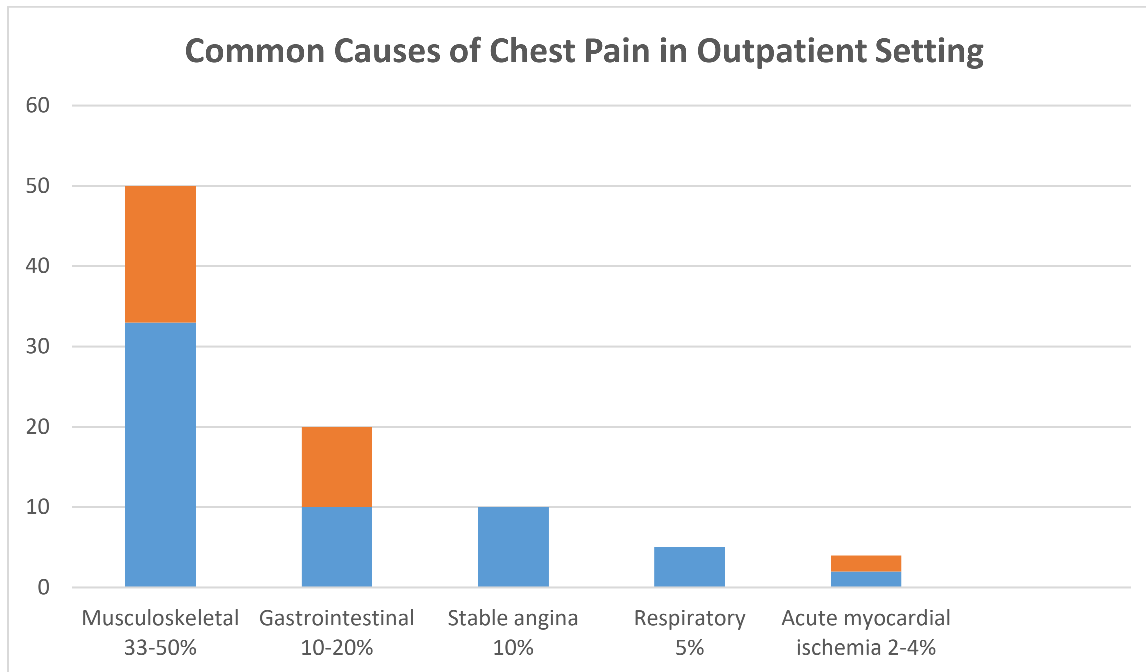
Assessment of Chest Pain Using NOPQRST Mnemonic

The most common etiologies of chest pain are musculoskeletal and gastrointestinal in origin; however, it is very important to obtain a thorough patient history so that acutely concerning conditions may be identified in a timely manner (Yelland, 2018).



(Yelland, 2018).

When examining the cardiovascular system, the mnemonic NOPQRST, is very useful in assessing chest pain so that differentiation can be made between diagnoses needing rapid treatment versus less immediately concerning diagnoses. The NOPQRST mnemonic provides a methodology in which communication to other healthcare providers will be most efficient and informative (Jacobson, Marzlin, & Webner, 2014).

Assess the following characteristics with each new report of pain and following any intervention:

- **(N) Normal:** What is the patient's baseline? i.e. vital signs, activity tolerance, pain level.
- **(O) Onset:** When did the patient begin experiencing the symptom?
- **(P) Provocative or Palliative**: What makes the symptom(s) better or worse?
- **(Q) Quality**: Describe the pain. Is it burning, shooting, aching, stabbing, crushing, etc.? Is the symptom continuous or intermittent, stable or progressive?
- **(R) Region or Radiation**: Where in the body does the symptom occur? Does the pain radiate to another body part?

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- **(S) Severity**: Use appropriate pain scale to determine severity of pain. For the adult patient, the numeric scale is generally appropriate. Ask: On a scale of 1-10, (10 being the worst) how bad is the symptom(s)?
- **(T) Timing**: Does it occur in association with something else (e.g. eating, exertion, movement)?

Identifying Normal (baseline) for the Individual Patient

Ask the patient if this is a new symptom or if they have experienced this symptom on a prior occasion, and if so how this compares to that occasion. Is the symptom occurring more frequently compared to baseline, or more intensely? Also ask about their previous and current activity tolerance and if there is any associated shortness of breath.

Symptoms could be related to an exacerbation of a previous diagnosis or a new illness.

Onset

Knowing the onset of chest pain is important to help to determine the cause and treatment of the pain. Ask the patient when they began experiencing the symptom and if the symptom came on suddenly or gradually. Ask if the symptom started today or if there was a change that prompted them to seek medical care today. Ask the patient if the symptom occurred during activity or while at rest, and if the patient was awake or if the pain woke the patient from sleep.

Most commonly, angina presents gradually with progression of chest pain. Myocardial infarctions may occur upon arising in the morning, after strenuous activity, or following a large meal as oxygen demands increase (Jacobson, Marzlin, & Webner, 2014).

Provocative or Palliative Factors

Ask the patient about what starts or worsens the pain. Chest discomfort provoked by exertion is a classic symptom of angina, although esophageal pain can also result from exertion. Other factors that may provoke ischemic pain include:

- Exercise or intense physical activity
- Cold
- Emotional stress
- Sexual intercourse
- Smoking
- Large meal

Discomfort that reliably occurs with eating is most likely related to an upper gastrointestinal disease. Pain made worse by swallowing is likely of esophageal origin. Factors that influence

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pain should also be established. Pain that responds to sublingual nitroglycerin or cessation of activity strongly suggests a cardiac ischemic etiology.

Pericarditis pain is more often associated with pain that changes with movement or deep breathing and typically improves with sitting up and leaning forward. Anginal pain usually remains stable despite position changes (Jacobson, Marzlin, & Webner, 2014).

Quality of Pain

The patient with myocardial ischemia often denies feeling chest "pain" and may delay seeking treatment. Typical descriptions of chest pain from myocardial ischemia may include:

Squeezing - A band-like sensation felt around the chest.

Tightness - There is a sensation of a knot being present in the center of the chest.

Pressure - A sensation of a lump in the throat, feeling of choking, or a heavy weight on the chest.

Chest Constriction - The "Levine sign" is displayed by a patient suffering from chest pain caused by a myocardial infarction. The patient typically presses a clenched fist against the chest to illustrate the sensation of pressure and constriction in the chest.

Burning - Infarction pain is often mistaken for heartburn or indigestion, especially in women.

Practice Pearl

Patients with a history of coronary heart disease tend to have the same quality of chest pain with recurrent episodes.

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Region or Radiation of Pain

Cardiac pain is typically located in the substernal area, although ischemic cardiac pain can be a diffuse type of non-localized pain (Jacobson, Marzlin, & Webner, 2014). The pain of myocardial ischemia often radiates to the neck, throat, lower jaw, teeth, upper extremities, or shoulder. If the chest pain is radiating to several areas, there is an increased chance that the patient is having a myocardial infarction (MI).

Pain that localizes to a small area of the chest is more likely to be related to a chest wall or pleural origin rather than the heart.

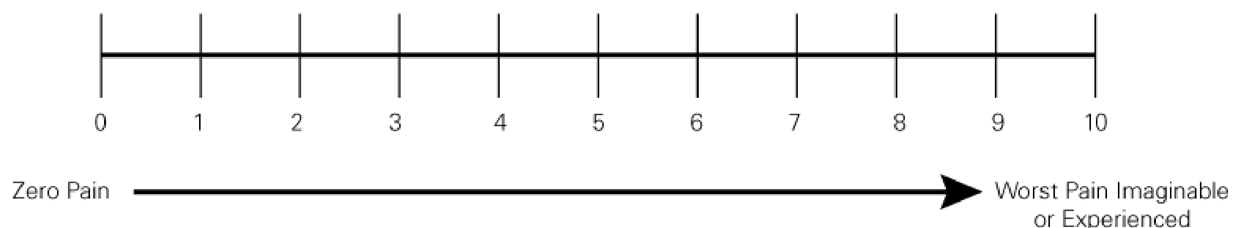
Women are less likely to report chest pain as a sign of myocardial ischemia. They are more likely to present with symptoms of shortness of breath, nausea, vomiting, weakness, fainting, or palpitations (Yelland, 2018).

Severity and Associated Symptoms

Most patients can use a pain rating scale to quantify their pain. There are many different pain scales available today. When selecting a pain scale, it is important to ensure that the selected pain scale is applicable to the patient population for whom it is being used. The numeric scale is the most commonly used pain scale with adult patients, rating pain on a scale of 0-10.

Using a 10-point numeric pain rating scale or visual analog scale often helps patients describe the intensity of pain. The 10-point score grades pain in severity ranging from 0 (no pain) to 10 (most excruciating). The severity of pain does not necessarily correlate with the degree of ischemia. As many as 1/3 of myocardial infarctions may go undetected by the patient. Some patients have difficulty putting a number on the pain in which case an adjective rating scale may be most helpful. The Numeric Pain Scale on the following page is a representation of one such numerical scale.

Numeric Pain Scale



Modified from McCaffery, M. & Pasero, C. (1999). Pain: Clinical Manual, (2nd ed.). p. 63. St Louis: Mosby.

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Always remember that severity is a subjective experience. Other symptoms that may be associated with myocardial ischemia may include:

- Nausea
- Vomiting
- Diaphoresis
- Syncope
- Palpitations
- Exertional dyspnea
- Fatigue
- Weakness
- Dizziness
- Light-headedness

(Jacobson, Marzlin, & Webner, 2014).

Timing

Ischemic pain is most often gradual with an increasing intensity over time. A crescendo pattern of pain can also be caused by esophageal disease. Pain associated with pneumothorax, aortic dissection, or acute pulmonary embolism typically has an abrupt onset with the initial sensation being the most intense.

Understanding the duration of pain and any patterns are also helpful. The pain from myocardial ischemia generally lasts for a few minutes whereas the pain from a myocardial infarction may be more prolonged. Chest discomfort that only lasts for a few seconds or pain that is constant for days or weeks is not generally due to ischemia. Myocardial ischemia may have a circadian pattern. It is more likely to occur in the morning than in the afternoon, correlating with an increase in sympathetic tone. However, this pattern may not be exhibited in patients with diabetes or patients taking beta-blockers as the patient's sympathetic tone is altered (Jacobson, Marzlin, & Webner, 2014).

Additional Questions to Ask

If the patient is unable to qualify and quantify their pain, the following questions may be useful in getting needed information regarding their pain:

- What gets the pain started?
- What helps the pain stop (rest, sitting up and leaning forward)?
- Would you describe it as more of a dull pressure or squeezing or more of a sharp, stabbing, or ripping feeling?
- Does this pain feel similar compared to when you had your previous heart attack?
- Is the pain mostly in one area or do you feel it up into your neck and arms?
- With '0' being no pain and '10' being the most excruciating pain ever, what number would you give the pain to describe the severity?

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- When applying a number is difficult: "Would you describe the pain as mild, moderate, or severe?
- Are you feeling nauseous, dizzy, lightheaded, short of breath, or tired?
- Does the pain start off gradually and get worse, or vice versa?
- How long does the pain last?
- When does the pain usually occur – morning, afternoon, or night?

Chest Pain in the Elderly

Typical clinical manifestations such as chest pain do not always occur with elderly patients with coronary artery disease (CAD), and it is important to remember that the most common symptom at presentation is dyspnea (Jacobson, Marzlin, & Webner, 2014). When pain is present in an older patient it is frequently vague and poorly localized or localized to the abdomen or epigastric area rather than the substernal area.

Elderly patients experiencing angina or myocardial ischemia may describe their symptoms simply as: exertional dyspnea, fatigue, syncope, nausea, anorexia, confusion, or shortness of breath at rest. Elderly patients may tend to attribute their dyspnea and decreased activity tolerance to aging, and may delay seeking medical attention (Jacobson, Marzlin, & Webner, 2014).

Test Yourself

Myocardial ischemia in women always presents with chest pain.

A. True
B. False

Did You Know?

Interested in more information on pain assessment and management? See RN.com's course *Pain Management and Assessment, Acute Pain: Evaluation and Management, and Chronic Pain: Evaluation and Management*.

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Other Symptoms:

Dyspnea
Dyspnea that accompanies chest pain needs to be differentiated from a number of pulmonary disorders (Jarvis, 2015; Shaw, 2012).

Ask the patient the following questions related to dyspnea:
- Do you ever get short of breath?
- What types of activity and how much activity brings on the shortness of breath?
- Does the shortness of breath come on suddenly or unexpectedly?
- Does the shortness of breath come and go or is it constant?
- Is the shortness of breath associated with change in position?
- Does the shortness of breath wake you up at night?
- Does the shortness of breath interfere with activities of daily living?

Orthopnea
Orthopnea is the inability to breathe when in a lying position. Asking the patient how many pillows he or she sleeps on at night may give more insight into a symptom that they may not always know is relevant.

Practice Pearl

Paroxysmal nocturnal dyspnea (PND) occurs at night with congestive heart failure. Fluid that has accumulated in the extremities while ambulatory during the day, is now returning to the heart while in a supine position. The weakened heart cannot accommodate this greater volume. Your patient will complain of sleeping for about two hours and then arising suddenly needing "fresh air."

Cough
Does the patient have a consistent cough? Have the patient describe the frequency, timing, severity of cough, and any sputum production. If the patient does have sputum production ask about the color of the sputum, if it has an odor, and if it is blood tinged (Jarvis, 2015).

Practice Pearl

Hemoptysis is often pulmonary in nature, but may occur with cardiogenic pulmonary edema.

Fatigue
Ask the patient if they tire easily. If so, ask when the fatigue started. Was it sudden or gradual? Has there been any recent change in energy level? Also ask about the time of the day the

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fatigue is related to, e.g. all day, morning or evening to establish the presence of a circadian rhythm, which may indicate ischemia (Jarvis, 2015; Shaw, 2012).

Practice Pearl

Cardiac related fatigue is worse in the evening. Fatigue due to anxiety or depression usually occurs all day or is worse in the morning.

Edema, Cyanosis, and Pallor

Does the patient have any swelling or skin color changes? Cyanosis or pallor occurs with myocardial infarction or low cardiac output. If the patient has swelling, ask about its location. Is it in the feet and legs? If so, when was it first noticed? Ask about any recent change in the swelling, if it is unilateral or bilateral, and if the swelling subsides after sleeping or resting with feet up. Also ask about any associated symptoms with the swelling such as shortness of breath (Jarvis, 2015; Shaw, 2012).

Practice Pearl

Cardiac related edema is worse in the evening and better in the morning after resting with the feet up.

Nocturia

Ask the patient if they get up at night to urinate? Ask how long this has been occurring and if there have been any recent changes in this pattern.

In cardiac failure, a person may not be able to pump enough blood to and meet individual organ (i.e. the kidneys) oxygen needs while active during the day, resulting in edema in the extremities. When lying down, this fluid returns back to the heart and cardiac output is increased at night, promoting fluid reabsorption and excretion (Jarvis, 2015).

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Pediatric, Pregnant, and Aging Patients

Additional history questions the healthcare provider may wish to ask regarding an infant, pediatric, pregnant, or aging patient are listed below (Jarvis, 2015).

Additional History for Infants

Congenital heart disease is the number one birth defect in the United States, affecting approximately 1% or 8-12 out of every 1,000 live births (Park, 2015).

- Mother's health during pregnancy? - Unexplained fever or rubella in the first trimester? Other infections, hypertension, drugs taken?
- Ever noticed any cyanosis while feeding, nursing or crying (e.g. "blue spells")?
- Does the baby eat or play without tiring?
- Is the baby growing according to normal for age and gender?
- Were the baby's motor milestones achieved as expected?
- How many naps per day and length of naps?

Additional History for Children

Two thirds of children that present with chest pain are found to have costochondritis, musculoskeletal, and respiratory diseases (Park, 2015). Cardiac causes for chest pain are rare in children, however must be ruled out due to risk of complications.

- Activity - Is the child able to keep up with same-aged playmates? Is the child willing or reluctant to play? Does the child prefer "quiet play"? Any recent injury?
- Does the child ever have "blue spells" (cyanosis)?
- Any unexpected joint pain or unexplained fever? Was the child recently sick?
- Does the child have frequent headaches or nose bleeds?
- Does the child have frequent respiratory infections? Any proven to be strep infections?
- Any family history of congenital diseases or chromosomal abnormalities?
- Is the child stressed?

Additional History for Pregnant Patients

- Blood pressure - Did you have high blood pressure in this or other pregnancies? What was your blood pressure before your pregnancy?
- Has your pressure been monitored in this pregnancy?
- Any protein in the urine?
- Any excessive weight gain?
- Have you had any swelling in the feet, legs or face?
- Have you experienced any faintness or dizziness with this pregnancy?

Additional History for Elderly Patients

- Do you are anyone in your immediate family have a history of heart disease, hypertension, coronary artery disease, emphysema, bronchitis?
- Do you take any medications for your illness?
- What are the side effects of the medication(s)?

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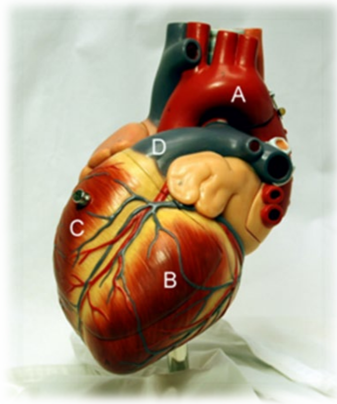
- Have you recently stopped taking any of your medications? If so, which ones and why?
- Do your illnesses interfere with your activities of daily living?
- Does your home have any stairs? How often do you need to climb them?
  (Jarvis, 2015)

The Physical Exam

When assessing the cardiovascular system, other systems such as the circulatory and respiratory systems, also need to be evaluated to provide a comprehensive and holistic picture.

In performing a cardiac assessment, a visual understanding of the heart may be useful:

(Image courtesy of wikimedia.org, 2007)



A: Aorta
B: Left ventricle
C: Right ventricle
D: Pulmonary artery

A branch of the coronary artery, Ramus interventricularis anterior, can be seen in the groove (sulcus interventricularis) between the ventricles.

Assessment of the Neck Vessels: Inspection

When inspecting the neck vessels, look for any abnormalities the healthcare provider can visualize or auscultate. The most important observation to be made in the neck region is the assessment of jugular venous pulse. From the jugular veins the healthcare provider can estimate central venous pressure (CVP) and estimate the heart's efficiency as a pump.

At a glance, if the patient is sitting in the supine position at 45 degrees or higher, the healthcare provider should not be able to see jugular venous pulsations unless there is underlying pathology (Jarvis, 2015; Shaw, 2012). If jugular venous distention is visualized, this indicates increased central venous pressure which may be caused by right-sided heart failure, an

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obstructive process such as pericardial effusion or tumor invasion, or hypervolemia (Jacobson, Marzlin, & Webner, 2014).

Assessment of the Neck Vessels: Auscultation

When auscultating, ensure the room is quiet, auscultate over bare skin, and listen to one sound at a time. The bell or diaphragm should be placed on the patient's skin firmly enough to leave a slight ring on their skin when removed. Be aware that the patient's hair may also interfere with true identification of certain sounds. The diaphragm is used to listen to high-pitched sounds and the bell is best used to identify low-pitched sounds (Jarvis, 2015). Also, remember to clean the stethoscope between patients.

Auscultate the carotid arteries in persons middle aged or older, or those with a history of cardiovascular disease. Listen for the presence of a bruit, which is a blowing or swishing sound, indicating turbulent blood flow. It may be necessary to ask the patient to hold their breath for a short time so as not to confuse tracheal breath sounds with a bruit. Typically, the presence of a bruit is an abnormal finding (Jacobson, Marzlin, & Webner, 2014).

Test Yourself

A bruit is often confused with:

A. Rales
B. Crackles
C. Wheezes
D. **Tracheal breath sounds**

Assessment of the Neck Vessels: Palpation

Palpation, another commonly used physical exam technique, requires the healthcare provider to touch the patient with different parts of his or her hand using different strength pressures. During light palpation, press the skin about 1/2 inch to 3/4 inch with the pads of your fingers. When using deep palpation, use your finger pads and compress the skin about 1½ inches to 2 inches. Palpation allows assessment of the neck for tenderness, abnormal temperature, excessive moisture, pulsations, or masses.

Palpate the carotid arteries very gently and never at the same time. Feel the contour and amplitude of the pulse. Normally, the contour is smooth with a rapid upstroke and normal strength (+2). Findings should be similar bilaterally (Jarvis, 2015; Shaw, 2012).

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Circulatory Assessment: Inspection

Performing a visual assessment of the circulatory system is an important component of a comprehensive cardiovascular assessment. The healthcare provider may inspect the skin color, location of any lesions, bruises or rash, symmetry of motion, size of body parts, and any abnormal findings, sounds, and odors.

See assessment findings and associated interpretations in the table below:

Assessment Findings	Interpretation of Findings
Cool, clammy skin	Vasoconstriction
Warm, moist skin	Vasodilation
Flushing of skin	May be related to medications, excess heat, anxiety, or fear
Pallor	May result anemia or increased peripheral vascular resistance caused by atherosclerosis
Dependent rubor (redness)	May be related to chronic arterial insufficiency
Bluish discoloration of lips, oral mucous membranes, nail beds (ie clubbing), and/or extremities	Peripheral cyanosis
Abnormal hair distribution/lack of hair	May be related to arterial insufficiency
Edema	May be related to heart failure, liver failure, venous insufficiency, varicosities, or thrombophlebitis
Delayed capillary refill > 2 seconds	Poor perfusion

(Jarvis, 2015; Shaw, 2012; Jacobson, Marzlin, & Webner, 2014).

Assess perfusion

Assess arterial perfusion to the lower extremities. Have the patient lie supine on a flat surface and elevate one of his legs above his heart for about one minute. The healthcare provider may need to assist with this movement. Then ask him to sit up and dangle his legs over the bed and inspect the color of both legs. The leg that was elevated should show slight pallor in comparison to the other leg. The color of both legs should be about the same in about ten seconds, once the veins have had time to fill (Jacobson, Marzlin, & Webner, 2014; Jarvis, 2015).

Differentiating type of cyanosis

There are two types of cyanosis that may occur in compromised patients: central and peripheral. Central cyanosis is consistent with reduced oxygen intake or transport from the lungs. Peripheral cyanosis suggests constriction of the peripheral arteries. This is usually from stress, cold, or anxiety. It may also be from hypovolemia, shock, or vasoconstrictive diseases.

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Circulatory Assessment: Auscultation

Auscultate the patient’s blood pressure. The systolic reading reflects the pressure exerted by the left ventricle during contraction. The diastolic reading reflects the pressure in the arteries when the heart is at rest.

Blood pressure is lowest in the newborn, and rises with age, weight gain, stress, anxiety, and during exercise. Hypertension is a risk factor for heart disease, stroke, and kidney disease. Diet, exercise, and medications-when necessary, can help to control blood pressure.

When auscultating blood pressure, be sure to choose an appropriate size cuff to avoid false readings. Some helpful hints when assessing blood pressure include:

- Never take a blood pressure in an arm on the same side as a mastectomy.
- Never take a blood pressure in an arm with an arteriovenous fistula or shunt, or in an arm with a peripherally inserted central catheter.

Blood Pressure Classification in Adults

Category	Systolic	Diastolic
Normal	<120	And <80
Pre-Hypertension	120-139	Or 80-89
Stage I Hypertension	140-159	Or 90-99
Stage II Hypertension	> 160	Or > 100

Circulatory Assessment: Palpation

The next part of the circulatory system examination is palpation. Begin by palpating the peripheral arteries. These include the brachial, radial, femoral, popliteal, dorsalis pedis, and posterior tibial. Note the contour and amplitude of each pulsation. These should feel similar bilaterally.

Moving away from the core of the body, the contour or upstroke of the pulsation may be less rapid. This is normal, but it is important to assess that the arteries have similar strength bilaterally.

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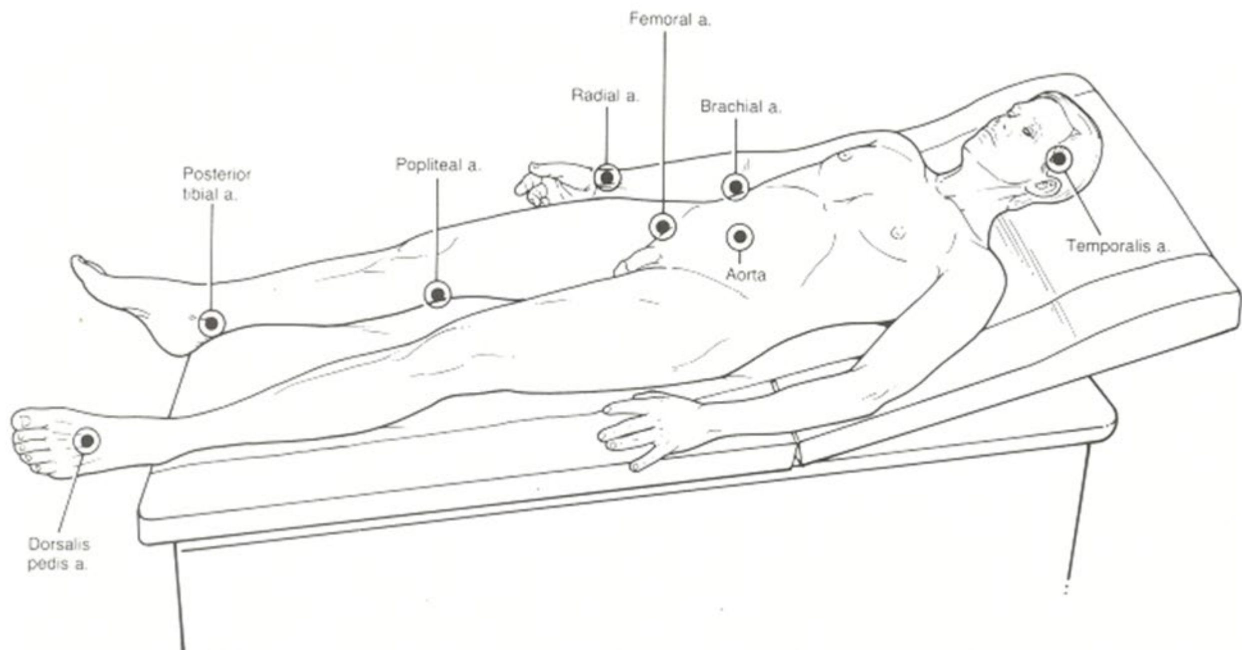
Diagram: Locations for Palpation



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Test Yourself

When assessing normal circulation in the extremities, an anticipated finding may be:

A. **Blood flow is similar bilaterally.**
B. The contour and amplitude of pulsations are greater on the left side of the body.
C. The contour and amplitude of pulsations are greater on the right side of the body.
D. Moving further away from the core of the body, the contour pulsations are more rapid.

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The Precordium: Inspection and Auscultation

Inspection
Inspect the anterior chest for pulsations. The apical pulse may or may not be visible. If it is visible, it can be seen in the fourth or fifth intercostal space.

Auscultation
Before beginning auscultation of the precordium, preface the exam by telling the patient you will be listening in many different places for what might be a while. Then, identify the areas you need to auscultate.   It is recommended to inch the stethoscope in a "Z-pattern" across the precordium, from the base of the heart to the apex. Concentrate on the sound of the "lub" and the "dub." The "lub" or first heart sound is known as S1. The "dub" or the second heart sound is known as S2 (Jarvis, 2015; Shaw, 2012).

Diagram: Locations for Auscultation

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http://3.bp.blogspot.com/_LJXXjzLkL8A/Rdfzr_BGI/AAAAAAAAABk/J4lxd6p06CQ/s320/a_auscultation_areas.jpg

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Heart Sounds: S1

S1 is produced by the closure of tricuspid and mitral valves. Alterations upon auscultation that involve S1, include:

- S1 is accentuated in exercise, anemia, hyperthyroidism, and mitral stenosis.
- S1 is diminished in first degree heart block.
- S1 split is most audible in tricuspid area (T-lub-dub).

(Jarvis, 2015; Shaw, 2012)

Heart Sounds: S2

S2 is produced by the closure of aortic and pulmonic valves. Alterations upon auscultation that involve S2, include:

- Splitting of S2 sound can occur when the aortic and pulmonary valves do not close at the same time.
- Normal physiological splitting of S2 is best heard at pulmonic area. It is heard during inspiration ("lub-T-dub, lub-dub") due to the increase in venous return during inspiration, which prolongs right ventricular systole and delays closure of pulmonic valve.
- Abnormal splitting of S2 is audible during both inspiration and expiration, also referred to as a Fixed Split S2. This can indicate an Atrial Septal Defect, pulmonic stenosis, systemic or pulmonary hypertension (Jacobson, Marzlin, & Webner, 2014).

Heart Sounds: S3

The third heart sound is produced by the rapid filling of the ventricle (that is not completely empty) during early diastole (Jarvis, 2015). S3 is also known as a ventricular gallop ("lub-DUB-ta" or "Ken-TUK'-ky").

S3 is normal in pregnancy, children, and adults less than thirty years old, during exercise, anxiety, or anemia. It is heard best at the apex in the left lateral decubitus position, using the bell.

Pathologic S3 occurs in people over the age of 40, usually due to myocardial failure.

Heart Sounds: S4

The fourth heart sound is typically heard in late diastole before S1, as a result of increased ventricular resistance to atrial filling, due to either decreased ventricular compliance or increased ventricular volume. It is low pitched and best heard with the bell. S4 is also known as an atrial gallop ("ta-lub-DUB" or"Tenn-es-SEE"), where the Tenn is the S4 sound.

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S4 is often normal in older adults and is heard best at the apex in the left lateral decubitus position.

Pathological S4 may be caused by coronary artery disease, hypertension, cardiomyopathy, or aortic stenosis (Jarvis, 2015).

Heart Sounds

Listen to actual heart sounds using the Auscultation Assistant
http://www.wilkes.med.ucla.edu/intro.html

This is a great tool for exposure to many different normal and abnormal heart sounds.

Test Yourself

Which heart sound is known as the atrial gallop?

A. S1
B. S2
C. S3
D. S4

Abnormal Heart Sounds Summation Gallop and Opening Snap

Summation Gallop

A summation gallop is produced when S3 and S4 merge into one sound. It often occurs at rates greater than 100 beats per minute. It may occur in heart failure and pericarditis. Summation gallops occur in 15% of all myocardial infarctions and are common following cardiac surgery. They are best heard with patient leaning forward, holding breath after full expiration.

Opening Snap

At the end of ventricular systole, when the aortic and pulmonic valves close, S2 is produced. Immediately after S2, the heart relaxes, and ventricular pressure falls below that of atrial pressure. This allows the atrioventricular valves to open. This is the start of diastole. Normally, you cannot hear these valves open. However, if the mitral valve becomes stenotic or abnormally narrowed they will create an opening snap. This sound usually precedes the development of a diastolic murmur associated with mitral stenosis. Once the valve becomes seriously impaired and inflexible, the opening snap disappears (Jacobson, Marzlin, & Webner, 2014; Shaw, 2012).

An "Opening Snap" is an abnormal heart sound due to a stenotic valve opening. When a normal cardiac valve opens, there is no sound created.

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Abnormal Heart Sounds: Ejection Click and Mid-Systolic Click

Ejection Click

Similar to an opening snap, an ejection click is caused by stenotic valve leaflets. This sound is produced when the aortic or pulmonic valves open at the beginning of systole. It is a brief high frequency sound best heard with the diaphragm over the aortic or pulmonary artery or Erb's point, or near the apex over the mitral area (Jacobson, Marzlin, & Webner, 2014; Shaw, 2012).

Mid-Systolic Click

A mid-systolic click occurs when the mitral valve's leaflets and cordae tendenae tense. The anterior or posterior or both leaflets can prolapse. Every once in a while multiple clicks occur. They are heard in mid to late systole. They are best heard over the tricuspid area and towards the mitral area. They are crisp, high frequency sounds (Jacobson, Marzlin, & Webner, 2014; Shaw, 2012).

Abnormal Heart Sounds: Pericardial Friction Rub and Mediastinal Crunch

Pericardial Friction Rub

A pericardial friction rub is usually heard best and is sometimes palpable over the tricuspid and xyphoid areas. It occurs when inflamed pericardial surfaces rub together. The rubbing of these surfaces produces the characteristic, high-pitched, grating noises. To differentiate a pericardial friction rub from a pleural friction rub, have the patient hold his or her breath. When they do this, a pericardial friction rub will continue, a pleural friction rub will cease (Jacobson, Marzlin, & Webner, 2014; Shaw, 2012).

Mediastinal Crunch

A mediastinal crunch is produced due to displaced air under the surface of the skin near the mediastinum. Patients with mediastinal crunch often have subcutaneous emphysema. You can assess for this by palpating crepitation in the neck. The noise has a crunching quality and is heard best along the left sternal border. It may be louder on inspiration (Jacobson, Marzlin, & Webner, 2014; Shaw, 2012).

Abnormal Heart Sounds: Murmurs

A murmur is an abnormal heart sound caused by turbulent blood flow. The sound may indicate that blood is flowing through a damaged or overworked heart valve, that there may be a hole in one of the heart's walls, or that there is a narrowing in one of the heart's vessels.

Some heart murmurs are a harmless type called innocent heart murmurs which are common in children and usually do not require treatment. Murmurs are more likely to be innocent if they are a systolic murmur, the grading is 1-2/6, and they are louder when supine.

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Auscultation of Murmurs

If a murmur is present, it is important to assess and document the following qualities of the murmur:

Timing: Are they systolic or diastolic?

Anatomical location of maximum intensity: Where is the murmur best heard?

Frequency: What is the pitch of the murmur?

Radiation: Can you hear the murmur in other locations such as the neck or upper chest?

Quality: Is the murmur harsh, soft, or blowing?

Intensity: Describe the loudness of the murmur on a scale of 1 to 6, as indicated by Levine's 6 point grading scale:

Grade	Intensity
1	Very Faint - Easily Missed
2	Quiet – Barely Audible
3	Moderately loud – but easily heard – same intensity as S_1 or S_2
4	Loud, but usually no thrill present
5	Very loud, thrill present
6	Heard with stethoscope off chest – Thrill present

(Jacobson, Marzlin, & Webner, 2014; Jarvis, 2015; Shaw, 2012)

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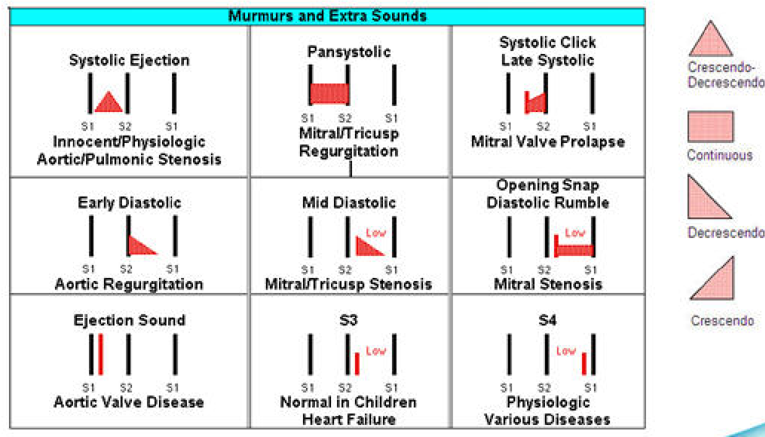
Timing and Quality of Common Murmurs

The following table depicts the timing and quality of common murmurs.



The Precordium: Palpitation and Percussion

Palpation

Palpate the apical pulse, normally in the fourth or fifth intercostal space, mid-clavicular line. It should be felt as a short, gentle tap. It can be palpated in about half of people. It is more difficult to palpate in obese patients or those with thick chest walls. Stress, fever, anxiety, hyperthyroidism, and anemia may increase the amplitude and duration of the apical pulse. When the apical pulse is palpated lower in the thoracic cage and has a greater amplitude than expected, it is often due to cardiac pathology (Jarvis, 2015).

Percussion

Use percussion to outline the cardiac border. Typically, however, a chest x-ray can reveal the same results. There are times, however, that chest x-rays are not available, and percussion may be one of the only tools to assess cardiac size.

To perform effective percussion, press the distal part of the middle finger of your non-dominant hand firmly on the body part, keeping the rest of the hand off the body surface. Using the middle finger of the dominant hand, tap quickly and directly over the point where the other middle finger makes contact with the patient’s skin. Dullness should be heard over the area where the heart is located (Jarvis, 2015).

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Recording Findings

It is important to accurately and thoroughly record and document findings from the cardiovascular exam. Standard documentation ensures that all members of the healthcare team interpret the findings accurately. In documenting murmurs, Levine's six-point grading scale is the most accurate way to record findings, as is the use of a standard four-point scale to assess and document edema.

Remember that the recordings are part of the medical record and should be as objective and accurate as possible.

Conclusion

Integrating the cardiovascular health history and physical exam takes practice. It is not enough to simply ask the right questions and perform the physical exam. As the patient's nurse, it is critical to analyze all of the data obtained, synthesize the data into relevant problem focus, and identify a plan of care for the patient based upon this synthesis. As the plan of care is being carried out, reassessments must occur on a periodic basis. How often these reassessments occur is unique to each patient, based upon their physical disorder.

Always take the time to ensure the patient understands their diagnosis, what signs and symptoms to report back to the provider following the visit, and when it is appropriate to call 911. Provide the patient with written handouts when available as stress associated with a new diagnosis can decrease a person's ability to retain verbal education. Patient education is vital to improving outcomes for patients with acute cardiovascular symptoms as every minute can be important (Aroesty & Kannam, 2018).

Resources

American College of Cardiology: www.acc.org
American Heart Association: www.heart.org
Auscultation Assistant: www.wilkes.med.ucla.edu/intro.html
Easy Auscultation.com: http://www.easyauscultation.com/
Heart risk calculator: http://www.cvriskcalculator.com/

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References

Aroesty, J.M. & Kannam, J.P. (2018). Patient education: Chest pain (Beyond the basics). In G.M. Saperia (Ed.) *Uptodate.* Retrieved April 20, 2018 from https://www.uptodate.com/contents/chest-pain-beyond-the-basics.

Cancer Treatment Centers of America. (2015). Risk factors for lung cancer. Retrieved April 20, 2018, from http://www.cancercenter.com/lung-cancer/lung-cancer-risk-factors.cfm

Centers for Disease Control (CDC). (2017). Heart disease facts. Retrieved April 20, 2018 from http://www.cdc.gov/heartdisease/facts.htm

Institute for Clinical Systems Improvement (2013). Coronary Artery Disease, Stable: Guideline Summary. Retrieved April 20, 2018 from https://www.icsi.org/guidelines__more/catalog_guidelines_and_more/catalog_guidelines/catalog_cardiovascular_guidelines/scad/.

Jacobson, C., Marzlin, K. & Webner, C. (2014). *Cardiovascular nursing practice: A comprehensive resource manual and study guide for clinical nurses*. Brockton, MA: Western Schools.

Jarvis, C. (2015). *Physical examination and health assessment* (7th ed). St. Louis, MO: Elsevier, Inc.

Park, M.K. (2015). *The pediatric cardiology handbook.* (5th ed.). Philadelphia, PA: Elsevier Saunders.

Shaw, M. (2012). *Assessment made incredibly easy* (5th ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

Yelland, M.J. (2018). Outpatient evaluation of the patient with chest pain. In D.J. Sullivan (Ed.) Uptodate. Retrieved April 20, 2018 from https://www.uptodate.com/contents/outpatient-evaluation-of-the-adult-with-chest-pain.

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