Lesson 8.1 Objectives

- Discuss anatomic structures and physiologic processes related to the cardiovascular system.

Three fluids interact with stationary cells to help maintain homeostasis by delivering oxygen and nutrients and by removing wastes:
- Blood
- Interstitial fluid
- Lymph

Three fluids bring nutrients to and remove waste from stationary cells:
- Blood
- Interstitial fluid
- Lymph

Cardiovascular System

- Main components:
  - Blood
  - Heart
  - Blood vessels

Cardiovascular System (cont’d.)

- Blood: consist of a liquid portion called plasma and blood cells
- Functions of blood:
  - Transports oxygen from the lungs
  - Transports nutrients from the digestive tract
  - Removes waste
  - Regulates pH using buffers
Cardiovascular System (cont’d.)

- Blood cells
  - Erythrocytes: red blood cells; contains hemoglobin
  - Leukocytes: white blood cells
  - Thrombocytes: platelets

- Plasma proteins
  - Transporters
  - Help with blood coagulation
  - Part of lymphatic/immune system
  - Enzymes
  - Hormones

- Heart chambers
  - Atria: superior chambers; left and right
  - Ventricles: inferior chambers; left and right

- Heart valves
  - Tricuspid
  - Mitral (bicuspid)
- Major blood vessels connected to heart
  - Superior vena cava
  - Inferior vena cava
  - Pulmonary trunk
  - Aorta
  - Coronary sinus
  - Coronary arteries

- Pulmonary and systemic circulation
  - Deoxygenated blood enters right atrium
  - Moves to right ventricle
  - Moves to lungs
  - Oxygenated blood enters left atrium
  - Moves to left ventricle
  - Moves throughout the body

- Coronary circulation
  - Heart’s own blood supply
  - Coronary arteries branch off aorta
  - Coronary veins drain deoxygenated blood
  - Coronary sinus drains into right atrium

- Cardiovascular System (cont’d.)
  - Heart’s conduction system
    - Autorhythmicity
    - Ensures a regular, coordinated heartbeat

- Heart’s conduction system
  - Sinoatrial node nerve impulse sets pace
  - Atria contract at same time, ventricles relax
  - Atrioventricular node contacted
  - Ventricles contract at same time, atria relax

- Heart rate Increases
  - Hormone epinephrine (adrenaline)
  - Sympathetic nervous system

- Heart rate decreases
  - Parasympathetic nervous system
Blood vessels
- Arteries
  - Distribute oxygenated blood
  - Branch off aorta
  - Have thick walls with smooth muscle and elastic tissues

Arterioles
- Distribute oxygenated blood
- Smallest branches of arteries
- Single layer of tissue covered by some smooth muscle

Capillaries
- Distribute nutrients and remove waste through interstitial fluid
- Smallest branches of arterioles and venules
- Single layer of epithelial tissue

Venules
- Remove deoxygenated blood
- Smallest branches of veins
- Single layer of tissue covered by some smooth muscle
Veins
- Remove deoxygenated blood
- Thin walls with smooth muscle and elastic tissues
- Skeletal muscles help move blood
- Valves prevent backflow

Tunics
- Tunic intima: innermost layer
- Tunic media: middle layer
- Tunic adventitia: outer layer
  - Vasa vasorum: blood supply for large vessels (vessels of the vessels)

Refer client to health care provider:
- Bradycardia or tachycardia
- Palpitations
- Difficulty with or rapid breathing
- Skin discolorations (pallor, redness, jaundice, cyanosis)
- Unexplained bruising or skin irritation
- Presence of rashes, hives, or scaliness

Refer client to health care provider:
- Unexplained chest or calf pain
- Edema (pitting edema, molted skin, or limbs of unequal circumference)
- Limbs unequal in temperature
- Chronic fatigue or dizziness
- Exercise intolerance

Lesson 8.2 Objectives
- Define disorders of blood and circulation and list appropriate massage considerations for each.
- Contrast and compare types of anemia.
- Identify disorders of the heart and list appropriate massage considerations for each.
- Explain different types of arrhythmias.

Disorders of Blood and Circulation
- Anemia
- Hemophilia
- Thrombosis
- Embolism
- Shock
Anemia

- Reduction in RBC quantity or their hemoglobin, which impairs the blood’s ability to carry O2
- Obtain medical clearance for severe forms; reduce treatment time and pressure if client is overly fatigued

Iron-deficiency – Associated with iron depletion; most common type
- Pernicious – Larger than normal RBC
- Folic Acid – Associated with folic acid deficiency
- Sickle Cell – Associated with RBC destruction, changing to sickle shape
- Aplastic – Associated with bone marrow failure; a rare, life-threatening form

Hemophilia

- Genetic disorder that impairs the blood’s clotting mechanisms
- Massage is contraindicated in moderate or severe forms; otherwise, obtain clearance and use lighter pressure; joint mobilizations are omitted or cautiously applied

Thrombosis

- Transformation of fluid blood into a gelatinous mass; also called blood clot formation
- Avoid deep or vigorous techniques on lower extremities for up to 10 days after the client is ambulatory if client is at risk for thrombosis (e.g., recent surgery)

Thrombosis (cont’d.)
Embolism

- Occlusion of a blood vessel by an embolus.
  - Embolus: floating matter in the intravascular space carried by blood
- Massage is contraindicated

Shock

- Failure of the cardiovascular system to deliver enough oxygen and nutrients to meet the body’s needs
- Massage is contraindicated

Disorders of the Heart

- Angina pectoris
- Arrhythmias
- Congestive heart failure
- Rheumatic fever
- Rheumatic heart disease
- Cardiomyopathy
- Endocarditis
- Myocarditis
- Pericarditis
- Myocardial infarction
- Cardiac arrest

TABLE 6-2 Types of Shock

<table>
<thead>
<tr>
<th>Type</th>
<th>Markers</th>
<th>Specific Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiogenic shock</td>
<td>Heart failure</td>
<td>Myocardial infarction, heart valve disorders, heart infections (pneumococcal, endocarditis), other problems with the heart</td>
</tr>
<tr>
<td>Hypovolemic shock</td>
<td>Hypovolemia</td>
<td>Massive hemorrhage, excessive other (losses in untreated diabetes, severe burns)</td>
</tr>
<tr>
<td>Anaphylactic shock</td>
<td>Generalized vasodilation</td>
<td>Allergic reaction to insect stings, drugs, nuts, shellfish</td>
</tr>
<tr>
<td>Septic shock</td>
<td>Generalized vasodilation</td>
<td>Severe or multiple infections (tet, bee, spiral cord injury, hypoglycemic-brain shock)</td>
</tr>
<tr>
<td>Neurogenic shock</td>
<td>Generalized vasodilation</td>
<td></td>
</tr>
</tbody>
</table>

Modified from Damjanov I: Pathology for the health-related professions, ed 2, Philadelphia, 2000, WB Saunders.
Angina Pectoris (Angina)

- Chest pain caused by reduced blood supply to heart
- Be sure to keep client warm (cold may trigger an attack); ensure client has necessary medications

Arrhythmias

- Any deviation from a normal heartbeat or rhythm; term encompasses abnormally fast or slow rhythms as well as irregular rhythms
- Reduce treatment time and pressure if client is overly fatigued

Arrhythmias, Types (cont’d.)

- Bradycardia – <50 or 60 BPM
- Tachycardia – >100 BPM
- Atrial fibrillation – atra quiver rather than contract
- Ventricular fibrillation – ventricles quiver rather than contract

Congestive Heart Failure

- Heart’s inability to meet body demands; associated with disease (longstanding HBP, CAD) or from heart problems (past MI, valvular)
- Types are:
  - Left-sided CHF – Most common
  - Right-sided CHF – usually from left-sided CHF

Congestive Heart Failure (cont’d.)

- For acute cases, massage is contraindicated
- For chronic cases, determine massage appropriateness or treatment modifications by presenting symptoms
  - Example: in cases of severe pitting edema, avoid the area


Artificial Pacemaker

- Delivers small electrical currents to stimulate heart contraction
- Postpone massage until physician removes restriction of strenuous activity; then avoid overhead movement of the pacemaker-side arm for additional 6 wks

Implantable Cardioverter Defibrillator (ICD)

- Delivers electrical shock to restore normal heart rate and rhythm
- If ICD delivers a shock during massage, discontinue massage; otherwise massage modifications same as artificial pacemaker

Massage considerations:
- Massage is postponed until client is completely recovered from surgery and cleared by his or her physician.
- Surgery incision should be fully healed.
- Scar mobilization is permissible.
- Avoid moving the arm near the pacemaker over the head.

Rheumatic Fever

- Condition that develops as a rare complication after an untreated strep throat infection
- Massage is contraindicated

Massage considerations (cont'd):
- Offer a soft pillow to place under the chest while the client is prone.
- The therapist might feel the shock if the therapist is touching the client when the device discharges.
- Massage should be discontinued if the device discharges, and the client should seek immediate medical attention.
**Rheumatic Heart Disease**
- Heart disease following rheumatic fever; affects all heart layers
- Massage is contraindicated

**Cardiomyopathy**
- Any weakening or change in the heart’s myocardium; associated with inadequate heart pumping
- Obtain medical clearance

**Endocarditis**
- Inflammation of heart’s internal lining (endocardium)
- Massage is contraindicated

**Myocarditis**
- Inflammation of the heart muscle (myocardium)
- Massage is contraindicated

**Pericarditis**
- Inflammation of the sac surrounding the heart (pericardium)
- Massage is contraindicated

**Myocardial Infarction (Heart Attack)**
- Death of myocardial tissue from interrupted blood supply and prolonged ischemia
- Medical clearance needed for recent MIs; once obtained, use reduced treatment time and pressure and maintain this protocol until client has regained most of his/her strength, then regular massage can resume
Myocardial Infarction (cont’d.)

- Warning signs of heart attack:
  - Chest pain that may be described as crushing, burning, viselike, heaviness, or fullness
  - Discomfort in other areas of the upper body such as the arm, shoulder, neck, or jaw
  - Shortness of breath, profuse sweating, fatigue, dizziness
  - Nausea and indigestion
  - Anxiety or fear

- Warning signs of heart attack (cont’d.):
  - Unusual chest pain, stomach or abdominal pain
  - Continuous midthoracic or interscapular pain
  - Continuous neck or shoulder pain
  - Isolated right biceps pain
  - Pain unrelieved by antacids, rest or nitroglycerin
  - Nausea and vomiting; flu-like manifestation without chest pain/discomfort
  - Unexplained intense anxiety, weakness, or fatigue
  - Breathlessness or dizziness

Cardiac Arrest

- Sudden and unexpected complete cessation of heartbeat
- Massage is contraindicated

Lesson 8.3 Objectives

- Identify diseases of the arteries and list appropriate massage considerations.
- Define diseases of veins and list appropriate massage considerations.
Diseases of Arteries

- Arteriosclerosis
- Atherosclerosis
- Coronary artery disease
- Peripheral arterial disease
- Hypertension
- Aneurysm
- Orthostatic hypotension
- Raynaud disease and Raynaud syndrome
- Thromboangiitis obliterans

Arteriosclerosis

- Group of diseases characterized by thickening and loss of elasticity in arterial walls; hardening of the arteries
- See slide on atherosclerosis for massage recommendations

Atherosclerosis

- Presence of lesions called plaque within middle-large size arteries; four main forms:
  - CAD
  - Cerebrovascular disease
  - Atherosclerosis of the aorta
  - PAD
- Since atherosclerosis leads to other diseases, follow massage recommendations for those specific diseases

Nonmodifiable factors

- Age
- Gender
- Genetics

Modifiable factors

- Obesity
- Elevated LDL-cholesterol and triglycerides and low HDL-cholesterol
- Cigarette smoking
- Sedentary lifestyle
- Diabetes
- Hypertension

Atherosclerosis (cont’d.)
Coronary Artery Disease
- Narrowed coronary arteries from atherosclerotic plaque
- Since CAD leads to other diseases, follow massage recommendations for those specific diseases (angina pectoris, CHF, MI)

Peripheral Arterial Disease
- Disease of narrowed arteries outside the heart
- Local contraindication (usually lower extremities)

Hypertension
- High blood pressure; often asymptomatic
- In cases of untreated HBP, treat as an absolute contraindication; otherwise, massage is indicated

Aneurysm
- Localized weakness in a blood vessel wall that bulges outward
- Obtain physician consent; once obtained, avoid affected area (usually the abdomen)

Orthostatic Hypotension
- Sudden drop in blood pressure when moving from recumbent to upright position causing loss of balance; dizzy spell
- Assist client getting off table if needed; remind him or her to move slowly rather than quickly
Raynaud Disease and Raynaud Syndrome

- Cycle of periodic temporary, but severe, vasospasms; usually in fingers and toes
- Avoid affected area during attacks; otherwise, massage indicated while avoiding cryotherapy

Thromboangiitis Obliterans

- Inflammatory condition of small-medium size arteries of upper and lower extremities
- Local contraindication; avoid all forms of thermo- and cryotherapy

Diseases of Veins

- Phlebitis
- Thrombophlebitis
- Varicose veins

Phlebitis

- Inflammation of the veins
- Local contraindication; while massaging other areas, place the affected limb on cushions to raise it above the level of the heart

Thrombophlebitis

- Inflammation of a vein with thrombus formation; Homan’s sign may be present
- Local contraindication

Varicose Veins

- Dilated veins from incompetent valves
- Local contraindication if pressure causes pain or if client has a history of blood clots