

## **Component III: Clinical**

### **Module A: Exam Room procedures**

#### **Topic 4: Vital Signs**

##### **Statement of Purpose**

To provide the learner with knowledge and skills concerning the anatomy and physiology, normal parameters, and theoretical and procedural requirements with taking vital signs.

##### **Student Learning Outcomes**

Upon completion of this topic, the learner will be able to:

1. Spell and define the key terms.
2. Identify vital signs and the body functions measured by each.
3. State the normal ranges of temperature, pulse, respiratory rates, and blood pressure in a variety of patients.
4. Explain how the body controls temperature.
5. List factors that cause body temperature to increase or decrease.
6. Identify and describe different types of thermometers.
7. Explain situations when measuring an oral, rectal, temporal artery, tympanic and axillary temperature is indicated and when contraindicated.
8. Explain and demonstrate the procedure for measuring a patient's temperature using the oral, rectal, temporal artery tympanic and axillary methods.
9. Convert temperature readings from degrees Fahrenheit (F) to degrees Centigrade (C) and vice versa.
10. Describe what causes a pulse and why it can be felt; name and locate major pulse points.
11. Describe factors that affect pulse rate.
12. Explain and demonstrate the procedure for measuring a patient's pulse rate.
13. Define pulse deficit, explaining its significance and how it is measured.
14. Describe normal respiration and explain abnormal breathing patterns.
15. Explain and demonstrate the procedure for counting a patient's respirations.
16. Explain and demonstrate the procedure for measuring the patients SpO<sub>2</sub> with pulse oximeter.
17. Explain how the body maintains blood pressure.
18. List the physiological factors reflected by the measurement of blood pressure.
19. Identify the phases of blood pressure, comparing them to the action of the heart.
20. Describe Korotkoff's sounds.
21. Discuss the aneroid, digital and mercury sphygmomanometers.
22. Explain and demonstrate the procedure for measuring a patient's blood pressure.
23. Explain causes of errors in blood pressure readings.
24. Chart all vital signs.
25. Describe ethical and legal obligations to yourself, the physician/employer and the patient.

##### **Terminology**

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|----------------|----------------------|
| 1. Afebrile    | 4. Angiotensin       |
| 2. Aldosterone | 5. Antecubital space |
| 3. Aneroid     | 6. Apex              |

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|--------------------------------|---|
| 7. Apical                      | 34. Idiopathic  |
| 8. Apnea                       | 35. Infrared  |
| 9. Arrhythmia                  | 36. Intermittent  |
| 10. Aural                      | 37. Medulla oblongata                                   |
| 11. Auscultated blood pressure | 38. Meniscus  |
| 12. Axilla (axillary)          | 39. Oral  |
| 13. Baseline                   | 40. Orthostatic   |
| 14. Beats Per Minute (BPM)     | 41. Palpation   |
| 15. Blood pressure             | 42. Pons  |
| 16. Body Mass Index (BMI)      | 43. Popliteal   |
| 17. Brachial artery            | 44. Postural  |
| 18. Calibrate                  | 45. Pulse oximetry                                      |
| 19. Cardiac cycle              | 46. Remittent   |
| 20. Cardiac output             | 47. Renin   |
| 21. Cardinal signs             | 48. Rhythm  |
| 22. Carotid                    | 49. Saturation of peripheral oxygen (SpO <sub>2</sub> ) |
| 23. Celsius (centigrade)       | 50. Sphygmomanometer                                    |
| 24. Diaphoresis                | 51. Stethoscope   |
| 25. Diastolic                  | 52. Sublingual  |
| 26. Fahrenheit                 | 53. Sympathetic nervous system                          |
| 27. Febrile                    | 54. Systole   |
| 28. Femoral                    | 55. Systolic  |
| 29. Groin                      | 56. Temporal artery                                     |
| 30. Hyperpnea                  | 57. Thermometer   |
| 31. Hypertension               | 58. Tympanic  |
| 32. Hyperventilation           | 59. Vital   |
| 33. Hypotension                | 60. Volume  |

## References

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**Websites**

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2. [www.cdc.gov](http://www.cdc.gov)
3. [www.innerbody.comwww.mbc.ca.gov/allied/medical\\_assistants.html](http://www.innerbody.comwww.mbc.ca.gov/allied/medical_assistants.html)
4. [www.jointcommision.org](http://www.jointcommision.org)

Content Outline/Theory Objectives	Suggested Learning Activities
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<p><b>Objective 1</b>  <b>Spell and define key terms.</b></p> <ul style="list-style-type: none"> <li>A. Review the terms listed in the terminology section.</li> <li>B. Spell the listed terms accurately.</li> <li>C. Pronounce the terms correctly.</li> <li>D. Use the terms in their proper context.</li> </ul>	<ul style="list-style-type: none"> <li>A. Games: word searches, crossword puzzles, Family Feud, Jeopardy, bingo, spelling bee, hangman, and concentration.</li> <li>B. Administer vocabulary pre-test and post-test.</li> <li>C. Discuss learning gaps and plan for applying vocabulary.</li> </ul>
<p><b>Objective 2</b>  <b>Identify vital signs and the body functions measured by each.</b></p> <ul style="list-style-type: none"> <li>A. The terms “vital signs” or “cardinal signs” are used by health care personnel to identify the measurement of body functions that are essential to life.</li> <li>B. Five indicators             <ul style="list-style-type: none"> <li>1. Temperature (T)</li> <li>2. Pulse (P)</li> <li>3. Respiration (R)</li> <li>4. Blood pressure (B/P)                 <ul style="list-style-type: none"> <li>a. Commonly known as TPR and B/P.</li> </ul> </li> </ul> </li> <li>C. Additional assessments.</li> <li>D. BMI.</li> <li>E. Pulse oximetry. SpO<sub>2</sub>, the saturation of peripheral oxygen; an indirect measurement of SaO<sub>2</sub>, which describes the amount of oxygen bound to hemoglobin in arterial blood.</li> <li>F. Pain, scale of 1-10.</li> <li>G. Body functions measured             <ul style="list-style-type: none"> <li>1. Temperature is the measurement of the balance between heat lost and heat produced in the body.</li> <li>2. Pulse is measured as the number of times the heart beats per minute (BPM).</li> <li>3. Respiration is measured as the number of times the patient breathes in one minute.</li> <li>4. Blood pressure (arterial blood pressure) is the fluctuating pressure that the blood exerts against the arterial walls as the heart alternately contracts and releases.</li> <li>5. Pulse oximetry is used to measure oxygen saturation of arterial blood.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>A. Lecture/Discussion</li> <li>B. Assigned Readings</li> <li>C. Discuss with students when pulse oximetry is used on admission             <ul style="list-style-type: none"> <li>1. All asthma patients</li> <li>2. Patients with chest pain</li> <li>3. Patients with dyspnea</li> </ul> </li> </ul>
<p><b>Objective 3</b>  <b>State the normal ranges of temperature, pulse, respiratory rates, and blood pressure in a variety of patients.</b></p> <ul style="list-style-type: none"> <li>A. 0-1 year             <ul style="list-style-type: none"> <li>1. Temperature                 <ul style="list-style-type: none"> <li>a. Oral (°F) 96-99.5 (less than 4 weeks)</li> <li>b. Rectal (°F) 99.0-100.0</li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>A. Lecture/Discussion</li> <li>B. Assigned Readings</li> </ul>

<ul style="list-style-type: none"> <li>2. Pulse (BPM) 80-160</li> <li>3. Respiration (per minute) 26-40</li> <li>4. Blood pressure (mmHg) <ul style="list-style-type: none"> <li>a. Systolic 60-96</li> <li>b. Diastolic 30-62</li> </ul> </li> </ul> <p>B. 1 – 6 years</p> <ul style="list-style-type: none"> <li>1. Temperature <ul style="list-style-type: none"> <li>a. Oral (°F) 98.5 – 99.5</li> <li>b. Rectal (°F) 99.0 – 100.0</li> </ul> </li> <li>2. Pulse (BPM) 75 –130</li> <li>3. Respiration (per minute) 20 – 30</li> <li>4. Blood pressure (mmHg) <ul style="list-style-type: none"> <li>a. Systolic 78-112</li> <li>b. Diastolic 50-79</li> </ul> </li> </ul> <p>C. 6 – 11 years</p> <ul style="list-style-type: none"> <li>1. Temperature <ul style="list-style-type: none"> <li>a. Oral (°F) 97.5 – 99.6</li> <li>b. Rectal (°F) 98.5 – 99.6</li> </ul> </li> <li>2. Pulse (BPM) 75 –130</li> <li>3. Respiration (per minute) 18-24</li> <li>4. Blood pressure (mmHg) <ul style="list-style-type: none"> <li>a. Systolic 85-114</li> <li>b. Diastolic 52-79</li> </ul> </li> </ul> <p>D. 11 – 16 years</p> <ul style="list-style-type: none"> <li>1. Temperature <ul style="list-style-type: none"> <li>a. Oral (°F) 97.6 – 99.6</li> <li>b. Rectal (°F) 98.6 – 100.6</li> </ul> </li> <li>2. Pulse (BPM) 55 – 110</li> <li>3. Respiration (per minute) 16 – 24</li> <li>4. Blood pressure (mmHg) <ul style="list-style-type: none"> <li>a. Systolic 94-119</li> <li>b. Diastolic 58-79</li> </ul> </li> </ul> <p>E. Adult</p> <ul style="list-style-type: none"> <li>1. Temperature <ul style="list-style-type: none"> <li>a. Oral (°F) 97.6 – 99.6</li> <li>b. Rectal (°F) 98.6 – 100.6</li> </ul> </li> <li>2. Pulse (BPM) 60 – 100</li> <li>3. Respiration (per minute) 12 – 20</li> <li>4. Blood pressure (mmHg) <ul style="list-style-type: none"> <li>a. Systolic 100-119</li> <li>b. Diastolic 60 – 79</li> </ul> </li> </ul>	
<p><b>Objective 4</b>  <b>Explain how the body controls temperature.</b></p> <ul style="list-style-type: none"> <li>A. Temperature regulating center in the body is located in the hypothalamus of the brain <ul style="list-style-type: none"> <li>1. The hypothalamus acts like a thermostat similar to that in a home; it turns off and on to keep the room temperature at the set number of degrees.</li> </ul> </li> <li>B. Various systems of the body assist to regulate the temperature</li> </ul>	<ul style="list-style-type: none"> <li>A. Lecture/Discussion</li> <li>B. Assigned Readings</li> </ul>

<ol style="list-style-type: none"> <li>1. Brain.</li> <li>2. Autonomic nervous system.</li> <li>3. Blood vessels.</li> <li>4. Skin.</li> </ol> <p>C. Process</p> <ol style="list-style-type: none"> <li>1. Hot and cold peripheral receptors in skin send messages to hypothalamus.</li> <li>2. Temperature receptors in spinal cord, abdomen and other internal organs send messages regarding the body's internal temperature.</li> <li>3. Hypothalamus heat sensitive nerves merge with messages received to evaluate situation and send signals to control heat loss or heat production.</li> <li>4. Mechanisms of heat transfer <ol style="list-style-type: none"> <li>a. Radiation.</li> <li>b. Convection.</li> <li>c. Evaporation.</li> <li>d. Conduction.</li> </ol> </li> </ol>	
<p><b>Objective 5</b>  <b>List factors that cause body temperature to increase or decrease.</b></p> <p>A. Increase</p> <ol style="list-style-type: none"> <li>1. Respiration.</li> <li>2. Muscle activity/exercise.</li> <li>3. Emotional changes/excitement.</li> <li>4. Sexual activities.</li> <li>5. Infectious process.</li> <li>6. Disease process/illness.</li> <li>7. High temperatures in the environment.</li> </ol> <p>B. Decrease</p> <ol style="list-style-type: none"> <li>1. Cold temperature in the environment.</li> <li>2. Time of the day (decreased muscular activity.)</li> <li>3. Starvation or fasting.</li> <li>4. Viral infection.</li> <li>5. Drugs.</li> <li>6. Age.</li> <li>7. Shock.</li> </ol>	<p>A. Lecture/Discussion  B. Assigned Readings</p>
<p><b>Objective 6</b>  <b>Identify and describe different types of thermometers.</b></p> <p>A. Disposable</p> <ol style="list-style-type: none"> <li>1. Single use plastic strips or single use thermometers.</li> <li>2. Not as reliable as glass or electronic.</li> </ol> <p>B. Electronic</p> <ol style="list-style-type: none"> <li>1. Self-contained digital; measures body temperature in 25 to 30 seconds.</li> <li>2. Battery operated.</li> <li>3. Disposable probe covers.</li> <li>4. Blue probe indicates oral.</li> </ol>	<p>A. Lecture/Discussion  B. Assigned Readings</p>

<ul style="list-style-type: none"> <li>5. Red probe indicates rectal.</li> <li>C. Tympanic (infrared/aural) <ul style="list-style-type: none"> <li>1. Reading in less than three seconds.</li> <li>2. Commonly used for children, though there are questions about accuracy in children younger than six years of age.</li> <li>3. Considered a highly reliable form of temperature measurement.</li> </ul> </li> <li>D. Temporal artery thermometer <ul style="list-style-type: none"> <li>1. Infrared scanner used to measure the temperature of the temporal artery in the forehead.</li> </ul> </li> </ul>	
<p><b>Objective 7</b>  <b>Explain situations when measuring an oral, rectal, tympanic and axillary temperature is indicated and when contraindicated.</b></p> <ul style="list-style-type: none"> <li>A. For accurate oral temperature patient must be able to close mouth around thermometer or probe.</li> <li>B. Contraindications to oral measurement <ul style="list-style-type: none"> <li>1. Infants and children under age six.</li> <li>2. Unconscious patients.</li> <li>3. Patients with respiratory complications <ul style="list-style-type: none"> <li>a. Require mouth breathing.</li> <li>b. Require use of oxygen.</li> </ul> </li> <li>4. Confused.</li> <li>5. Disoriented.</li> <li>6. Emotionally unstable.</li> <li>7. Patients with oral injuries.</li> <li>8. Recent oral or nasal surgery.</li> <li>9. Facial paralysis.</li> <li>10. Nasal obstruction.</li> <li>11. Seizure disorder.</li> <li>12. Diseases in the oral cavity.</li> <li>13. If a patient has been recently smoking, chewing gum, eating hot or cold food or fluids.</li> </ul> </li> <li>C. Indications/contraindication to rectal measurement <ul style="list-style-type: none"> <li>1. Core temperature is considered most accurate.</li> <li>2. Indicated for babies and young children not yet able to keep thermometer in place.</li> <li>3. Newborns.</li> <li>4. After certain cardiac surgeries.</li> <li>5. Patients with recent rectal surgery, diarrhea, or disease of the rectum.</li> <li>6. Because insertion of the thermometer may slow the heart rate by stimulating the vagus nerve, check with provider before taking a rectal temperature.</li> </ul> </li> <li>D. Indication/contraindications to axillary measurement <ul style="list-style-type: none"> <li>1. Indicated when oral is contraindicated.</li> <li>2. Evidence demonstrates that with accurate axillary</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>A. Lecture/Discussion</li> <li>B. Assigned Readings</li> </ul>

<p>temperature taking, readings are as accurate as oral or rectal.</p> <ol style="list-style-type: none"> <li>3. Indicated when rectal inconvenient, undesirable, or contraindicated.</li> </ol> <p>E. Indications/contraindication to tympanic measurement</p> <ol style="list-style-type: none"> <li>1. Indicated for instant results.</li> <li>2. Applicable for majority of patient.</li> <li>3. Healthy newborns.</li> <li>4. Incorrect and low readings caused if there is "wax" in the ear.</li> <li>5. Do not use when a person has a sore ear, an ear infection, or if they just had ear surgery.</li> </ol> <p>F. Indications/contraindication to temporal artery thermometer</p> <ol style="list-style-type: none"> <li>1. Records a person's temperature quickly and are easily tolerated.</li> <li>2. Appropriate for infants older than age 3 months and older children.</li> <li>3. New research suggests that a temporal artery thermometer also might provide accurate readings for newborns.</li> <li>4. Temporal artery thermometers may be more expensive than other types of thermometers.</li> </ol>	
<p><b>Objective 8</b>  <b>Explain and demonstrate the procedure for measuring a patient's temperature using oral, rectal, temporal artery, tympanic and axillary methods.</b></p> <p>A. Steps common to all methods with method variation</p> <ol style="list-style-type: none"> <li>1. Wash hands, put on gloves.</li> <li>2. Identify patient.</li> <li>3. Explain procedure.</li> <li>4. Record in patient's chart.</li> </ol> <p>B. Variations</p> <ol style="list-style-type: none"> <li>1. Oral and disposable <ol style="list-style-type: none"> <li>a. Determine if patient has consumed hot or cold drink or smoked.</li> <li>b. If so, wait ten minutes.</li> </ol> </li> <li>2. Rectal <ol style="list-style-type: none"> <li>a. Place a small amount of water-soluble lubricant on tissue/4x4.</li> <li>b. Lubricate the rectal thermometer probe</li> <li>c. Insert thermometer into rectum <ol style="list-style-type: none"> <li>(1) For infants ½"</li> <li>(2) For child 1 inch</li> <li>(3) For adult 1 ½"</li> </ol> </li> <li>d. Hold buttocks together to prevent expulsion of the thermometer.</li> <li>e. Hold in place for 2-3 minutes or until digital thermometer beeps.</li> <li>f. Remove from rectum.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>A. Lecture/Discussion</li> <li>B. Assigned Readings</li> <li>C. Provide learner with procedures for measuring temperature.</li> </ol>

- g. Read results.
  - h. Discard probe cover.
  - i. Remove gloves.
  - j. Wash hands.
  - k. Record on patient chart.
3. Tympanic
- a. Use only a digital tympanic thermometer.
  - b. Place disposable speculum or cover on the thermometer.
  - c. Set the thermometer to start and wait for the ready signal.
  - d. Gently place the probe into the ear canal to seal the area and activate the system.
  - e. Adult pull the ear up and back.
  - f. Child pull ear down and back.
  - g. Wait until temperature is displayed on the screen.
  - h. Remove from ear.
  - i. Discard disposable cover.
  - j. Wash hands.
  - k. Replace thermometer into holder.
  - l. Record temperature on patient chart.
4. Axillary
- a. Expose axillary area.
  - b. Wipe axillary area to remove moisture.
  - c. Place thermometer in axilla and fold arm against chest.
  - d. Hold in place until digital thermometer beeps.
  - e. Remove from arm, remove sheath and dispose.
  - f. Wash hands.
  - g. Record temperature on patient chart.
5. Temporal artery
- a. Remove the cover from the tip of the thermometer and wipe the end with an alcohol wipe to clean it.
  - b. Press the button on the temporal thermometer and hold it while you slide the thermometer straight across the forehead in a line parallel to the eyebrows, halfway between the bottom of the bangs or hairline and the eyebrows. Listen for a beeping sound and look for red light to signal that the thermometer registers a temperature.
  - c. Keep the button pressed and place the tip of the thermometer just behind the earlobe, against the neck. Do this after scanning the forehead if you notice sweat on the brow which could skew the

<p>forehead temperature reading. Release the button and read the temperature on the digital display.</p>	
<p><b>Objective 9</b>  <b>Convert temperature readings from degrees Fahrenheit (F) to degrees Centigrade (C) and vice versa.</b></p> <ul style="list-style-type: none"> <li>A. Most temperatures measured on a thermometer with a Fahrenheit scale</li> <li>B. Some areas/physicians now use a Celsius scale</li> <li>C. To convert Fahrenheit (F) to Celsius (C) <ul style="list-style-type: none"> <li>1. Subtract 32 from the Fahrenheit and then multiply by 5/9</li> <li>2. Formula: <math>(^{\circ}\text{F}-32) \times 5/9 = ^{\circ}\text{C}</math></li> <li>3. Example: <math>101^{\circ}\text{F}-32=69 \times 5/9=38.3^{\circ}\text{C}</math></li> </ul> </li> <li>D. To convert Celsius (C) to Fahrenheit (F) <ul style="list-style-type: none"> <li>1. Multiply the Celsius by 9/5 or 1.8 and then add 32 to the total</li> <li>2. Formula: <math>^{\circ}\text{C} \times 9/5 + 32 = ^{\circ}\text{F}</math></li> <li>3. Example: <math>8.3^{\circ}\text{C} \times 9/5 = 69 + 32 = 101^{\circ}\text{F}</math></li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>A. Lecture/Discussion</li> <li>B. Assigned Readings</li> <li>C. Students to take peer's temperature and convert it to opposite scale used.</li> </ul>
<p><b>Objective 10</b>  <b>Describe what causes pulse and why it can be felt; name and locate major pulse points.</b></p> <ul style="list-style-type: none"> <li>A. Cause <ul style="list-style-type: none"> <li>1. Pulse is a perceptible throbbing sensation as a wave of blood is pumped into the arteries by the contractions of the left ventricle of the heart.</li> <li>2. This wave continues through all the body's arteries, causing the alternating expansion and recoil of the arterial walls.</li> </ul> </li> <li>B. Why it can be felt <ul style="list-style-type: none"> <li>1. Effect can be felt (palpated) in arteries that are close to the body surface and that lie over bone or firm structures.</li> <li>2. When an artery is pressed against the underlying structure, it is possible to feel the rhythmic pulsation.</li> <li>3. Rate, rhythm, and amplitude of peripheral pulses may be assessed by compressing an artery against an underlying bone with the tips of the fingers.</li> <li>4. The thumb should not be used because the thumb has its own pulse and the Medical Assistant will tend to feel his or her own pulse rather than the patient's pulse.</li> </ul> </li> <li>C. Pulse sites <ul style="list-style-type: none"> <li>1. Peripheral pulses.</li> <li>2. Temporal.</li> <li>3. Carotid.</li> <li>4. Brachial.</li> <li>5. Radial.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>A. Lecture/Discussion</li> <li>B. Assigned Readings</li> <li>C. Learner will feel radial pulse during lecture content. <ul style="list-style-type: none"> <li>1. Students will identify the pulse points on peers.</li> <li>2. The students can locate and label the pulse points on a diagram with 100% accuracy.</li> </ul> </li> </ul>

<ul style="list-style-type: none"> <li>6. Femoral.</li> <li>7. Popliteal.</li> <li>8. Posterior tibial.</li> <li>9. Dorsalis pedis.</li> </ul>	
<p><b>Objective 11</b>  <b>Describe factors that affect pulse rate.</b></p> <ul style="list-style-type: none"> <li>A. Exercise or activity <ul style="list-style-type: none"> <li>1. Increases 20 to 30 beats per minute to meet the body's need.</li> <li>2. Should return to normal within three minutes after activity has stopped.</li> </ul> </li> <li>B. Age, the younger the person, the faster the heartbeat.</li> <li>C. Gender, a female's pulse about 10 BPM more rapid than a male of the same age</li> <li>D. Size, a larger person will have a slower rate than a smaller person</li> <li>E. Physical condition, athletes can have a slower pulse rate due to a more efficient circulatory system.</li> <li>F. Stimulated sympathetic nervous system increases heart rate <ul style="list-style-type: none"> <li>1. Feelings of fear.</li> <li>2. Anxiety.</li> <li>3. Pain.</li> <li>4. Anger.</li> </ul> </li> <li>G. Certain conditions increase heart rate <ul style="list-style-type: none"> <li>1. Thyroid disease.</li> <li>2. Anemia.</li> <li>3. Shock/blood volume.</li> <li>4. Fever.</li> </ul> </li> <li>H. Stimulated parasympathetic nervous system causes the rate to be much slower</li> <li>I. Other factors decreasing a pulse rate: <ul style="list-style-type: none"> <li>1. Medications (can also raise pulse rate)</li> <li>2. Heart disease</li> <li>3. Emotional depression</li> <li>4. Drugs/caffeine/nicotine</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>A. Lecture/Discussion</li> <li>B. Assigned Readings</li> <li>C. Pulse exercise (demonstrating how pulse changes with activity) <ul style="list-style-type: none"> <li>1. Have students get into pairs.</li> <li>2. Each takes another student's pulse while they are quietly sitting.</li> <li>3. Record their pulse.</li> <li>4. In turn, run in place for 30 seconds.</li> <li>5. Take pulses again, and note the difference.</li> </ul> </li> </ul>
<p><b>Objective 12</b>  <b>Explain and demonstrate the procedure for measuring a patient's pulse rate.</b></p> <ul style="list-style-type: none"> <li>A. Palpation <ul style="list-style-type: none"> <li>1. Patient should be completely relaxed and sitting comfortably or lying down when the pulse is measured/evaluated.</li> <li>2. Radial and brachial sites should be well supported with the pulse near the level of the heart and never above it <ul style="list-style-type: none"> <li>a. Radial, wrist area coming up from thumb about one inch.</li> <li>b. Brachial, antecubital area coming up from little finger of hand.</li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>A. Lecture/Discussion</li> <li>B. Assigned Reading.</li> <li>C. Students practice taking each other's pulse.</li> </ul>

3. Never use your thumb to measure pulse rate (your own pulse is strong in the thumb and will interfere with the reading).
4. Apply an appropriate amount of pressure to the artery so pulsation can be felt
  - a. Too much pressure eliminates the pulse beat.
  - b. Too little pressure will not compress the artery sufficiently to feel the pulse rate.
  - c. With practice, applying the correct amount of pressure will become routine.
5. Note pulse characteristics while counting
  - a. Volume is the force or strength of the pulse; soft pounding, weak, thready, feeble, strong or full.
  - b. Rhythm, its regularity or the equal spacing of beats vs. irregular spacing.
  - c. Condition of the arterial wall
    - 1) Normally elastic and soft.
    - 2) Hard and rope like can indicate arteriosclerosis.
  - d. Rate
    - 1) Bradycardia, pulse less than 60 BPM.
    - 2) Tachycardia, pulse more than 100 BPM (adult).

B. Auscultation (Apical)

1. Measuring the apical pulse requires listening to the heart at its apex with a stethoscope.
2. Apical pulse is a very accurate method of measuring the heartbeat.
3. To locate the apical pulse find the left midclavicular line and count down to the fifth intercostal space where the stethoscope is placed.
4. The Medical Assistant will hear a “lub dub” signifying both (atrial and ventricular) contraction phases; however it is counted as only one beat.
5. AP is the abbreviation for apical when documenting.
6. The apical pulse is taken for one full minute
7. Wash diaphragm of stethoscope with alcohol between patients to decrease possibility of cross contamination.
8. Place stethoscope diaphragm at apex (bottom or lower edge) of the heart
  - a. Warm diaphragm in palm of one hand before placement.
  - b. Concentrate on rhythm and volume.

<p><b>Objective 13</b>  <b>Define pulse deficit, explaining its significance and how it is measured.</b></p> <p>A. Definition</p> <ol style="list-style-type: none"> <li>1. Certain heart conditions cause a symptom known as pulse deficit.</li> <li>2. A patient with a pulse deficit will have a higher apical than radial pulse rate.</li> <li>3. The difference between the two is called the pulse deficit.</li> </ol> <p>B. Pulse deficit is significant because it indicates that some heart contractions are not strong enough to produce a palpable radial pulse.</p> <p>C. Procedure to measure is called apical-radial pulse</p> <ol style="list-style-type: none"> <li>1. Two people (preferred) <ol style="list-style-type: none"> <li>a. One measures the radial pulse rate.</li> <li>b. Other auscultates the apical pulse with a stethoscope.</li> </ol> </li> <li>2. One person <ol style="list-style-type: none"> <li>a. Take apical pulse first.</li> <li>b. Radial pulse done immediately after.</li> </ol> </li> <li>3. An apical-radial pulse must be taken for a full minute.</li> <li>4. The radial rate is subtracted from the apical; the difference is the pulse deficit.</li> <li>5. Formula: AP-R=pulse deficit.</li> <li>6. Documentation formats used <ol style="list-style-type: none"> <li>a. P.97 (AP)-75 (R) =22 deficit.</li> <li>b. Subtract the radial pulse from the apical pulse to find the apical radial deficit.</li> <li>c. Check with your physician for preferred method of documentation.</li> </ol> </li> </ol>	<p>A. Lecture/Discussion  B. Assigned Readings  C. Have students take apical radial pulse.  D. Discuss the importance of not going beyond the Medical Assistant's scope of practice and the difference between accumulating data and using the data to make decisions.</p>
<p><b>Objective 14</b>  <b>Describe normal respiration and explain abnormal breathing patterns.</b></p> <p>A. Pulmonary Ventilation</p> <ol style="list-style-type: none"> <li>1. Breathing is the movement of air in and out of the lungs.</li> <li>2. Inspiration (or inhalation) is the act of breathing in.</li> <li>3. Expiration (or exhalation) is the act of breathing out.</li> </ol> <p>B. Rate and depth</p> <ol style="list-style-type: none"> <li>1. Can change in response to body demands.</li> <li>2. These changes are brought about by the inhibition of stimulation of the respiratory muscles by the respiratory centers in the medulla oblongata and pons.</li> <li>3. The medulla is the main control center of breathing.</li> </ol>	<p>A. Lecture/Discussion  B. Assigned Readings</p>

<ol style="list-style-type: none"> <li>4. The pons modifies and helps control breathing patterns.</li> <li>5. An increase in carbon dioxide is the most powerful respiratory stimulant, causing an increase in respiratory depth and rate.</li> <li>6. The cerebral cortex of the brain allows voluntary control of breathing, such as when singing or playing a musical instrument.</li> </ol> <p>C. Factors affecting respirations</p> <ol style="list-style-type: none"> <li>1. Exercise.</li> <li>2. Alterations in fluid, electrolyte, and acid-base balances.</li> <li>3. Medications.</li> <li>4. Trauma.</li> <li>5. Infection.</li> <li>6. Pain and anxiety.</li> </ol> <p>D. Respiratory Rate</p> <ol style="list-style-type: none"> <li>1. Under normal conditions, healthy adults and children breathe about 16-20 times each minute (eupnea).</li> <li>2. Infants and younger children breathe more rapidly.</li> <li>3. The respiratory rate increases (tachypnea) in response to the increased metabolic rate during pyrexia. Cells require more oxygen at this time and have more carbon dioxide that must be removed.</li> <li>4. The rate increases as much as 4 breaths/minute with every 0.6 degree Centigrade (one degree Fahrenheit) that the temperature rises above normal.</li> <li>5. Any condition causing an increase in carbon dioxide and a decrease in oxygen in the blood also tends to increase the rate and depth of respirations.</li> <li>6. Some conditions characteristically result in slow breathing (bradypnea)             <ol style="list-style-type: none"> <li>a. Increase in intracranial pressure.</li> <li>b. Narcotic medication such as morphine or meperidine (Demerol).</li> </ol> </li> </ol>	
<p><b>Objective 15</b>  <b>Explain and demonstrate the procedure for counting a patients' respirations.</b></p> <p>A. With fingers still in place after counting the pulse rate, the Medical Assistant counts the patient's respiratory rate</p> <ol style="list-style-type: none"> <li>1. Note the rise and fall of the patient's chest.</li> <li>2. Using a watch with a second hand, count the number of respirations for a minimum of 30 seconds. Multiply this number by two for the respiratory rate.</li> </ol>	<ol style="list-style-type: none"> <li>A. Lecture/Discussion</li> <li>B. Assigned Readings</li> <li>C. Ask students to discuss the rationale behind each step for counting a patient's respirations.</li> </ol>

<ol style="list-style-type: none"> <li>3. If respirations are abnormal in any way, count the respirations for at least one full minute.</li> </ol> <p>B. Documentation</p> <ol style="list-style-type: none"> <li>1. Document respiratory rate on paper, the flow sheet, or the computerized record.</li> <li>2. Report any abnormal findings.</li> </ol>	
<p><b>Objective 16</b>  <b>Explain and demonstrate the procedure for measuring the patients SpO<sub>2</sub> with pulse oximeter.</b></p> <ol style="list-style-type: none"> <li>A. Explain the procedure.</li> <li>B. Wash hands.</li> <li>C. Clean the sensor with an alcohol wipe.</li> <li>D. Locate the power button and turn the pulse oximeter on.</li> <li>E. Place a finger, preferably the index finger, inside the finger pulse oximeter.</li> <li>F. Read the display, the pulse and the SpO<sub>2</sub>.</li> <li>G. Concerns             <ol style="list-style-type: none"> <li>1. Make sure that the person's finger is free of nail polish since it can prevent the oximeter from getting a reading.</li> <li>2. Make sure that the person's finger is not too cold, as the pulse oximeter will not be able to obtain a reading.</li> </ol> </li> <li>H. Document SpO<sub>2</sub> on paper, the flow sheet, or the computerized record. Report any abnormal findings.</li> <li>I. Wash your hands.</li> </ol>	<ol style="list-style-type: none"> <li>A. Lecture/Discussion</li> <li>B. Assigned Readings</li> <li>C. Ask students to discuss the rationale behind each step for measuring the patients SpO<sub>2</sub>.</li> </ol>
<p><b>Objective 17</b>  <b>Explain how the body maintains blood pressure.</b></p> <ol style="list-style-type: none"> <li>A. The pulse and blood pressure are indicators of cardiovascular status.</li> <li>B. Volume is the amount of blood in the arteries.</li> <li>C. Peripheral resistance of blood vessels is the relationship of the lumen or diameter of the vessel and the amount of blood flowing through.</li> <li>D. Vessel elasticity is the ability of blood vessels to expand and contract to supply the body with a steady flow of blood</li> <li>E. Hormonal control.</li> <li>F. Angiotensin constricts the arterioles and signals the adrenal to discharge more aldosterone.</li> <li>G. Aldosterone will influence the kidneys and sweat glands to preserve sodium.</li> <li>H. Renin, sympathetic nervous system will produce renin when the body is under the influence of stress.</li> </ol>	<ol style="list-style-type: none"> <li>A. Lecture/Discussion</li> <li>B. Assigned Readings</li> </ol>
<p><b>Objective 18</b>  <b>List the physiological factors reflected by the measurement of blood pressure.</b></p> <ol style="list-style-type: none"> <li>A. When the cardiac output of the heart increases, the arteries distend more, resulting in increased blood pressure.</li> </ol>	<ol style="list-style-type: none"> <li>A. Lecture/Discussion</li> <li>B. Assigned Readings</li> </ol>

<ul style="list-style-type: none"> <li>B. When cardiac output is decreased, blood pressure falls.</li> <li>C. A weak pumping action results in a lower blood pressure than a strong pumping action.</li> <li>D. Blood leaving the heart circulates through a continuous loop of blood vessels consisting of arteries, arterioles, capillaries, venules and veins.</li> <li>E. Arterioles <ul style="list-style-type: none"> <li>1. Very small elastic tubes.</li> <li>2. Able to contract or dilate to regulate the distribution of blood to various organs, tissues or cells, depending on their moment by moment requirements.</li> <li>3. Normally, arterioles are in a state of partial contraction, resulting in peripheral resistance and creating a relatively constant level of restraint to blood flow.</li> </ul> </li> </ul>	
<p><b>Objective 19</b>  <b>Identify the phases of blood pressure, comparing them to the action of the heart.</b></p> <ul style="list-style-type: none"> <li>A. Blood pressure refers to the force of the blood against arterial walls.</li> <li>B. Maximum blood pressure is exerted on the walls of the arteries when the left ventricle of the heart pulses blood through the aortic valve into the aorta during systole.</li> <li>C. The highest pressure is called systolic pressure.</li> <li>D. The lowest pressure present on the arterial walls at the time is called diastolic pressure; this is when the heart rests between beats.</li> <li>E. The difference between the systolic and diastolic pressure is called the pulse pressure.</li> <li>F. Blood pressure is measured in millimeters of mercury (mm Hg) and is recorded as a fraction <ul style="list-style-type: none"> <li>1. The numerator is the systolic pressure.</li> <li>2. The denominator is the diastolic pressure.</li> <li>3. If the blood pressure is 120/80 mm Hg the systolic pressure is 120, the diastolic pressure is 80 and the pulse pressure is 40.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>A. Lecture/Discussion</li> <li>B. Assigned Readings</li> </ul>
<p><b>Objective 20</b>  <b>Describe Korotkoff's sounds.</b></p> <ul style="list-style-type: none"> <li>A. Korotkoff's sounds are the sounds that medical personnel listen for when taking a blood pressure.</li> <li>B. Korotkoff's sounds are classified into five phases <ul style="list-style-type: none"> <li>1. Phase 1, the first sound heard, which should be a sharp tapping sound, systolic number.</li> <li>2. Phase 2, a swishing sound that is made as the cuff continues to deflate and more blood enters the artery.</li> <li>3. Phase 3, distinct tapping sounds that are heard as the pressure is released in the blood pressure cuff.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>A. Lecture/Discussion</li> <li>B. Assigned Readings</li> </ul>

<ol style="list-style-type: none"> <li>4. Phase 4, the point at which the distinct tapping sounds disappear and usually where the diastolic number is read.</li> <li>5. Phase 5, the point where the sound disappears completely.</li> </ol>	
<p><b>Objective 21</b>  <b>Discuss the aneroid, digital and mercury sphygmomanometers.</b></p> <ol style="list-style-type: none"> <li>A. The sphygmomanometer is designed to monitor blood pressure             <ol style="list-style-type: none"> <li>1. Aneroid sphygmomanometers (with a dial) are in common use; they require regular calibration checks                 <ol style="list-style-type: none"> <li>a. Aneroid sphygmomanometers are considered safer than mercury based ones, although less accurate.</li> <li>b. A major cause of departure from calibration is mechanical jarring. Aneroids mounted on walls or stands are less susceptible to this particular problem.</li> <li>c. There is a data displayed on an easy-to-read gauge that will function in any position.</li> </ol> </li> <li>2. Digital sphygmomanometer use oscillometric measurements and electronic calculation rather than auscultation                 <ol style="list-style-type: none"> <li>a. They may use manual or automatic inflation. These are electronic, easy to operate without training and can be used in noisy environments.</li> <li>b. Digital instruments may use a cuff placed around the upper arm, the wrist, or a finger (in order of accuracy and inverse order of portability and convenience.)</li> </ol> </li> <li>3. Mercury sphygmomanometers should no longer be used.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>A. Lecture/Discussion</li> <li>B. Assigned Readings</li> </ol>
<ol style="list-style-type: none"> <li>7. Have patient assume a comfortable position lying or sitting with the forearm supported at the level of the heart and the palm of the hand upward. If sitting, feet should be on the floor.</li> <li>8. Expose the area of the brachial artery by removing garments, or move a sleeve (if it is not too tight) above the area where the cuff will be placed.</li> <li>9. Locate the brachial artery.</li> <li>10. Center the bladder of the cuff over the brachial artery, above the midway on the arm so that the lower edge of the cuff is about 2.5-5cm (1-2 inches) above the inner aspect of the elbow (antecubital space). The tubing should extend</li> </ol>	<ol style="list-style-type: none"> <li>A. Lecture/Discussion</li> <li>B. Assigned Readings</li> <li>C. Practice taking blood pressure.</li> </ol>

<p>from the edge of the cuff nearer the patient's elbow.</p> <ol style="list-style-type: none"> <li>11. Wrap the cuff around the arm smoothly and snugly.</li> <li>12. Fasten it securely or tuck the end of the cuff well under the preceding wrapping. Do not allow any clothing to interfere with the proper placement of the cuff.</li> <li>13. If an aneroid gauge is used, the needle should be calibrated within the zero mark.</li> <li>14. Palpate the pulse at the brachial or radial artery by pressing gently with the fingertips.</li> <li>15. Tighten the screw valve on the air pump.</li> <li>16. Inflate the cuff while continuing to palpate the artery. Note the point on the gauge where the pulse disappears; inflate 10-15 mm hg higher.</li> <li>17. Deflate the cuff and wait 15 seconds.</li> <li>18. Assume a position that is no more than three feet away from the gauge.</li> <li>19. Place the stethoscope earpieces in the ears. Direct the ear tips forward into the canal and not against the ear itself.</li> <li>20. Place the bell or diaphragm of the stethoscope firmly but with as little pressure as possible over the brachial artery. Do not allow the stethoscope to touch clothing or the cuff.</li> <li>21. Pump the pressure 30mm Hg above the point at which the systolic pressure was palpated and estimated. Open the valve on the manometer and allow air to escape slowly (allowing the gauge to drop 2-3 mm per heartbeat).</li> <li>22. Note the point on the gauge at which there is an appearance of the first faint, but clear, sound that slowly increases in intensity. Note this number as the systolic pressure.</li> <li>23. Read the pressure to the closest even number.</li> <li>24. Do not re-inflate the cuff once the air is being released to recheck the systolic pressure reading.</li> <li>25. Note the pressure at which the sound first becomes muffled. Also, observe the point at which the sound completely disappears. These may occur separately or at the same point.</li> <li>26. Allow the remaining air to escape quickly.</li> <li>27. Repeat any suspicious reading but wait 30 to 60 seconds between readings to allow normal circulation to return in the limb.</li> <li>28. Be sure to deflate the cuff completely between attempts to check the blood pressure.</li> <li>29. Remove the cuff, clean and store the equipment properly.</li> </ol>	
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<p>30. Wash your hands. 31. Record readings and report any unusual findings.</p> <p>B. Automated blood pressure</p> <ol style="list-style-type: none"> <li>1. Use steps 1-10 above.</li> <li>2. Reset equipment before beginning to avoid any pre-set inflation parameters.</li> <li>3. Record readings.</li> <li>4. Wash your hands.</li> <li>5. Record readings and report any unusual findings.</li> </ol>	
<p><b>Objective 23</b> <b>Explain causes of errors in blood pressure readings.</b></p> <p>A. Taking blood pressure</p> <ol style="list-style-type: none"> <li>1. Over clothing.</li> <li>2. Patient's legs are crossed.</li> <li>3. Re-inflating the cuff before allowing blood to normalize (usually sooner than 30 seconds).</li> <li>4. Wrong size cuff.</li> <li>5. Cuff wrinkled and is not on the arm correctly.</li> <li>6. After exercise or the patient is emotionally upset.</li> </ol> <p>B. Cuff is in the way of the stethoscope.</p> <p>C. Cuff placed upside down.</p> <p>D. Improper placing of stethoscope ear pieces into ear.</p> <p>E. Hearing deficit.</p> <p>F. Noise in environment.</p> <p>G. Using cracked or kinked tubing.</p> <p>H. Releasing the valve rapidly.</p> <p>I. Not placing the diaphragm over the artery.</p> <p>J. Failing to pump the cuff 20-30 mm above the disappearance of the pulse.</p> <p>K. Failure to recognize auscultation gap in hypertensive patients</p> <ol style="list-style-type: none"> <li>1. Temporary sensation of sound occurring after first systolic sound.</li> <li>2. If not recognized, it leads to serious underestimations of systolic pressure.</li> </ol> <p>L. Failure to reset automated devices between patients.</p>	<p>A. Lecture/Discussion B. Assigned Readings C. Discuss with class the contributing cause of each blood pressure reading error.</p>
<p><b>Objective 24</b> <b>Chart all vital signs.</b></p> <p>A. Use forms specific to facility B. Follow guidelines for documentation from facility</p>	<p>A. Lecture/Discussion B. Assigned Readings C. Provide each student with progress notes and have them document the temperature, pulse, respirations, and blood pressures they take.</p>
<p><b>Objective 25</b> <b>Describe ethical and legal obligations to yourself, the physician/employer, and the patient.</b></p> <p>A. Be prepared and assure one's competence. B. Supporting good patient care by being culturally competent, demonstrating good work ethic, and</p>	<p>A. Lecture/Discussion B. Assigned Readings</p>

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