CHAPTER 24 VITAL SIGNS AND MEASUREMENTS

Overview

Medical assisting students learn the theory and practice of taking vital signs, which will be one of the most important responsibilities in their careers as medical assistants. They must understand the reasons why vital signs are important, know the clues to disease that these measurements can provide, follow Standard Precautions, and be comfortable with all the required equipment and procedures. They must also have the ability to explain vital sign procedures for temperature, pulse rate, respiration, and blood pressure readings to patients. Possessing knowledge of normal vital sign expectations for patients across the life span will help medical assistants perform the procedures with efficiency and accuracy, recognizing both inaccurate readings and also abnormal readings and measurements that may signal patient illness. As always, the medical assistant must act to ensure patient safety and comfort.

Lesson Plan

I. LEARNING OUTCOMES		ABHES	CAAHEP
А.	Define, spell, and pronounce the key terms as presented in the glossary.		
В.	Discuss normal and abnormal temperatures, including factors affecting temperature.	MA.A.1.2.c	I.C.5
C.	Identify and explain the procedures for using, caring for, and storing the various types of thermometers.		
D.	Discuss the Environmental Protection Agency's initiative to phase out mercury thermometers and other mercury-containing equipment.		XI.C.3
E.	Describe the locations and procedure for obtaining pulse rates.	MA.A.1.9.c	I.P.1
F.	Explain the procedure for obtaining respiration rates.	MA.A.1.9.c	I.P.1
G.	Identify and describe normal and abnormal pulse and respiratory rates and the factors affecting each.	MA.A.1.2.c	I.C.5
Н.	Describe the appropriate equipment and procedure for obtaining a blood pressure measurement.	MA.A.1.9.c	I.P.1
I.	Identify normal and abnormal blood pressure, including factors affecting blood pressure.	MA.A.1.2.c;	I.C.5-6;
J.	Describe the procedures for obtaining height, weight, and chest measurements of adults.	MA.A.1.9.c	I.P.1
К.	Accurately record measurements on the patient's chart or electronic medical record.	MA.A.4.a MA.A.8.b;	IV.P.8
L.	Explain two reasons why a professional individual shows responsibility by learning about the dangers of mercury.		XI.C.9
М.	Analyze the professionalism questions and apply them to this chapter's content.		

- **II. PROFESSIONALISM QUESTIONS**
 - A. Communication
 - 1. Did you introduce yourself? Did you identify the patient through name and birth date or other identifying feature?
 - 2. Did you listen to and acknowledge the patient?
 - 3. Did you speak at the patient's level of understanding?
 - 4. Did you provide appropriate responses/feedback?
 - 5. Did you allay patients' fears regarding the procedure being performed and help them feel safe and comfortable?
 - 6. Did you accurately and concisely update the provider on any aspect of the patient's care?
 - B. Presentation
 - 1. Did you attend to any special needs of the patient? Did you first ask if assistance was needed, rather than taking charge?
 - 2. Were you courteous, patient, and respectful to the patient?
 - 3. Did you display a calm, professional, and caring manner?
 - C. Competency
 - 1. Did you pay attention to detail?
 - 2. Did you ask questions if you were out of your comfort zone or did not have the experience to carry out tasks?
 - 3. Did you recognize the importance of local, state, and federal legislation and regulations in the practice setting?
 - D. Integrity
 - 1. Did you protect personal boundaries?
 - 2. Did you protect and maintain confidentiality?
 - 3. Did you immediately report any error you had made?

III. REFERENCES

- A. Lindh, Wilburta Q., Pooler, Marilyn S., Tamparo, Carol D., Dahl, Barbara M., & Morris, Julie A., Delmar's Comprehensive Medical Assisting: Administrative and Clinical Competencies, 5e
- B. See text Chapter 24, References/Bibliography
- C. Any other teacher-preferred reference material
- IV. VISUAL AIDS
 - A. Computer access to identified Internet resources
 - B. Copy of a height/weight chart
 - C. Sample patient chart
 - D. Copy of graphic recording sheet for patient chart
 - E. Any other teacher-preferred visual aids (PowerPoint, etc.)
- V. EQUIPMENT AND MATERIALS
 - A. Computer, TV monitor, and Internet access
 - B. Disposable (with plastic probe cover) temporal artery and tympanic thermometers
 - C. Single- and dual-head stethoscopes
 - D. Watch with a second hand
 - E. Mercury and aneroid sphygmomanometers
 - F. Blood pressure cuffs of various sizes
 - G. Balance beam and digital scale with measuring bar
 - H. Materials/supplies for sanitization/disinfection per OSHA standards
 - I. See IV: Visual Aids
- VI. SAFETY
 - A. Basic classroom procedures
 - B. Follow Standard Precautions
 - C. Patient should be seated while vital signs are being taken

VII. PREPARATION

- A. Arrange for visual aids equipment.
- B. Collect materials.
- C. Review Chapter 24 in the text, the Study Guide, the Competency Manual, and the Instructor's Manual.
- D. Assemble items for demonstrations of procedures.

VIII. INTRODUCTORY REMARKS/ACTIONS

- A. Read the learning outcomes in the text with students to introduce the chapter.
- B. Say, "You've probably had your vital signs taken many times. What you may not realize is that the procedure is very important because these signs indicate the general health and well-being of the patient and may measure patient response to treatment. Today, you'll learn about the TPR and BP and how to measure them."

IX. PRESENTATION

- A. The Importance of Accuracy (while taking vital signs)
 - 1. Vital signs may be altered by many factors: anxiety, anger, stress, and food intake (discuss the information in the Critical Thinking box)
 - 2. Baseline shows patient's overall well-being, and a deviation from the baseline may indicate illness
 - 3. Treatment plans are developed using vital sign measurements (discuss the information in the Critical Thinking box)
 - 4. Concentrate and attend to procedures
- B. Temperature
 - 1. Heat production and heat loss maintain and regulate (by brain) body temperature
 - 2. Body heat produced by actions of voluntary and involuntary muscles (produces energy)
 - 3. Cellular metabolic activities produce heat
 - 4. Body loses heat through five processes: convection, conduction, radiation, evaporation, and elimination
 - 5. The hypothalamus in the brain monitors blood temperature and triggers heat loss or production
 - 6. Body temperature measured in degrees
 - 7. Body temperature influenced by several factors (listed in the text)
 - 8. There is no "normal" temperature
 - 9. Average temperature for an adult is 98.6°F, or 37.0°C
 - 10. Types of fevers: continuous, remittent, intermittent, and relapsing
 - 11. Fevers may indicate an infection
 - 12. Types of thermometers: glass, disposable, digital, tympanic, and temporal artery
 - 13. Recording temperature:
 - a. Label as "F" for Fahrenheit or "C" for Celsius
 - b. Label if taken by methods other than oral:
 - (1) "R" for rectal
 - (2) "A" for axillary
 - (3) "Tym" for tympanic
 - (4) "TA" for temporal artery
 - 14. Measuring temperature (see Procedures 24-1 through 24-6 in the text)
 - a. Oral
 - b. Aural
 - c. Rectal
 - d. Axillary
 - 15. Cleaning and storage of thermometers
 - a. Always separate oral and rectal thermometers
 - b. Rinse immediately after use, cleanse in mild soap and cool water solution, rinse, dry, then submerge in disinfectant solution for 30 minutes
 - c. Label storage containers
 - d. Clean digital, temporal artery, and tympanic thermometers according to manufacturer's directions
 - e. Disinfect thermometers
- C. Pulse
 - 1. Pulse rate consists of two phases of the heart action
 - 2. Felt when compressing an artery
 - 3. Pulse and heartbeat rate should be same
 - 4. Pulse sites
 - a. Radial—most commonly used site for obtaining pulse rate
 - b. Carotid-used during emergency and CPR procedures
 - c. Temporal—rarely used
 - d. Brachial-most commonly used for blood pressure measurements

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- e. Femoral-deep in groin; compress firmly to feel
- f. Popliteal-used to monitor circulation in leg
- g. Dorsalis pedis-used to monitor lower limb circulation, especially feet
- h. Apical-apex of heart; stethoscope needed
- i. Posterior tibial—found on the medial side of the ankle, posterior to the ankle bone
- 5. Measuring a pulse (see Procedures 24-7 and 24-8 in the text)
 - a. Note rate, rhythm, volume of pulse, and condition of the arterial wall
 - b. Rate is the number of beats felt for 1 minute
 - c. Pulse rates vary according to age, activities, general health, gender, emotions, pain, and medications
 - d. Arrhythmias may or may not indicate heart disease
- 6. Normal pulse rates
- 7. Pulse abnormalities
 - a. May be in the rate, rhythm, and feel of the arterial wall
 - b. Bradycardia—pulse rate less than 60 beats per minute
 - c. Tachycardia—pulse rate greater than 100 beats per minute
 - d. Premature ventricular contraction (PVC)-pulsation felt before expected
 - e. Sinus arrhythmia-variation of rhythm sometimes during respiration
 - f. Note, record, and alert provider to any abnormalities in any vital signs
- 8. Recording pulse rates
 - a. Record after temperature
 - b. Report any unusual findings to the provider
- D. Respiration
 - 1. Rate, rhythm, and depth of respiration are noted when taking respiratory rate or measuring respiration
 - 2. Respirations vary with age, activities, illness, emotions, and drugs
 - 3. Normal respiration rate is a 1:4 ratio to the pulse rate
 - 4. Rhythm varies with age and is altered by laughing and sighing
 - 5. See normal respiratory rates chart in the text
 - 6. Depth noted by watching degree of rise and fall of the chest wall when taking respiration rate
 - 7. Measuring respiration rate (see Procedure 24-9 in the text)
 - 8. Abnormalities
 - a. Apnea
 - b. Cheyne-Stokes
 - c. Tachypnea
 - d. Bradypnea
 - e. Orthopnea
 - f. Hypoventilation
 - g. Hyperpnea
 - h. Hyperventilation
 - 9. Breath sounds can indicate respiratory problems
 - a. Rales and rhonchi
 - b. Wheezes
 - c. Stridor
 - d. Stertorous
- E. Blood Pressure
 - 1. Components
 - a. Systole-the force exerted on the arterial walls during cardiac contraction
 - b. Diastole-the force exerted during cardiac relaxation
 - 2. Recorded as a fraction: systole/diastole
 - 3. Factors that affect blood pressure:
 - a. Blood volume—increased volume increases blood pressure; decrease in volume decreases blood pressure, as in hemorrhage or loss of body fluids
 - b. Peripheral resistance—the smaller the lumen, the more pressure needed to push blood through; accumulation of cholesterol can affect size of lumen
 - c. Vessel elasticity-age reduces elasticity
 - d. Condition of heart muscle-strong heart muscle results in efficient blood flow

- 4. Equipment for measuring blood pressure
 - a. Auscultatory (listening) method uses a sphygmomanometer and stethoscope
 - b. Types of sphygmomanometers
 - (1) Mercury manometer—cuff contains a rubber bladder attached by rubber tubing to a glass column of mercury; most accurate but not as portable; contains mercury
 - (2) Aneroid manometer—cuff contains a rubber bladder attached to dial; should be calibrated regularly; not as accurate but is portable; no mercury
 - (3) Digital—no stethoscope needed; easily read on screen; fragile mechanism
 - c. Cuff sizes vary; choose appropriate size to obtain accurate measurement
- 5. Measuring blood pressure (see Procedure 24-10 in the text)
 - a. Korotkoff sounds are heard during blood pressure measurement
 - b. Phases of Korotkoff sounds
 - (1) Phase I—first sound is the systolic reading
 - (2) Phase II—more blood passes through the vessels
 - (3) Phase III—rhythmic tapping sound; cuff is deflated
 - (4) Phase IV—may be used to record diastolic pressure in children and those patients where a tapping sound is heard to zero
 - (5) Phase V—blood flowing freely; sounds disappear; recorded as diastolic pressure
 - c. Palpatory method
 - (1) Step one—establishes the peak inflation level; performed by placing cuff on patient, palpating radial pulse, and inflating cuff until radial pulse can no longer be felt; record number where radial pulse disappears
 - (2) Step two—deflate cuff and allow arm to rest a minute or two; calculate peak inflation level by taking that number and adding 30 mmHg
 - d. Auscultatory gap
 - (1) In some patients all sounds disappear between Phases I and II or III
 - e. Errors in blood pressure measurement procedures
- 6. Recording blood pressure measurement
- 7. Normal blood pressure readings (see chart in the text)
- 8. Blood pressure abnormalities
 - a. Hypertension 140/90 (Case Study 24-2)
 - (1) Primary or essential—most commonly seen form; no apparent cause or cure; treatable
 - (2) Secondary—result of underlying problem; treatable by curing underlying problem
 - (3) Benign—slow progression
 - (4) Malignant—fast progression; severe damage to cardiovascular system, possibly to point of death
 - b. Hypotension
 - (1) Usually below 90/60
 - (2) Result of various shock-like conditions
 - (3) Treatment of underlying problem usually cures
 - (4) Orthostatic hypotension occurs when blood pressure has momentarily dropped; patient can experience vertigo/blurred vision when arising suddenly from lying flat or sitting for a long period of time
- F. Height and Weight
 - 1. Not considered vital signs
 - 2. Many providers prefer height and weight measurements as part of yearly physical
 - 3. Height measured with a measuring bar (see Procedure 24-11 in the text)
 - 4. Weight measured on a calibrated balance beam scale or digital scale (see Procedure 24-12 in the text)
 - 5. Significance of weight
 - a. Provides insight into metabolic, nutritional, and emotional problems (see Case Study 24-1)
 - b. See the text for desirable weights chart
- G. Measuring Chest Circumference
 - 1. Take one measurement on deepest inspiration and one on deepest expiration and compare
 - 2. Measure at disrobed patient's nipple level
 - 3. Record measurements for provider to make comparison

- X. APPLICATION
 - A. Use the Learning Outcomes at the beginning of Chapter 24 in the text as the basis for questions to assess comprehension.
 - B. See the Classroom Activities section below for numerous application activities.
 - C. Assign students to complete Chapter 24 in the Study Guide.
 - D. Complete the Procedures in Chapter 24, using the Competency Manual to evaluate.
 - E. Allow for ample lab time for students to practice vital sign activities.
- XI. EVALUATION
 - A. Evaluate any assigned application activities.
 - B. Grade responses to Chapter 24 in the Study Guide.
 - C. Evaluate student performance on Chapter 24 Procedures.
 - D. Assign credit for group participation activities.

Classroom Activities

- 1. Prepare thermometers to be cleaned. Cover them with sticky material such as lubricant, egg white, or peanut butter. Assign students to clean them. Have low solution level in storage container.
- 2. Assign students to practice taking oral and axillary temperatures on each other. Rectal temperatures can be practiced on a mannequin. Remember: Temperatures do not register with a mannequin; you may want to preset a reading.
- 3. Practice recording temperatures. Make a list of temperatures to read to the students to practice recording. Include some of the ones usually confused, such as 98.0, 98.8, 100.2, 102.0, 100.4, and 104.0. Read using either the word "tenth" or "point" as preferred.
- 4. Have students locate the five pulse points on a partner.
- 5. Develop an assignment sheet to practice measuring and recording pulse rates after various activities. The roles should be reversed after completing the assignment. An example follows:

The Effect of Exercise on the Pulse Rate

Complete the following exercise with a classmate. Write the name of your "patient" and the results in the spaces provided on the worksheet.

А.	With the patient in a sitting position, measure and record the pulse rate.
B.	Have the patient lie down and rest for 2 minutes concentrating on slowing the
	heart rate. Measure and record the pulse.
С.	Have the patient stand up, and immediately measure and record the pulse rate.
D.	Have the patient bend and touch the toes 20 times. Immediately measure and
	record the pulse rate.
E.	Have the patient sit in a chair. Measure and record the pulse after 1 minute.
F.	Measure and record the pulse after 2 minutes.
Ans	swer the following questions regarding your findings:
	• What was the initial pulse rate?

- How many fewer beats per minute were counted after the 2-minute rest?
- What effect did standing have on the pulse rate?
- How many beats per minute did the pulse increase after the exercise?
- How long did it take the heart to return to normal?
- Another activity that could be included on the assignment sheet is running in place for 1 minute. (*NOTE:* If a student is discovered to have an irregular rhythm or abnormal finding, be certain a medical evaluation is obtained.)
- 6. Assign students to measure and record respirations. The suggestions listed for pulse practice can be used for respirations as well. It would be advisable to measure both vital signs when practicing. Remember, the number of respirations per minute does not fluctuate as markedly as heart beats because the ratio is approximately 1:4.
- 7. Attempt to demonstrate different respiration patterns such as hyperventilation, gasping, apnea, and Cheyne-Stokes respiration.
- 8. Have students examine the blood pressure equipment thoroughly. Point out the various sections, including the tubing connections, bulb valve directions, cuff construction, cuff measurement technique, and the bladder section. Study the mercury column and the aneroid dial with its digital screen to become familiar with the calibrations.

- 9. Assign students to practice measuring and recording blood pressure. You might divide them into groups of six or eight, with half assuming the patient role. Have the other half, the "medical assistants," measure and record the blood pressure of each patient. The results should be compared. If any measurement is significantly different, it should be repeated.
- 10. If you have different sizes of cuffs, have the students try using one too small and one too large to determine the difference in blood pressure readings when compared with the proper size.

Answers to Critical Thinking Boxes

Discuss the normal vital sign differences expected between an infant and an adult. Why do they occur?

There are differences in all of the vital signs between an infant and an adult because of the difference in body size. Because infants are smaller and weigh less, they have smaller cardiovascular and pulmonary systems. A smaller heart pumps faster, and the infant's pulse and heart rates are higher than those of an adult. Respirations are greater in number in an infant because the lungs are smaller, and more respirations per minute are needed to sustain life.

Discuss the methods the medical assistant may use to obtain patient cooperation when taking vital signs. Describe and demonstrate the appropriate charting procedure for normal vital sign results.

It is important for a medical assistant to establish trust with patients in order to gain their cooperation when taking vital signs. A careful explanation of why vital signs are taken that is geared to patient's level of understanding is always important. Warmth, friendliness, and being genuine will also help gain cooperation. The appropriate charting procedure for vital signs is: 4/19/XX, 2:00 p.m., T98°F, P68, R12, BP 118/72. J. Guerra, CMA (AAMA).

Answers to Case Studies

Case Study 24-1

Refer to the scenario at the beginning of the chapter.

- 1. There are three different kinds of sphygmomanometers. Give advantages and disadvantages of each.
- Mercury—being phased out due to the possibility of mercury poisoning. Medical facilities are phasing out mercury sphygmomanometers in agreement with the Environmental Protection Agency (EPA). This type of sphygmomanometer is the most accurate, but if the mercury escapes when the column is broken, it contaminates the environment. It can cause a mercury vapor in the indoor air and can cause a serious health problem or even death.
- <u>Aneroid—more portable than mercury, with no danger of a mercury spill. Less accurate than mercury and</u> <u>loses calibration readily, hence must be calibrated regularly. Can be easily damaged.</u>
- Digital—portable, no stethoscope needed. Readings appear on the screen, are easily read, and are accurate. Some disadvantages include complexity, fragile mechanism, need to be checked for accuracy at regular intervals, accuracy easily influenced by body movements, significant expense, and need to place the cuff and position the arm carefully.
- 2. When you weigh Mrs. Williams, you notice from her record that she has lost 10 pounds in 6 months. What questions will you ask her about her weight loss?

Ask Mrs. Williams if she has been intentionally cutting back on her food intake or whether she has lost her appetite. Also determine if she has been ill within the last six months, and if so, the nature of her illness. Has she seen any other providers? It might be helpful to ask Mrs. Williams if she knows why she has lost weight.

3. Height and weight measurements are important for many reasons. What do you consider the most important of the many reasons? What do you consider the least important reason? Why?

From infancy to adulthood the measurements show whether an individual is growing taller and gaining weight at an average rate, as would be expected in healthy individuals. Failure to grow and not gain weight as expected for one's age group can signal illness or disease. Growing in height and gaining weight at a greater than average pace can also signal illness or disease. The most important reason to measure height and weight is in order for the provider to be aware of any changes in either measurement, because it could signify the possibility of an illness or disease.

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Case Study 24-2

Herb Fowler, a regular patient of Dr. Lewis at the medical facility of Drs. Lewis and King, is an African American in his 50s. He has smoked for many years and only recently has thought about quitting smoking because of a chronic cough. Herb is significantly overweight but is having a hard time making the decision to give up smoking *and* change his diet. Although his blood pressure has been stable for the last few years, Audrey Jones, CMA (AAMA), is concerned when she takes Herb's vital signs during his most recent checkup. His weight is slightly up, and his blood pressure has jumped from 140/90 to 156/100.

1. Is a blood pressure reading of 156/100 a cause for concern? Should Audrey take a second reading?

A normal blood pressure reading for adults would have a systolic reading below 140 and a diastolic reading below 90. Herb's reading of 156/100 is considered hypertension, or a blood pressure that is above normal. Audrey should measure the patient's blood pressure again to confirm that a proper reading was taken. She should also confirm that the cuff size was correct, because a too-small cuff can give an artificially high blood pressure reading.

2. In addition to alerting the provider to the change in Mr. Fowler's blood pressure and weight, Audrey feels she may be able to provide advice to the patient (with provider permission). How can Audrey use her communication and medical assisting knowledge to counsel Herb Fowler on lifestyle changes?

Herb is obviously considering but having a difficult time implementing lifestyle changes. Audrey may find that educating Herb about diet and exercise may give him some information that will encourage him to make some changes in his lifestyle. While the high blood pressure may be due to a number of reasons, weight and smoking certainly contribute to it. Audrey and Herb could pinpoint a long-term goal and then select a few manageable short-term goals to reduce Herb's weight, improve his circulation, and reduce his blood pressure.

- 3. To follow up, Audrey reviews her knowledge of hypertension and discusses the four types with the provider. What are the four kinds of hypertension and what are their characteristics?
- 1. Primary or essential hypertension: there is no identified cause. Treatment is a change in diet, lifestyle and medication.
- 2. Secondary hypertension: It is caused by a known condition. This can be treated by treating the underlying <u>condition.</u>
- <u>3. Malignant hypertension: it occurs suddenly and drastically. Treatment includes immediate treatment of the underlying condition and short-term medications.</u>
- 4. White coat: caused by anxiety or fear of the blood pressure measurement. There is no treatment required.

Answers to Certification Review

- 1. <u>b. TA</u>
- 2. <u>c. radial</u>
- 3. <u>c. give an arbitrarily high result</u>
- 4. <u>b. tachycardia</u>
- 5. <u>b. apnea</u>
- 6. <u>d. both a and b</u>
- 7. c. high-pitched musical sounds heard upon expiration
- 8. <u>b. divide by 2.2</u>
- 9. <u>b. 148/92</u>
- 10. <u>d.</u> all of the above

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