SESSION VII

EXAMINATION OF VITAL SIGNS

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Upon successfully completing this session the student will be able to:

- Explain the purposes of the various vital signs examinations in the drug influence evaluation procedure.
- Explain the administrative procedures for these examinations.
- Explain the cues obtained from these examinations.
- Document the examinations of vital signs accurately and completely.
- Correctly answer the "topics for study" questions at the end of this session.

A. Concepts and Procedures for Measuring Pulse Rate

Some important definitions:

Pulse is the expansion and relaxation of an artery generated by the pumping action of the heart.

Pulse rate is the number of pulsations in an artery in one minute.

An artery is a strong, elastic blood vessel that carries blood from the heart to the body tissues.

A vein is a blood vessel that carries blood back to the heart.

When the heart contracts, it squeezes blood out of its chambers, and sends the blood surging into the arteries. The surging blood pushes against the walls of the arteries, causing them to expand. If you know where to locate an artery (for example, in the crease of your wrist, just below the base of the thumb) and you press your finger tips onto the skin just above the artery, you will feel the artery expand each time blood surges through it. If you keep your finger tips on the artery and count the pulses that occur in one minute, you will determine your pulse rate.

The Radial Artery provides a convenient pulse point. The Radial Artery can be located in or near the natural crease of the wrist, on the side of the wrist next to the thumb. To use the Radial Artery pulse point, have the subject hold his or her arm straight out, with the palm of their hand facing down. Place the tips of your index and middle fingers into the crease of the subject's wrist, near the base of the thumb, and exert a slight pressure. Allow the subject's hand to droop down from gravity; this will tighten the pressure on your finger tips and aid you to feel the pulse.

The Brachial Artery provides another useful pulse point. It can be located in the crook of the arm, halfway between the center of the arm and the side of the arm closest to the body.

The Carotid Artery can also provide pulse points. The Carotid Artery can be located in the neck, on either side of the “Adam's Apple.”

Key points to keep in mind about measuring pulse rate:

- Don't use your thumb to feel someone's pulse because there is an artery in the thumb. If you apply pressure with the thumb, the "beat" you feel may be your own pulse, and not the subject's.

- If you use the Carotid Artery pulse point, don't apply pressure to both sides of the “Adam's Apple.” Doing so can cut off the supply of blood to the brain.

- When measuring pulse rate, count the beats for 30 seconds, then multiply by two.

Some technical terms associated with pulse rate:

- Tachycardia: Abnormally rapid heart rate.
- Bradycardia: Abnormally slow heart rate.
- Arrhythmia: Abnormal heart rhythm.

B. Concepts and Procedures for Measuring Blood Pressure

All DREs need to be aware that many females have birth control implants in their upper left arm. The DRE should check for the implants, and if found, the blood pressure should be taken on the subject's right arm.

Some important definitions:

Blood pressure is the force that the circulating blood exerts on the walls of the arteries. The blood pressure changes from instant to instant, as the heart contracts and relaxes.

Systolic pressure is the maximum or highest blood pressure. The blood pressure reaches its systolic value when the heart contracts and sends the blood surging into the arteries.

Diastolic pressure is the minimum or lowest blood pressure. The blood pressure reaches its diastolic value when the heart is fully expanded.

A Sphygmomanometer is a device for measuring blood pressure. The major parts or components of a Sphygmomanometer include:

- The compression cuff, which can be wrapped securely around the arm and which contains a rubber bladder that can be inflated with air. There are different cuffs designed for children, adults and people with extra large arms; these cuffs have different sized bladders.

- The pressure bulb, which can be squeezed to inflate the rubber bladder with air.

- The pressure control valve, which controls the inflation or deflation of the rubber bladder. To inflate the bladder, the pressure control valve must be twisted all the way to the right (clockwise); then, the pressure bulb can be squeezed to pump air into the bladder. To deflate the bladder, the pressure control valve must be twisted to the left (counter-clockwise); the more the valve is twisted to the left, the faster the bladder will deflate.

- The manometer, or pressure gauge, which displays the air pressure in the bladder.

- Tubes, connecting the pressure cuff to the manometer and to the pressure bulb.

Some technical terms associated with blood pressure:

- Hypertension: Abnormally high blood pressure.
- Hypotension: Abnormally low blood pressure.

Blood Pressure is measured in units of millimeters of mercury. Sometimes this is abbreviated as "mmHg", where "mm" represents "millimeters" and "Hg" is the chemical symbol for the element mercury (from "Hydrargyrum", the Latin word for "mercury"). When the manometer or pressure gauge indicates that the pressure in the bladder is 120 mmHg, that means that the air in the bladder, if forced into a glass tube containing liquid mercury, would push the mercury up the tube to a height of 120 millimeters. Some Sphygmomanometers actually have pressure gauges that consist of glass tubes containing mercury, with a ruler alongside the tube marked off in millimeters. Usually, however, aneroid pressure gauges are used. ("Aneroid" means "without fluid".)

When you measure and record blood pressure, it is not necessary to use the symbols "mmHg". Simply record the numbers.

The principles involved in measuring blood pressure are easy to understand. When the pressure cuff is wrapped around the upper arm (e.g. around the bicep) and inflated with air, the air pressure exerts a force on the arm. When the pressure in the bladder gets high enough, the arteries in the arm will be squeezed shut, and no blood will flow through the arteries. In this respect, the pressure cuff works just like a tourniquet.

When the pressure control valve is twisted to the left, air starts to escape from the bladder and the pressure on the arm (and on the artery) starts to drop. However, as long as the air pressure on the artery remains higher than the blood pressure in the artery, the artery will remain squeezed shut and no blood will flow.

Consider this question: What will happen when the air pressure on the artery drops to the point where it just equals the blood pressure in the artery?

At that point, the heart will again be able to push the blood through the artery, so the flow of blood will resume.

But the blood pressure is constantly changing, from instant to instant. At one instant, the pressure will be at its maximum, or Systolic value. Then the blood pressure drops, and a very short time later it will reach its minimum or Diastolic level. Then it climbs again, and repeats the cycle over and over.

When the air pressure in the bladder drops to the point where it equals the Systolic blood pressure, blood will be able to spurt through the artery each time the heart contracts. But an instant later, as the heart starts to expand and the blood pressure drops, the artery will squeeze shut again and the flow will stop.

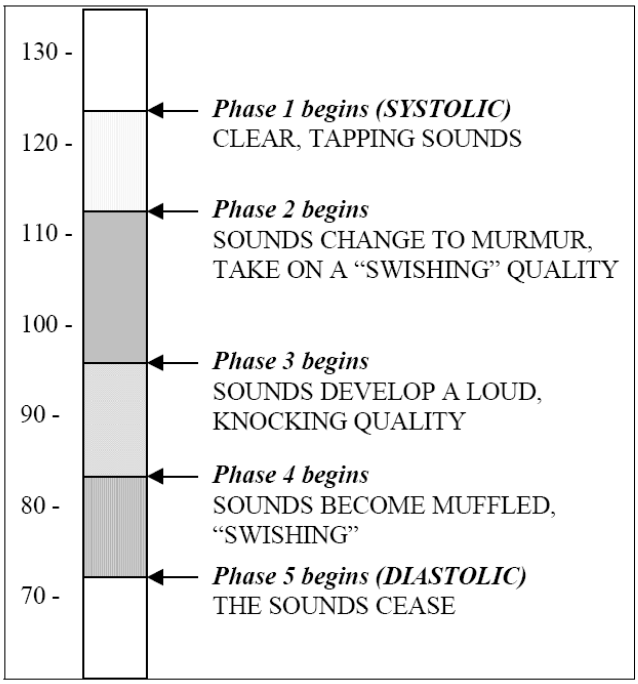
If the air is allowed to continue to escape from the bladder, the air pressure eventually will fall to the point where it reaches the Diastolic level. At that point, the blood pressure in the artery always will be equal to or higher than the air pressure on the artery, so the artery will stay open and blood will flow steadily.
So the basic idea is simple:

- To measure blood pressure, start by pumping up the bladder until the artery is squeezed completely shut and no blood flows.
- Let the air pressure drop slowly until the blood just begins to spurt through the artery. When that happens, the pressure shown on the gauge will be equal to the Systolic pressure.
- Continue to let the air pressure drop until the blood finally flows steadily through the artery. The pressure showing on the gauge at that time will be the Diastolic pressure.

To determine when the blood starts to spurt, and when it starts to flow steadily, a stethoscope is needed.

The stethoscope should be applied to the skin, directly above the artery. For example, with the blood pressure cuff wrapped around the bicep, the stethoscope can be applied to the Brachial artery pulse point.

When no blood is flowing through the artery, you will hear nothing through the stethoscope. But when the air pressure in the cuff falls to the systolic level, you will hear the blood begin to spurt. The sound you will hear starts as a clear tapping. This is the first phase of what are called the Korotkoff Sounds, a distinct series of sounds that are heard as the air pressure in the cuff drops from the systolic to the diastolic level.



As you continue to allow the air to escape from the cuff, the spurts of blood through the artery become steadily longer and the sounds change. They become fainter taking on a swishing quality, and pass through a "knocking" phase, and then suddenly become muffled. Eventually, when the air pressure drops to the diastolic level, the blood flows steadily and all sound ceases.

Step-by-step procedures for measuring blood pressure

(1) Position the cuff on the bicep so that the tubes extend down the middle of the arm.

(2) Wrap the cuff snugly around the bicep.

(3) Clip the manometer to the subject's sleeve, or to some other convenient location, so that you can observe the gauge easily.

(4) Twist the pressure control valve all the way to the right.

(5) Put the stethoscope earpieces in your ears. Make sure the earpieces are turned forward.

(6) Apply the stethoscope to the Brachial Artery pulse point.

(7) Rapidly inflate the bladder to a level high enough to squeeze the artery shut. Usually, a pressure of 180 will be sufficient.

(8) Twist the pressure control valve slightly to the left to allow the air to escape from the bladder slowly (2 mmHg per second).

(9) Keep your eyes on the pressure gauge and listen for the Korotkoff Sounds.

    a. Record the Systolic pressure when the first sound (clear, tapping) is heard.

    b. Record the Diastolic pressure when the sounds cease.

If the DRE is unable to successfully obtain a blood pressure measurement the first time, they should wait a minimum of three minutes before attempting to obtain another measurement.

C. Concepts of Temperature Measurement

Body temperature is measured using an oral thermometer. The thermometer should always be covered with a clean disposable cover prior to taking the subject's temperature.

When measuring temperature with an oral thermometer, it is important to ensure that the thermometer remains under the person's tongue and that the person is not talking during the measurement process. DRE's should also try to refrain from letting the person drink hot or cold fluids immediately prior to measuring temperature.

The following summarizes the results that generally can be expected when the vital signs examinations are administered to persons under the influence of the various categories of drugs.

	CNS Depressants	CNS Stimulants	Hallucinogens	D/A	Narcotic Analgesics	Inhalants	Cannabis
Pulse	Down (*)	Up	Up	Up	Down	Up	Up
Blood Pressure	Down	Up	Up	Up	Down	Up/Down (**)	Up
Temperature	Normal	Up	Up	Up	Down	Up/Down /Normal	Normal

* Quaaludes, ETOH, and possibly some anti-depressants may elevate.

** Down with Anesthetic gases, up with volatile solvents and aerosols.

NOTE: "Normal" systolic blood pressure 120-140
"Normal" diastolic blood pressure 70-90
"Normal" pulse (adult male) 60-90
"Normal" temperature 98.6 plus or minus 1 degree, Fahrenheit

Topics for Study

1. Where is the Radial Artery pulse point?

2. Why should you never attempt to feel a subject's pulse with your thumb?

3. Does an artery carry blood <u>to</u> the heart or <u>from</u> the heart?

4. What does the symbol "Hg" represent?

5. What is <u>Diastolic</u> pressure?

6. When do the Korotkoff Sounds begin?

7. Name and describe the major components of a Sphygmomanometer.

8. Which of the seven categories of drugs generally will cause blood pressure to be elevated?