3 Hours

SESSION VI

EXAMINATIONS OF VITAL SIGNS

SESSION VI EXAMINATIONS OF VITAL SIGNS

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

- Define basic terms relevant to pulse rate and blood pressure measurements.
- Measure pulse rate.
- Measure blood pressure.
- Relate the expected results of vital signs examinations to the various categories of drugs.

CONTENT SEGMENTS

A. Purposes of the Examinations

B. Procedures and Cues

C. Demonstrations

D. Normal Ranges of Vital Signs

E. Relationship of Drug Categories to the Vital Signs Examinations

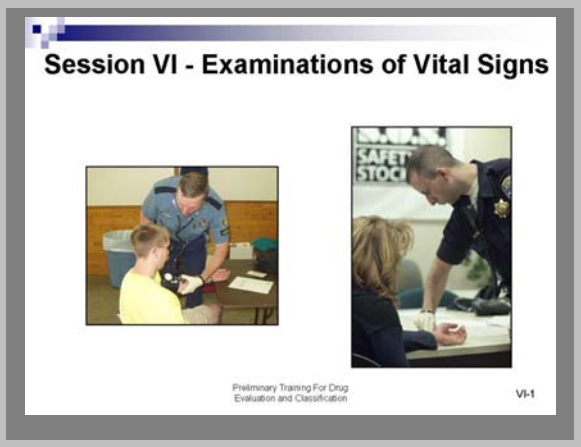
F. Practice

LEARNING ACTIVITIES

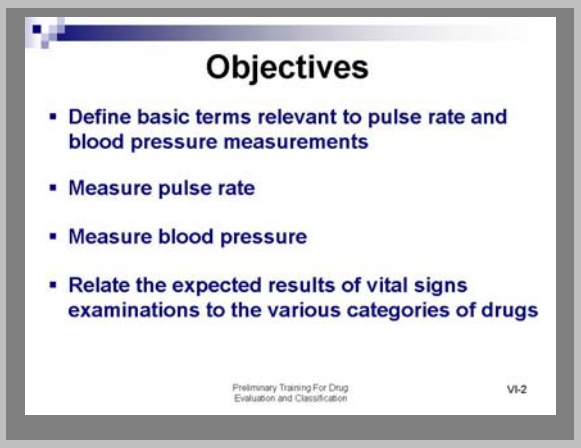
- Instructor-Led Presentations
- Student-Led Demonstrations
- Hands-on Practice

I. EXAMINATIONS OF VITAL SIGNS

Display Slide VI-1: Examinations of Vital Signs



Display Slide VI-2: Objectives



Briefly review the objectives, content and activities of this session.

A. Purposes of the Examinations

The vital signs that are relevant to the drug evaluation and classification process include:

Point out these vital signs on the wall chart.

- Pulse rate
- Blood pressure
- Temperature

Different types of drugs affect these vital signs in different ways.

Certain drugs tend to “speed up” the body and elevate these vital signs.

Clarification:

- pulse may quicken
- blood pressure may rise
- temperature may rise

Other drugs tend to “slow down” the body and lower these vital signs.

Clarification:

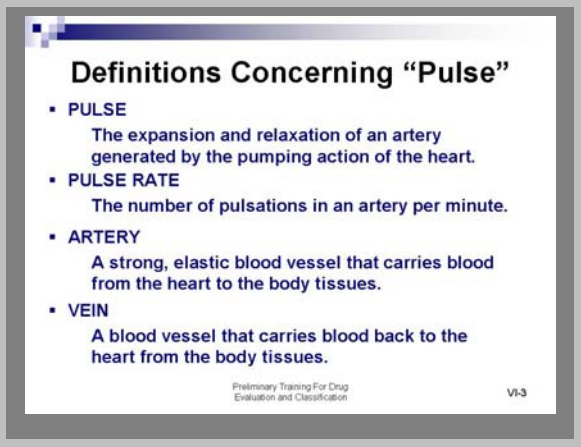
- pulse may slow
- blood pressure may drop
- temperature may fall

Systematic examination of the vital signs gives us much useful information concerning the possible presence or absence of various categories of drugs.

- Point out that for purposes of standardization, the pulse and blood pressure readings will be obtained using the left arm if at all possible.

B. Procedures and Cues

Display Slide VI-3: Definitions Concerning “Pulse”



Measurement of Pulse Rate

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 per minute.

- Point out that pulse rate is equal to the number of contractions of the heart per minute.

An artery is a strong, elastic blood vessel that carries blood away from the heart.

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

When the heart contracts, it squeezes blood out of its chambers into the arteries.

The surging blood causes the arteries to expand.

By placing your fingers on the skin next to an artery and pressing down, you can feel the artery expand as the blood surges through.

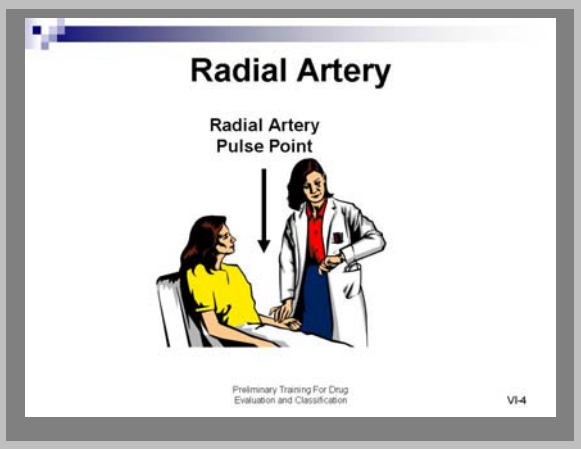
- Emphasize: The "surge" can be felt as the blood is squeezed from the heart through an artery. The pulse cannot be felt in a vein.

By keeping your fingers on the artery and counting the number of pulses that occur in one minute, you will measure the pulse rate.

Demonstrate this, by holding your fingers on your own radial artery.

Pulse is easy to measure, once you locate an artery close to the surface of the skin.

Display Slide VI-4: Radial Artery



Radial Artery

One convenient pulse point involves the radial artery.

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.

- Point to the radial artery pulse point on your own wrist.

Hold your left hand out, with the palm down.

Demonstrate this.

Place the tips of your right hand's index finger and middle finger into the crease of your left wrist, and exert a slight pressure.

Demonstrate this.

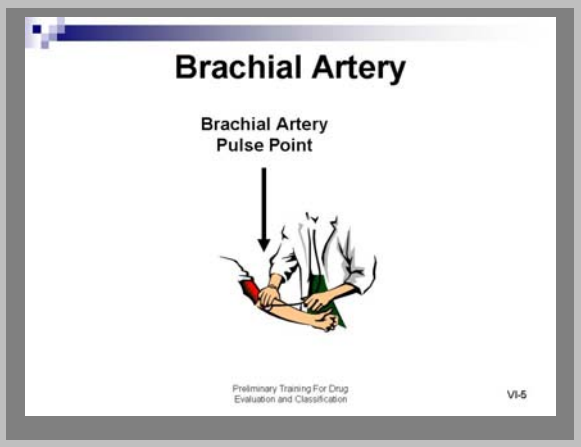
Allow your left hand to curl downward.

Demonstrate this.

- You should be able to feel the pulse in your radial artery.

Ask students whether they can feel their pulses. Coach any students who have difficulty in locating the pulse.

Display Slide VI-5: Brachial Artery



Brachial Artery

Another pulse point involves the brachial artery.

- Point to the brachial artery pulse point in your own arm.

The brachial artery 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.

- Instruct students to roll up their sleeves, if necessary, to expose their brachial artery pulse points.

Hold your left hand out, with the palm up.

Demonstrate this.

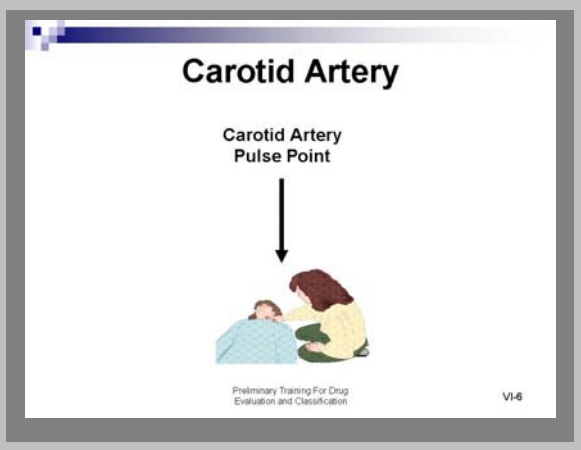
Place the tips of your right hand's index and middle fingers into the crook of your left arm, close to the body, and exert a slight pressure.

Demonstrate this.

- You should be able to feel the pulse in your brachial artery.

Ask students whether they can feel their pulses. Coach any student who has difficulty locating the pulse.

Display Slide VI-6: Carotid Artery



Carotid Artery

Another pulse point involves the carotid artery.

- Point out the carotid artery pulse point on your own neck.

The carotid artery can be located in the neck, on either side of the Adam's Apple.

Place the tips of your right hand's index and middle fingers alongside the right side of your "Adam's Apple."

Demonstrate this.

- You should be able to feel the pulse in your carotid artery.

Ask students whether they can feel their pulses. Coach any student who has difficulty locating the pulse.

Basic Do's and Don'ts of Measuring Pulse

- Don't use your thumb to apply pressure while measuring a subject's pulse.
- Point out that there is an artery located in the thumb. If you apply pressure with the thumb, you may be actually measuring your own pulse instead of the subject's.
- If you use the carotid artery pulse point, don't apply pressure to both sides of the Adam's Apple: this can cut off the supply of blood to the brain.
- When measuring the pulse rate, use 30 seconds as the standard time interval.
- Point out that pulse rate is always expressed as "beats per minute." If you count the beats during an interval of 30 seconds, you must double the result to obtain the pulse rate. The pulse reading should not be an odd number.

Students' Initial Practice at Measuring Pulse Rate

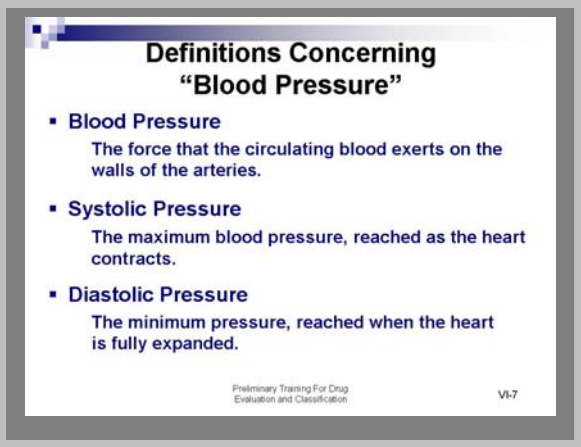
- Instruct students to work in pairs, taking turns measuring each other's pulse.
- Tell students to record on paper their partner's pulse rates.
- Monitor, coach and critique the students' practice. Allow the practice to continue for only about 5 minutes.

Print the following lists on the dry erase board or flip-chart.

50 or less____	76-78____
52-54____	80-82____
56-58____	84-86____
60-62____	88-90____
64-66____	92-94____
68-70____	96-98____
72-74____	100+____

- Tabulate the numbers of students whose pulse rates were in each of the listed intervals.
- Point out that the "normal range" of pulse rate is 60-90 beats per minute.

Display Slide VI-7: Definitions Concerning "Blood Pressure"



Measurement of Blood Pressure

Blood pressure is the force that the circulating blood exerts on the walls of the arteries.

- Blood pressure changes constantly as the heart contracts and relaxes.
- Blood pressure reaches its maximum as the heart contracts and sends the blood surging through the arteries. This is called the systolic pressure.
- Blood pressure reaches it minimum when the heart is fully expanded. This is called the diastolic pressure.
- It is always necessary to measure and record both the systolic and diastolic blood pressure.

Memory aid:

Systolic: "S" for "Superior"

Diastolic: "D" for "Down"

- Remind students that "systolic" is the higher number, "diastolic" is the lower number.

The device used for measuring blood pressure is called a sphygmomanometer.

- Exhibit a sphygmomanometer.

Write "SPHYGMOMANOMETER" on the dry erase board or flip-chart.

The sphygmomanometer has a special cuff that can be wrapped around the subject's arm and inflated with air pressure.

Select a student to come before the class. Have the student sit in a chair facing the class and roll up a sleeve, if necessary, to expose the left bicep.

Wrap the cuff around the student-volunteer's arm and inflate it.

- As the pressure in the cuff increases, the cuff squeezes tightly on the arm.

Ask the student-volunteer whether they can feel the pressure of the cuff.

- When the pressure gets high enough, it will squeeze the artery completely shut.

Ask students: "What artery is located in the crook of the arm?" (Point to that location on the student-volunteer's arm).

- Blood will cease flowing through the brachial artery. Since the brachial artery "feeds" the radial artery, blood will also cease flowing through the radial artery.

Release the pressure in the cuff on the student-volunteer's arm.

If we slowly release the air in the cuff, the pressure on the arm and on the artery will start to drop.

- Eventually, the pressure will drop enough so that blood will once again start to flow through the artery.

Ask students: "How far must the pressure in the cuff drop before the blood can start to squeeze through the artery?"

- Blood will start flowing in the artery once the pressure inside the artery equals the pressure outside the artery.

Ask students: "What would happen if we allowed the pressure in the cuff to drop down to the systolic level, and held the air pressure at that level?"

- The two pressures will become equal when the air pressure in the cuff drops down to the systolic pressure.

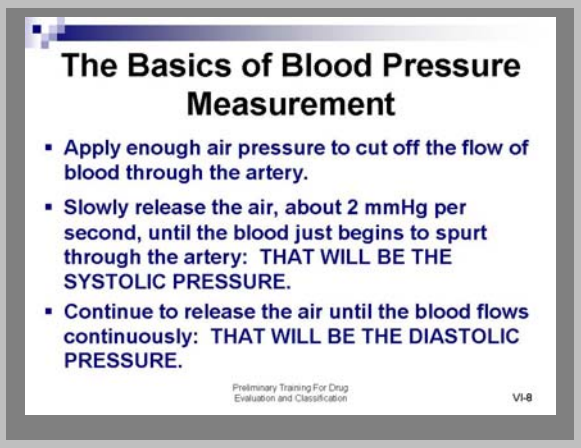
- Point out that the blood would spurt through the artery each time the heart contracted, but would cease flowing when the heart expanded.

Ask students: "How far down must the air pressure in the cuff drop before the blood will flow through the artery continuously?"

- When that happens, blood will spurt through the artery each time the heart contracts.

- Once the air pressure in the cuff drops down to the diastolic level, the blood will flow continuously through the artery.

Display Slide VI-8: The Basics of Blood Pressure Measurement



Overview of Procedures for Measuring Blood Pressure

- Apply enough air pressure to the cuff to cut off the flow of blood through the artery (approximately 180 mmHg).

Demonstrate, using the student-volunteer (apply pressure to the cuff). As DREs we usually inflate the cuff until the manometer shows a reading of approximately 180 mmHg.

- Slowly release the air pressure until the blood just begins to spurt through the artery: that level will be the systolic pressure.

- Slowly release the pressure in the cuff.

- Emphasize that the pressure should drop at approximately 2 mmHg per second (5 sec for each 10 mm drop).

- Continue to release the air pressure until the blood flows continuously through the artery: that level will be the diastolic pressure.

Ask students:

- "How can we tell when the blood starts to spurt through the artery?"
- "How can we tell when the blood is flowing continuously through the artery?"

We can listen to the spurting blood, using a stethoscope.

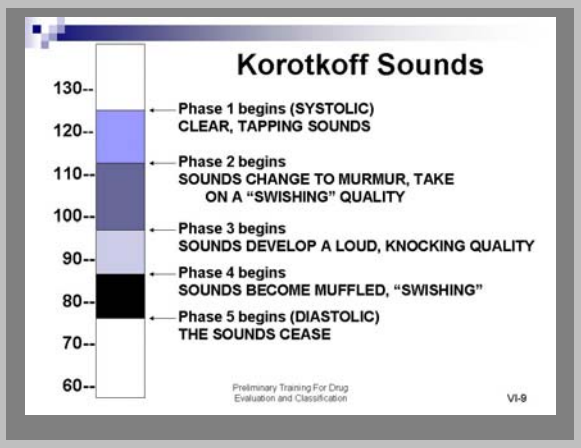
- Exhibit a stethoscope.
- Apply the stethoscope to the skin directly above the artery.

Demonstrate using the student-volunteer.

- Apply pressure to the cuff, enough to cut off the flow of blood.
- Inflate the cuff on the student-volunteer's arm.
- When no blood is flowing through the artery, we hear nothing through the stethoscope.
- Slowly release the air from the cuff, letting the pressure start to drop.
- Release the air in the cuff.
- When we drop to the systolic pressure, we start to hear a spurting sound.
    - Note: This begins as a clear, tapping sound.
- As we continue to allow the air pressure to drop, the surges of blood become steadily longer.
    - Note: The sounds take on a swishing quality and become fainter.
- When we drop to the diastolic pressure, the blood slows steadily and all sounds cease.

Excuse the student-volunteer and thank him or her for participating.

Display Slide VI-9: Korotkoff Sounds



Korotkoff Sounds

The sounds that we listen to are called Korotkoff Sounds.

Named after Dr. Nikolai Korotkoff, a Russian physician who introduced the method of determining blood pressure in 1905.

Phase 1: the first appearance of clear, tapping sounds that gradually increase in intensity.

- Point out that the beginning of Phase 1 corresponds to the systolic pressure.

Phase 2: the sounds change to a murmur and take on a swishing quality.

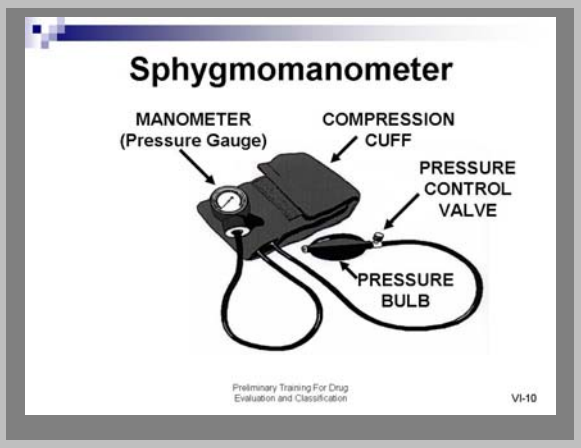
Phase 3: the sounds develop a loud, knocking quality (not quite as clear as Phase 1).

Phase 4: the sounds suddenly become muffled and again have a faint swishing quality.

Phase 5: the sounds cease.

- Point out that the beginning of Phase 5 corresponds to the diastolic pressure.

Display Slide VI-10: Sphygmomanometer



Familiarization with the Sphygmomanometer

Hand out stethoscopes and sphygmomanometers (one per each student is desirable; at minimum, there should be one for every four students).

The compression cuff contains an inflatable rubber bladder.

- Point out the components of the sphygmomanometer on Visual VI-10.

A tube connects the bladder to the manometer, or pressure gauge.

- Clarification: The manometer displays the air pressure inside the bladder.

Another tube connects the bladder to the pressure bulb, which can be squeezed to inflate the bladder.

The pressure control valve permits inflation of the bladder and regulates the rate at which the bladder is deflated.

To inflate the bladder, the pressure control valve must be twisted all the way to the right.

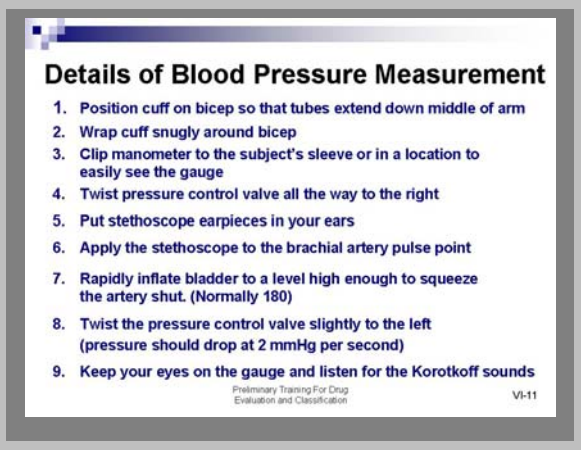
When the valve is twisted all the way to the right, air can be pumped into the bladder, but no air can escape from the bladder.

To deflate the bladder, twist the valve to the left.

Demonstrate this.

The more the valve is twisted to the left, the faster the bladder will deflate.

Display Slide VI-11: Details of Blood Pressure Measurement



Details of Blood Pressure Measurement

Select a student to serve as a blood pressure subject and demonstrate the procedures using the student.

- Position the cuff on the bicep so that the tubes extend down the middle of the arm.
- Wrap the cuff snugly around the bicep.
- Clip the manometer (pressure gauge) on the subject's sleeve, so that it is readily viewable.
- Twist the pressure control valve all the way to the right.
- Put the stethoscope earpieces in your ears.
- Make sure the earpieces are turned forward, i.e., toward the nose.
- Place the diaphragm or bell of the stethoscope over the brachial artery.
- Rapidly inflate the bladder to approximately 180mmHg.
- Twist the pressure control valve slightly to the left to release the pressure slowly.
- Emphasize the need to release the pressure slowly. If the pressure drops too fast, the needle will sweep down the gauge too quickly to be read accurately.

The pressure should be released at a speed that takes one second for the needle to move a single gradation (i.e., 2 millimeters of mercury) on the gauge.

- Keep your eyes on the gauge and listen for the Korotkoff sounds.
- Point out that the needle on the pressure gauge generally will "bounce" slightly when blood starts to spurt through the artery.

Excuse the student and thank him or her for participating.

Solicit students' questions concerning these procedures.

Normal Blood Pressure Values

- Point out that "normal" values of blood pressure are:
    - Systolic: 120-140
    - Diastolic: 70-90

Note: "Normal" people can have significantly different blood pressures: there is a wide variation in human blood pressure.

Do's and Don'ts of Blood Pressure Measurement

If you inflate the bladder and then need to repeat the measurement, wait at least three minutes to allow the subject's artery to return to normal.

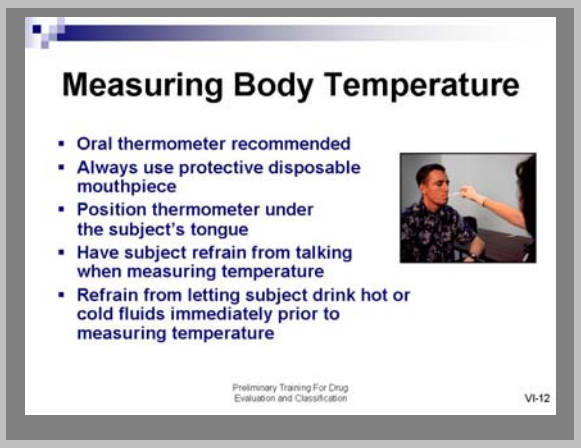
- Point out that if difficulty is encountered in hearing the Korotkoff sounds, try having the subject raise his or her arm and clench the fist to allow blood flow back to the heart.

Hold the bell of the stethoscope with your fingers; don't slide it under the cuff – that will distort the measurement.

Students Initial Practice at Measuring Blood Pressure

If at least one sphygmomanometer and stethoscope are available for every two students, instruct students to practice in pairs. Otherwise, assign students to practice in teams of 3 or 4 members.

Display Slide VI-12: Measuring Body Temperature



Measurement of Temperature

- Point out that the "normal" range for body temperature taken orally is 98.6 degrees + / - 1 degree.
- Temperature is measured orally using a thermometer.
- Make sure that a fresh disposable mouthpiece is used each time.

Exhibit this.

- Ensure that the subject does not take any hot or cold liquids by mouth prior to taking the temperature.
- Point out that hot and cold liquids immediately prior to the temperature examination may effect the result.

Solicit students' comments and questions concerning this overview of procedures and cues.

C. Demonstrations

Pulse Rate Measurement Demonstrations

Select two students to come before the class.

- Instruct the first student to measure the second's pulse using the radial artery pulse point. (Simultaneously, the instructor should measure the subject's pulse using a carotid artery pulse point).

- Instruct the second student to measure the first's pulse using the carotid artery pulse point. (Simultaneously, the instructor should measure the subject's pulse using a radial artery pulse point).

Excuse the two students and thank them for participating.

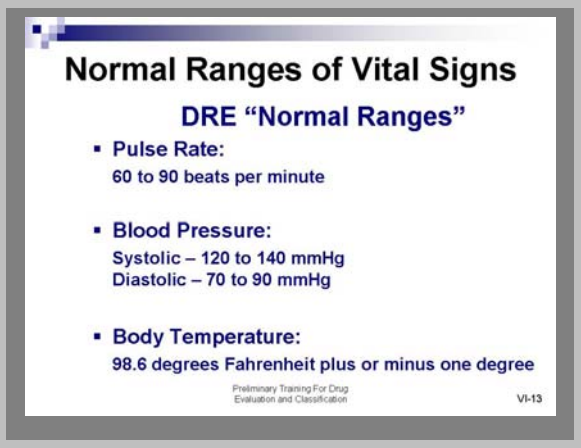
Blood Pressure Measurement Demonstrations

Select two other students to come before the class.

- Instruct the first student to measure the second's blood pressure.
- Have the students reverse roles.

Excuse the two students and thank them for participating.

Display Slide VI-13: Normal Ranges of Vital Signs



D. Normal Ranges of Vital Signs

Normal human vital signs vary between individuals. However, the DEC program has identified a set of "normal" ranges for each of the three vital sign examinations used in the drug influence evaluation process. The ranges used in the DEC program are normally a bit wider than those used by the medical profession.

- Remind students that the "normal" ranges identified for the DEC program have been established through years of research and with medical input.

DEC Program normal ranges:

Pulse rate: 60 to 90 beats per minute

Blood pressure: Systolic: 120-140 mmHg and Diastolic: 70-90 mmHg

Body temperature: 98.6 degrees, plus or minus 1 degree.

E. Relationship of Drug Categories to the Vital Signs Examinations

Note: Draw the matrix (at the end of this session) on the dry erase board or flip-chart at the outset of this session.

- All seven categories of drugs ordinarily will affect pulse rate and blood pressure.
- Some categories usually will lower pulse and blood pressure.

Ask the students which categories will lower pulse rate and blood pressure.

- CNS Depressants and Narcotic Analgesics usually lower pulse and BP.

Write "DOWN" on the pulse and blood pressure lines under the columns for Depressants and Narcotics.

- Point out that Quaaludes, ETOH and possibly some anti-depressants may cause the pulse to increase.
- The other five categories all tend to elevate pulse rate.

Write "UP" on the pulse line under the five remaining columns.

- Most of the drug categories that elevate pulse rate also elevate blood pressure.
- CNS Stimulants, Hallucinogens, Dissociative Anesthetics and Cannabis all usually cause blood pressure to rise.

Write "UP" on the blood pressure line for those four categories.

- The vast majority of Inhalants, namely, the volatile solvents and the aerosols, also elevate blood pressure.
- But the remaining small group of Inhalants, the anesthetic gases, actually lowers the blood pressure.
- Remind students that the anesthetic gases include such things as nitrous oxide, amyl nitrite and ether.
- So for Inhalants, the effect on blood pressure will be up or down.

Write "UP/DOWN" with the footnote – down with anesthetic gases, up with volatile solvents and aerosols – on the blood pressure line under the Inhalants column.

- Three of the categories usually will cause the body temperature to rise.

Ask students which categories usually cause an elevation in body temperature.

- The drug PCP and its analogs from the Dissociative Anesthetics category usually increases body temperature; PCP users have been known to remove their clothing to cool down.

Write "UP" on the TEMP line under the Dissociative Anesthetics column.

- CNS Stimulants and Hallucinogens also will usually increase body temperature.

Write "UP" on the TEMP line for CNS Stimulants and Hallucinogens.

- The effect of Inhalants on body temperature depends on the specific substance that is inhaled.
- Some inhalants may cause temperature to increase or be down.
- But other inhalants may leave the temperature near normal.

Write "UP/DOWN/or NORMAL" on the TEMP line for Inhalants.

- One category usually causes body temperature to be lowered.

Ask students which category usually lowers temperature.

- Narcotic Analgesics usually lower body temperature.

Write “DOWN” on the TEMP line for Narcotics.

- The remaining two categories usually do not affect temperature.

Write “NORMAL” on the TEMP line for Depressants and Cannabis.

- Three of the categories usually will cause the muscle tone to be rigid.

Ask students which categories will cause the muscle tone to be rigid.

- CNS Stimulants, Hallucinogens and Dissociative Anesthetics will usually cause a rigid muscle tone.

Write “RIGID” on the Muscle Tone line for Stimulants, Dissociative Anesthetics and Hallucinogens.

- Two categories usually cause muscle tone to be flaccid.

Ask students which categories cause flaccid muscle tone.

- CNS Depressants and Narcotic Analgesics usually cause a flaccid muscle tone.

Write “FLACCID” on the Muscle Tone line for Depressants and Narcotic Analgesics.

- One category usually causes normal muscle tone.

Ask students which category causes a normal muscle tone.

- Cannabis usually causes normal muscle tone.

Write “NORMAL” on the Muscle Tone line for Cannabis.

- One category will usually cause either normal or flaccid muscle tone.

Ask students which categories usually cause either normal or flaccid muscle tone.

- Inhalants usually cause either normal or flaccid muscle tone.

Write "NORMAL or FLACCID" on the muscle tone line for Inhalants.

Solicit students' questions and comments.

F. Practice

Assignments and Procedures

Team Assignments:

- Group the students into teams of three (3) members each. Each team must have at least one blood pressure kit.

Explanation of Practice

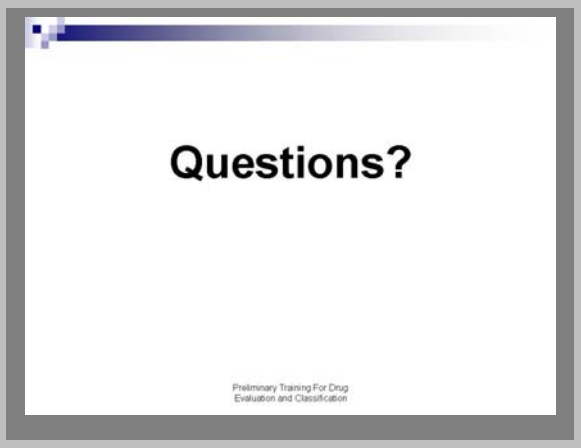
- Teammates will take turns measuring each other's pulse rate and blood pressure.
- Each student will write down every measurement he or she makes and the time at which the measurement was made.
- Whichever member of the team is not engaged in taking the measurement or serving as the "suspect" will act as a coach and offer appropriate constructive criticism to his or her teammate.
- Practice will continue until each student has taken at least three complete pulse and blood pressure measurements on both teammates.

Solicit questions about the practice procedures.

Testing (students testing students):

- Monitor the practice to ensure compliance with the procedures.
- Offer coaching and constructive criticism as appropriate.

Display Slide VI-14: Questions



REVIEW QUESTIONS

1. Where is the radial artery pulse point?

   Crease of the wrist

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

   You can mistakenly measure your own pulse

3. Does an artery carry blood to the heart or from the heart?

   Away from the heart

4. What does the symbol "Hg" represent?

   Mercury (Hydrargyrum)

5. What is diastolic pressure?

   The pressure when the heart relaxes

6. When do the Korotkoff Sounds begin?

   At the systolic level when the blood begins to spurt through the brachial artery

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

   Compression Cuff, Pressure bulb, Manometer, Pressure control valve, Tubes

8. Which of the seven categories of drugs generally will cause pulse rate to be elevated?

   CNS Stimulants, Hallucinogens, Dissociative Anesthetics, Inhalants, Cannabis

9. What is the normal range of body temperature?

   98.6 +/- 1 degree

10. For how long must a DRE count the beats to obtain a measurement of pulse rate?

    30 seconds

11. What is the normal range of pulse rate?

    60 – 90 bpm

12. Which categories of drugs usually lower body temperature?

    Narcotic Analgesics

13. What is the normal range for the higher value of blood pressure? What is the normal range for the lower value?

    120-140 / 70-90