



Dear Health Care Professional,

Thank you for your interest in the “Blood Pressure Measurement for the 21<sup>st</sup> Century “ Tool Kit. We hope you will use this video and information to provide accurate blood pressure readings and health promotion education. This Tool Kit is the product of the collaboration of many wonderful and talented professionals in the Virginia Department of Health; the Medical Committee of the Healthy Pathways Cardiovascular Coalition; Sentara Healthcare; and The Governor’s School for the Arts.

The “Blood Pressure Measurement for the 21<sup>st</sup> Century” Tool Kit provides information on accurately and reliably taking a blood pressure measurement, to properly maintain the blood pressure equipment, and suggestions for lifestyle changes that can be taken to reduce high blood pressure. We hope you will view the video whenever you need a refresher on proper blood pressure taking technique.

As you are aware, high blood pressure is one of the major modifiable risk factors for cardiovascular disease. By being diagnosed early, citizens of Virginia can change behaviors that can have serious consequences on their quality of life. Health care providers use blood pressure measurements to identify at-risk individuals and to guide recommendations for treatment and follow-up. Proper blood pressure measurements are vital for decisions regarding major diagnostic and therapeutic decisions and must be correct, valid and reliable. That is why we made this training video.

We are interested in your comments about the video. **Please fill out and return the enclosed postcard survey.** If you have any questions about the video , call Susan A. Tweed, Ph.D., R.N. at (757) 552-7297.

# Blood Pressure Measurement for the 21<sup>st</sup> Century Toolkit

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## Instructions for Measurement of Blood Pressure Course

The “Measurement of Blood Pressure for the 21<sup>st</sup> Century Toolkit” can be used in two ways. First as a self-study course for health care professionals to update their blood pressure measurement skills and their knowledge regarding current guidelines for the detection and evaluation of hypertension. Or as an adjunct to the Virginia Department of Health’s “Blood Pressure Measurement Specialist Certification” (BPMS) course. The BPMS course is available free of charge to any group of 10-20 health care professionals in Virginia. It is a four-hour course and has been approved for 3.5 contact hours for R.N.s and L.P.N.s. For more information, contact Barbara Mueller at the Virginia Department of Health, (804) 864-7883.

### 1. Use “Measurement of Blood Pressure for the 21<sup>st</sup> Century Toolkit” as a self-study course:

- Make copies of the written materials (except the Answer Key) for each participant. Make two copies of the test. Mark one as the pretest and the other as the posttest.
- Allow participants to review the written materials prior to viewing the video.
- Before the video, ask each participant to take the pretest.
- Encourage participant’s to place a copy of the “Summary of Blood Pressure Measurement Technique” in view. This will be used as a guide to follow along with the presentation.
- After the video ask participants to take the posttest. Allow participants to “grade” their own tests.
- Encourage participants to “practice” the blood pressure measurement technique on each other.
- Complete the “Blood Pressure Measurement for the 21<sup>st</sup> Century” Evaluation postcard.
- For CEU’s - complete the Certification Form and the Evaluation Form and send to Barbara Mueller at the Virginia Department of Health.

### 2. Use the “Measurement of Blood Pressure for the 21<sup>st</sup> Century Toolkit” as an adjunct to the Blood Pressure Measurement Specialist Certification course:

- View the video. It is divided into six sections: Introduction, Sources of Errors and Remedies, How to Measure Blood Pressure, Trouble Shooting (includes information on mercury spills), Current Guidelines, and Quick Review.
- All material in the Toolkit is also in the BPMS course Student Manual. Trainers can use the Toolkit to replace corresponding sections of the BPMS course or pre-select one or more specific sections of the video.

## **Application for CEU's Registered Nurses and Licensed Practical Nurses Only**

1. Each Registered Nurse or Licensed Practical Nurse must submit:
  - a completed posttest
  - a course Evaluation Form
  - sign the Certification form
  
2. Send completed Posttests, Evaluation Forms and Certification form to:

Barbara Mueller  
Virginia Department of Health  
PO Box 2448 Room 106  
Richmond VA 23218  
804 225-2633

3. Completed CEU forms will be mailed to participants.

# Learning Objectives

## Measuring Blood Pressure for the 21<sup>st</sup> Century

By the end of the session, participants will be able to:

1. Distinguish between normal, prehypertension and hypertension.
2. Understand current recommendations for follow-up based on initial blood pressure readings.
3. List the lifestyle modifications that can help to prevent and/or reduce high blood pressure.
4. Understand and describe the proper use and maintenance of blood pressure equipment.
5. Understand the current issues regarding the use of mercury sphygmomanometers and how to respond to mercury spills.
6. Define and describe the phases of the Korotkoff sounds and their use in blood pressure measurement.
7. Define Auscultatory Gap and Maximum Inflation Level (MIL).
8. Determine systolic and diastolic criteria for measuring blood pressure.
9. Perform correct blood pressure measurement technique according to current evidence-based guidelines established by the leading authorities in the field of hypertension detection and evaluation.

## National Guidelines

### Classification and Management of Blood Pressure for Adults

BP Classification	SBP* mmHg	DBP* mmHg	Lifestyle Modifications	Initial Drug Therapy	
				Without Compelling Indications**	With Compelling Indications**
<b>Normal</b>	<120	and <80	Encourage		
<b>Prehypertension</b>	120-139	or 80-89	Yes	No medication indicated	Drug therapy
<b>Stage 1 Hypertension</b>	140-159	or 90-99	Yes	Thiazide diuretics for most. May consider ACE1, ARB, BB, CCB or combination	Drug therapy as recommended for compelling indications.
<b>Stage 2 Hypertension</b>	≥160	or ≥100	Yes	Two-drug combination for most (usually thiazide-type diuretic and ACE1, ARB, BB or CCB).	Drug therapy as recommended for compelling indications.

\*Treatment determined by highest BP category. Treat patients with chronic kidney disease or diabetes to BP goal of <130/80.

\*\* Certain conditions for which specific drugs have been found, in clinical trials and outcome studies, to have the most benefit. These conditions include heart failure, post myocardial infarction, high coronary disease risk, diabetes, chronic kidney disease and history of prior stroke.

From the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC 7), May 2003. National Institutes of Health.

# Educational Recommendations

## Definition:

Education includes presenting verbal and/or written information that interprets results of blood pressure measurement and provides information about the risk factors for cardiovascular disease. This information should be individualized to each patient. Written educational materials should be appropriate for the patient's literacy level, culturally sensitive, and available to patients to take with them when they leave. Every patient should be minimally educated with the following recommendations at the time of BP measurement.

## Protocol:

1. List and briefly explain the controllable and uncontrollable risk factors for coronary heart disease and stroke.

<u>Controllable</u>	<u>Uncontrollable</u>
* Smoking (cigarettes)	* Heredity (history in immediate family of a CVD event or sudden death before age 55)
* Obesity (as determined by BMI)	* Gender (risk is higher starting at age 45 in men - age 55 in women)
* High blood pressure	
* Lack of exercise	
* High blood cholesterol	* Race
* Low HDL cholesterol (below 40)	* History of prior cardiovascular event
* Diabetes	

2. Educate the individual about the risk factors he/she has, identifying those risks that the individual could improve through lifestyle behavior modification.
3. Provide patients with a written copy of their blood pressure numbers and explain where their results fall according to national recommendations.
4. Tell the patient that a single blood pressure measurement does not constitute a diagnosis of hypertension.
5. Refer patient to a health care provider and for further counseling if their BP measurement is not within normal range and/or if they need counseling for any other risk factor.
6. Answer any questions the patient may have about his/her results.

# Lifestyle Changes to Lower Blood Pressure

Lifestyle changes can help to prevent and/or manage high blood pressure.

“Adoption of healthy lifestyles by all persons is critical for the prevention of high blood pressure and is an indispensable part of the management of those with hypertension. Major lifestyle modifications shown to lower blood pressure include weight reduction in those individuals who are overweight or obese, adoption of the Dietary Approaches to Stop Hypertension (DASH) eating plan, dietary sodium reduction, physical activity, and moderation of alcohol consumption” (JNC 7).

## 1. Lose Weight if Overweight or Obese

Thin people are less likely to have high blood pressure than those who are overweight. The latest national guidelines state that increased weight is also a risk factor for cardiovascular disease, thus increasing the chance of having heart attacks or strokes. Evaluation of risk should be based on all three of the following criteria:

- Body Mass Index (BMI )
  - BMI of 25-29 = overweight
  - BMI of 30 or above = obese
- For those with a BMI  $\geq 25$  and a waist circumference  $>40$  inches for men or  $>35$  inches for women, risk is even greater.
- Presence of other risk factors:
  - Family history of premature cardiovascular disease
  - Smoking
  - Personal history of prior cardiovascular disease

- Diabetes
- High blood pressure
- Abnormal cholesterol levels
- Age - over 45 for males or over 55 for females

## 2. Adopt the DASH diet

- The DASH diet (**D**ietary **A**pproaches to **S**top **H**ypertension) which is high in fruits and vegetables (which are rich in potassium, calcium and magnesium\*\*), and low fat dairy products with a reduced content of fat, saturated fat and cholesterol will help to reduce BP. In fact a 1600mg sodium DASH diet has effects similar to single drug therapy (JNC 7).
- For a 2000 calorie diet, the following are recommended:
 

➤ Vegetables	4-5 servings/day
➤ Fruits	4-5 servings/day
➤ Low fat dairy	2-3 servings/day
➤ Grains	7-8 servings/day
➤ Meat, poultry, fish	2 or less servings/day
➤ Nuts, seeds, beans	4-5 servings/week
➤ Fats/oils	2-3 servings/day
➤ Sweets	5 servings/week
- **Servings differ depending on amount of calories needed to maintain a healthy weight or to reduce weight. Approximate systolic blood pressure reduction is 8-14 mmHg (JNC 7).**
- **\*\* At this time, there is no evidence that dietary supplements of potassium, calcium or magnesium are helpful in controlling blood pressure.**

### **3. Reduce Sodium Intake**

The benefit of limiting sodium intake to prevent or control high blood pressure has been a controversial issue for years. The National Institutes of Health (NIH) in May 2000 released the results of a clinical study that showed a large benefit to blood pressure from reduced dietary sodium. This study showed that “the lower the amount of sodium in the diet, the lower the blood pressure, for both those with and without hypertension. The lowest sodium level tested, which produced the lowest blood pressure, was well below the currently recommended intake of 2,400 milligrams a day.”<sup>1</sup> One teaspoon of salt has 2300mg of sodium. Thus, persons who salt their food at the table and/or in cooking and do not avoid foods high in sodium, probably consume 5000-10,000mg of sodium daily.

### **4. Increase Aerobic Physical Activity**

Regular physical activity should be encouraged as a means of weight control, to improve cardiovascular fitness and to reduce blood pressure. “Blood pressure can be lowered with moderately intense physical activity such as 30-45 minutes of brisk walking most days of the week. (JNC VI)

### **5. Limit Alcohol**

Excessive alcohol intake is associated with higher blood pressure and an increased incidence of hypertension. It also can limit the effectiveness of high blood pressure medications. It is recommended that alcohol intake be less than 24 ounces of beer, 10 ounces of wine, 3 ounces of 80 proof whiskey or 2 ounces of 100 proof whiskey (or liquor) per day for men and only half these amounts for women and lighter weight persons. Also, for heart health persons should:

## **Stop Smoking!**

Smoking causes a narrowing or constriction of the blood vessels for at least 30 minutes following smoking a cigarette which may increase blood pressure, temporarily, in both persons with normal pressure and in those with high blood pressure. And, although smoking is not a risk factor for Primary Hypertension, it does increase the risk of developing cardiovascular disease. Thus, smoking cessation is an important behavior change, especially for persons who have high blood pressure.

### ◆ Other Factors

#### 1. Caffeine

Caffeine may raise blood pressure acutely, but tolerance to this effect develops rapidly. No direct relationship between caffeine intake and primary hypertension has ever been found.

#### 2. Stress

Many persons believe that emotional tension, or stress, is an important cause of high blood pressure. Some research has been conducted to test the effect of relaxation exercises, biofeedback and stress management techniques on reduction of blood pressure. These procedures may help some people with high blood pressure sometimes. They may be useful as an adjunct in the treatment of mild hypertension. They may also be of value, in combination with drug therapy, in persons with more severe hypertension. However, more research is needed before stress management is used as a “treatment” for high blood pressure.

# The DASH Diet Eating Plan

Research has shown that following a healthy eating plan can reduce the risk of developing high blood pressure and lower an elevated blood pressure. DASH stands for “Dietary Approaches to Stop Hypertension.” Study results found that elevated blood pressures were reduced with this eating plan which emphasizes fruits and vegetables, lowfat dairy foods and whole grains. The eating plan is low in saturated fat, cholesterol and total fat, and limits red meat, sweets and sugary beverages. The DASH eating plan is rich in calcium, magnesium and potassium, as well as protein and fiber. To further lower blood pressure, reduce your intake of salt and sodium.

Since the DASH eating plan includes up to ten servings of fruits and vegetables and at least two servings of dairy foods every day, you should make a few changes at a time. Eat fruits and vegetables for snacks and gradually increase the number of servings at meals. Choose lowfat and fat free dairy foods, such as milk, cheese and yogurt. The DASH eating plan has more

servings of fruits, vegetables and whole grains than you may be used to eating. Because it is high in fiber, it may cause bloating and diarrhea in some persons. Be sure to gradually increase your intake of fruits, vegetables and whole grain foods.

The eating plan is high in potassium, about 4,400 milligrams per day. Research has shown that potassium lowers blood pressure by relaxing the arteries, and may also counter the effect of sodium, which tends to increase blood pressure. The best effect on blood pressure has been shown when sodium intake is lowered and potassium intake is increased. If you have kidney disease be sure to check with your physician before increasing your potassium intake.

High blood pressure can be controlled and may even be prevented, if you take these steps: maintain a healthy weight; be physically active; follow a healthy eating plan, which includes foods lower in salt and sodium; and if you drink alcoholic beverages, do so in moderation. If you have high blood pressure and are prescribed medication, take it as directed.

## DASH DIET BASICS

- Eat at least 2 to 3 servings of low-fat dairy products per day
- Eat 8 to 10 servings of fruits and vegetables per day
- Stop smoking
- Limit alcohol intake
- Lose weight if overweight
- Increase physical activity
- Limit salt and sodium in your diet
- Cut down on the amount of fat you eat, and choose healthy fats when you do.

## Getting Started

It's easy to adopt the DASH eating plan. Here are some ways to get started.

### **Change gradually.**

- ◆ If you eat one or two vegetables a day, add a serving at lunch and another at dinner.
- ◆ If you don't eat fruit now or have only juice at breakfast, add a serving to your meals or have it as a snack.
- ◆ Gradually increase your use of fat free and lowfat dairy products to three servings a day. For example, drink milk with lunch or dinner, instead of soda, sugar sweetened tea, or alcohol. Choose lowfat (one percent) or fat free (skim) dairy products to reduce your intake of saturated fat, total fat, cholesterol, and calories.
- ◆ Read food labels on margarine and salad dressing to choose those lowest in unsaturated fat. Some margarine's are now trans-fat free.

### **Treat meat as one part of the whole meal, instead of the focus.**

- ◆ Limit meat to 6 ounces a day (two servings) all that's needed. Three to four ounces is about the size of a deck of cards.
- ◆ If you now eat large portions of meat, cut back gradually – by a half or a third at each meal.
- ◆ Include two or more vegetarian-style (meatless) meals each week.
- ◆ Increase servings of vegetables, rice, pasta, and dry beans in meals. Try casseroles and pasta, and stir-fry dishes, which have less meat and more vegetables, grains, and dry beans.

### **Use fruits and other foods low in saturated fat, cholesterol, and calories as desserts and snacks.**

- ◆ Fruits and other lowfat foods offer great taste and variety. Use fruits canned in their own juice. Fresh fruits require little or no preparation. Dried fruits are a good choice to carry with you or to have ready in your car.
- ◆ Try these snack ideas: unsalted pretzels or nuts mixed with raisins; graham crackers; lowfat and fat free yogurt and frozen yogurt; popcorn with no salt or butter added; and raw vegetables.

### **Try these other tips:**

- ◆ Choose whole grain foods to get added nutrients, such as minerals and fiber. For example, choose whole wheat bread or whole grain cereals.
- ◆ If you have trouble digesting dairy products, try taking lactase enzyme pills or drops with the dairy foods. Or, buy lactose-free milk or milk with lactase enzyme added to it.
- ◆ Use fresh, frozen, or no-salt added canned vegetables.

Facts about the DASH Eating Plan, U.S. Department of Health and Human Services, NIH, NHLBI, May, 2003.

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Health Educator, Sentara Healthcare

## Common Causes of Blood Pressure Measurement Errors Manometer

Cause	Effect	Correction
Loss of mercury	Reading too low	Add mercury.
Too much mercury	Reading too high	Have extra mercury removed or have system cleaned.
Clogged diaphragm	Mercury will not rise easily or bounces.	Replace diaphragm.
Dirty mercury or dirty acrylic tube	Mercury meniscus is irregular and reading is impaired.	Have mercury and acrylic tube cleaned.

## Inflation System

Cause	Effect	Correction
Bladder too small	High reading	Use proper size cuff . The circumference and <u>diameter</u> of the arm determines the size needed.
Bladder too large	Low reading	
A leak in the bladder or tubing	Mercury continues to fall when valve is closed.	Replace bladder or tubing.
Bladder not centered over artery	High reading	Use proper technique.
Cuff not applied snugly	High reading	Reapply cuff.
Cuff applied over clothing	Incorrect reading	Use proper technique.
Pressure bulb has air leaks	Mercury continues to fall when valve is closed.	Replace bulb.
Control valve "sticks"	Unable to control deflation.	Replace valve.
Control valve dirty, worn, or has broken parts	Mercury continues to fall when valve is closed.	Have valve cleaned or repair broken parts.

## Stethoscope

Cause	Effect	Correction
Ear tips not forward	Hearing impairment	Use proper technique.
Placed under cuff or near tubing	False sounds	Use proper technique.
Applied with heavy pressure	May be heard below the true diastolic resulting in an incorrect reading.	Use proper technique.

## Screenee

Cause	Effect	Correction
Slouched	High reading	Have screenee sit up straight.
Brachial pulse below heart level	High reading	Place arm so that brachial is at heart level.
Arm not fully supported on stable surface	High reading	Place arm on desk, table, etc.
Brachial pulse above heart level	Low reading	Place arm so that brachial is at heart level.
Clothing around arm too tight	Incorrect reading	Remove clothing on arm.
Leaning on arm	High reading	Have screenee sit back in chair with no weight on arm.

## Screener

Cause	Effect	Correction
Inflation rate slow or inconsistent	Incorrect reading May cause auscultatory gap	Maintain rapid and constant inflation rate.
Cuff inflated too high	Painful to screenee and may cause incorrect reading	Determine MIL.
Deflation rate too slow	High diastolic reading and may cause auscultatory gap	Deflate at 2-3 mm Hg per second.
Deflation rate too fast	Low reading	Deflate at 2-3 mm Hg per second.
Cuff reinflated after deflation has begun	Incorrect reading	Deflate cuff completely. Wait 15-30 seconds before reinflating.
Observer bias, digit preference, cut-point bias, previous reading bias or fatigue	Incorrect readings	Be aware of and on guard against these problems.

## Testing Aneroid Manometers for Accuracy

The aneroid manometer consists of a round gauge connected by a tube to the cuff. This instrument is reliable and easy to use as long as it is checked regularly to determine its accuracy (every 3-6 months depending on frequency of use). The mechanical workings of the aneroid manometer are more easily disturbed than those of a mercury manometer. The dial at the zero mark of an aneroid under no pressure does not mean that the instrument will provide accurate readings. The aneroid must be checked against a mercury manometer (at several points throughout the range) to establish its accuracy. Mercury manometers will provide accurate readings if the mercury is at "0" on the scale when the instrument is not under any pressure and if the mercury is not dirty.

### Test for Accuracy of Aneroid Manometers

- Equipment needed
  - Aneroid manometer gauge to be tested.
  - Mercury manometer.
  - Y-connector (see below for ordering information).
  - Bulb and valve from aneroid.
- Technique
  - Remove coiled tubing from mercury manometer. Connect one end of "Y" tubing to mercury manometer.
  - Connect other end of "Y" to aneroid manometer gauge.
  - Connect tail of "Y" tubing to aneroid's pressure bulb.
  - Hold aneroid gauge at same level as mercury manometer (for accurate viewing).
  - Inflate mercury gauge to test levels (60, 120, 180, and 240 mm Hg).
  - Compare aneroid reading to reading on mercury manometer at each level, compute average deviation.
  - If not accurate within plus or minus 2 mm Hg at any one test level or as an average deviation, then discontinue use and replace or repair faulty gauge.
- Additional checks
  - Bladder: Should be intact without leaks.
  - Tubing: Should have no leaks.
  - Valve: Should not stick or leak.
  - Cuff: Should fasten securely. Center of bladder should be marked.

**\*\* Note: The "Y" connectors can be purchased at most medical supply firms.**

**Order a "Calibration Y Connector"  
Made by W.A. Baum Company  
Catalog # 2940 - Cost- about \$4.00**

# Summary of Blood Pressure Measurement Technique

1. **Patient position**
  - a. Seated with feet flat on floor.
  - b. Leaning against back of chair, not on their arm.
  - c. Entire arm fully supported on table with brachial artery at heart level.
  - d. Upper arm should be bare-**do not apply cuff over clothing.**
2. **Cuff size**
  - a. Most modern cuffs are marked with range lines to denote need to use larger or smaller cuff.
  - b. If cuff isn't marked, the screener must ensure that the rubber bladder covers 80% of the circumference of the arm (100% in children) and the width of the bladder should be 20% greater than the diameter of the arm.
3. **Cuff placement**
  - a. Apply cuff **snugly** to bare upper arm.
  - b. Place center of bladder directly above brachial artery.
  - c. Place bottom edges of cuff about 1" above the crease in the elbow.
4. **Palpate (feel) for radial pulse.**
5. **Inflate manometer while palpating radial pulse.**
  - a. Note level at which radial pulse disappears.
  - b. Release air from cuff rapidly.
6. **Wait 15 seconds and then:**
  - a. Palpate brachial pulse.
  - b. Place ear tips of stethoscope in ears with tips facing forward.
  - c. Place stethoscope over brachial artery **not touching the cuff.**
7. **Measure blood pressure by:**
  - a. Rapidly inflating cuff to a level 20-30 mm Hg above point where radial pulse disappeared.
  - b. While slowly releasing the air in the cuff, listen for the Korotkoff sounds.  
  
**The first of two consecutive sounds is recorded as the systolic pressure.  
The diastolic is recorded at the level where the sound disappears.**
8. **When the sound disappears:**
  - a. Continue to deflate the cuff slowly for another 10 mm Hg.
  - b. If no further sounds are heard, rapidly release all air in the cuff and record the BP.

Name: \_\_\_\_\_ Pre-test: \_\_\_\_\_  
Post-test \_\_\_\_\_

## Blood Pressure Measurement Quiz

### Multiple choice (circle the correct answer)

1. Normal blood pressure in adults (age 18 or older) is:
  - a. 115/75
  - b. Below 120/80 mm Hg
  - c. Below 160/90 mm Hg
  - d. Depends on your age
  
2. The Korotkoff sound used to determine diastolic pressure in adults is:
  - a. The phase when all sounds disappear
  - b. The phase when the sounds suddenly become muffled
  - c. The last sound heard through the stethoscope
  
3. Which of the following can cause sounds to be heard down to zero?
  - a. Anemia
  - b. Vigorous exercise
  - c. Heavy pressure on the stethoscope
  - d. All of the above
  
4. A cuff with a bladder too small for the screenee's arm will result in:
  - a. An inaccurately high reading
  - b. An inaccurately low reading
  - c. Sounds heard down to zero
  
5. If the cuff is applied too loosely, the pressure reading will be:
  - a. Too low
  - b. Too high
  - c. Not affected
  
6. Common causes of errors in blood pressure measurement include:
  - a. Dirty mercury or dirty glass tube
  - b. Cuff applied over clothing
  - c. Leaks in the pressure bulb or tubing
  - d. Arm above or below heart level
  - e. All of the above

7. Some factors that can alter blood pressure are:
  - a. Smoking
  - b. Anxiety and other emotional states
  - c. Talking
  - d. Full bladder
  - e. All of the above
  - f. b & d only
  
8. Maximum Inflation Level refers to:
  - a. The maximum level to which the manometer can be inflated (300 mm Hg on some models – 250 mm Hg on others)
  - b. The maximum systolic blood pressure of each individual
  - c. The maximum level, as determined by palpating the radial pulse, to which the pressure in the cuff needs to be raised to accurately assess the systolic blood pressure.
  
9. When using the Auscultatory–Palpatory technique of blood pressure measurement, the pressure in the cuff should be raised:
  - a. 20-30 mm Hg higher than the point where the pulse disappeared
  - b. 30 mm Hg higher than the systolic pressure
  - c. 20 mm Hg higher than systolic pressure
  
10. While taking a blood pressure, the first sound heard through the stethoscope is at 150 mm Hg and sounds are heard from “150” until the last sound is heard at 78” mm Hg. What is the screenee’s Blood Pressure?
  - a. 150/78
  - b. 148/76
  - c. 150/76
  - d. 148/78
  
11. While taking a blood pressure, the screener is not sure whether the first sounds were heard at 170 mm Hg. What action should be taken?
  - a. Immediately deflate the cuff to “0”, wait 15-30 seconds and reinflate the cuff.
  - b. Immediately reinflate the cuff above 170 mm Hg and listen carefully for the first Korotkoff sounds.
  - c. Deflate the cuff to “0”. Immediately reinflate to 30 mm Hg above estimated systolic pressure and listen carefully for the first Korotkoff sounds.

12. When performing the Auscultatory-Palpatory technique of blood pressure measurement, you feel the radial pulse disappear at 175 mm Hg. What should you do next?
- Continue to inflate the cuff to 205 mm Hg; place the stethoscope over the brachial artery; slowly deflate the cuff and listen for the Korotkoff Sounds.
  - Place the stethoscope over the brachial artery, slowly deflate the cuff and listen for the Korotkoff sounds.
  - Deflate the cuff fully; wait 15-30 seconds; place the stethoscope over the brachial artery; reinflate to 205 mm Hg and listen for the Korotkoff sounds.
13. Which of the following will increase the loudness of the Korotkoff sounds?
- Have the screenee open and close their fist 8-10 times after the pressure cuff has been inflated above systolic level.
  - Rapidly inflating the cuff.
  - Raise the screenee's arm above heart level for several seconds – inflate the cuff above the systolic level while the arm is still elevated – lower the arm and proceed with the blood pressure measurement.
  - All of the above
  - a & c only
14. The screenee, a 25-year-old white male, has just run up five flights of stairs – what action should be taken?
- Have the screenee rest 5 minutes and then proceed with measurement
  - Wait until pulse has returned to normal before measuring blood pressure
  - Have screenee return in 30 minutes for Blood Pressure check – advise the screenee not to do any exercise or other strenuous activity before returning.
15. If the cuff is deflated too rapidly, which of the following might happen?
- Auscultatory gap may occur
  - Inaccurate reading
  - An increase in systolic pressure
  - a and b only

## True or False

Circle the correct answer.

1. To avoid incorrectly assessing the systolic blood pressure due to the auscultatory gap, the auscultatory-palpatory technique of blood pressure measurement should always be used.

**True**      **False**

2. A diagnosis of hypertension (high blood pressure) cannot be made from one Blood Pressure reading.

**True**      **False**

3. A high diastolic Blood Pressure indicates more of a risk for complications (in most people, especially those over age 55) than a high systolic.

**True**      **False**

4. You shouldn't have your Blood Pressure checked immediately after smoking.

**True**      **False**

5. If the initial blood pressure reading is greater than or equal to 120/80, two more readings should be taken.

**True**      **False**

# **Blood Pressure Measurement**

## ***Answer Key***

### **Multiple choice**

1. Below 120/80 mm Hg
2. The phase when all sounds disappear
3. All of the above
4. An inaccurately high reading
5. Too high
6. All of the above
7. All of the above
8. The maximum level, as determined by palpating the radial pulse, to which the pressure in the cuff needs to be raised to accurately assess the systolic blood pressure.
9. 20-30 mm Hg higher than the point where the pulse disappeared
10. 150/76
11. Immediately deflate the cuff to "0", wait 15-30 seconds and reinflate the cuff.
12. Deflate the cuff fully; wait 15-30 seconds; place the stethoscope over the brachial artery; reinflate to 205 mm Hg and listen for the Korotkoff sounds.
13. All of the above
14. Have screenee return in 30 minutes for Blood Pressure check – advise the screenee not to do any exercise or other strenuous activity before returning.
15. Inaccurate reading

### **True or False**

1. True
2. True
3. False
4. True
5. True

## References

American Academy of Family Physicians. [familydoctor.org](http://familydoctor.org)

American Heart Association. [americanheart.org](http://americanheart.org) National Heart, Lung and Blood Institute (NHLBI). [www.nhlbi.nih.gov/hbp](http://www.nhlbi.nih.gov/hbp)

Blood Pressure Guidelines. [www.nhlbi.nih.gov/guidelines/hypertension/index.htm](http://www.nhlbi.nih.gov/guidelines/hypertension/index.htm)

Blood Pressure Medications guidelines. [www.nhlbi.nih.gov/hbp](http://www.nhlbi.nih.gov/hbp)

Dash Eating Plan. Available from NHLBI. [www.nhlbi.nih.gov](http://www.nhlbi.nih.gov)

National High Blood Pressure Education Month.  
[www.nhlbi.nih.gov/hbp/index.html](http://www.nhlbi.nih.gov/hbp/index.html)

# Blood Pressure Measurement Specialist Evaluation Form

Name: \_\_\_\_\_ SS#: \_\_\_\_\_

Address: \_\_\_\_\_

E-mail: \_\_\_\_\_ Phone: \_\_\_\_\_

Session topic: Blood Pressure Measurement Specialist - Self-Study Course

Presenter(s): \_\_\_\_\_

1. Were the objectives clear? Yes No (Circle one)

2. Were the objectives achieved? (Circle only one number)

- 1= not achieved
- 2=marginal
- 3=acceptable
- 4=thoroughly achieved

3. Usefulness of information (Circle only one number)

- 1=not useful
- 2=background information only
- 3=clarified my understanding
- 4=direct application

4. Coverage of subject matter (Circle only one number)

- 1=material rudimentary
- 2=added little
- 3=added some
- 4=added significantly

Comments about presentation

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Thank you!

## Certification Form

By signing below, I certify that I have viewed the film “Blood Pressure Measurement for the 21<sup>st</sup> Century” and read the written course materials.

<u>Name</u>	<u>Address</u>	<u>Phone</u>	<u>E-mail</u>	<u>Signature</u>

**Send List of CEU applicants to:** Barbara Mueller, Virginia Department of Health, Division of Chronic Disease, 109 Governors Street, 10<sup>th</sup> floor, Richmond VA 23219. For more information, call (804) 864-7883.

## Are You at Risk of Stroke?

Take this quick quiz to find out!

**You can reduce your risk of stroke. Start by becoming aware of your risk factors — the personal characteristics and habits that may increase your chances of having a stroke. Some you can't change or control; some you can, by making a few changes in your daily habits or taking medicine as prescribed.**

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**The following factors may increase your risk. Check all boxes that apply to you.**

If you check 2 or more boxes, see a healthcare provider for a complete assessment of your risks!

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- AGE and SEX...** You are a man over 45 years old, OR you are a woman over 55 years old, OR you have passed menopause or had your ovaries removed and are not taking estrogen.
  - FAMILY HISTORY...** Your mother, father, sister, brother or grandparent had a stroke, OR your father or brother had a heart attack before age 55, OR your mother or sister had a heart attack before age 65.
  - Your **BLOOD PRESSURE...** is 120/80 mm Hg or higher, OR a health professional has said your blood pressure is too high, OR you don't know what your blood pressure is.
  - You **SMOKE...** OR live or work with people who smoke tobacco regularly.
  - You have **DIABETES...** a fasting blood sugar of 126 mg/dL or higher, OR you need medicine to control your blood sugar.
  - Your total **CHOLESTEROL...** is 200 mg/dL or higher, OR you don't know your level.
  - Your **HDL...** ("good") cholesterol is less than 40 mg/dL, OR you don't know your HDL cholesterol level.
  - Your **PHYSICAL ACTIVITY...** level is less than a total of 30 minutes on most days.
  - You are **OVERWEIGHT...** by 20 pounds or more for your height and build.
  - MEDICAL HISTORY...** You have been told that you have carotid artery disease, OR you have had a stroke or TIA (transient ischemic attack), OR you have a disease of the leg arteries, a high red blood cell count or sickle cell anemia.
  - You have atrial fibrillation, coronary heart disease or other heart condition(s), OR you have had a heart attack.
- 

Take charge of your health!

**Use this quiz to learn where to focus your efforts. Then, work with your healthcare provider to reduce, control or prevent as many risk factors as you can. You will be glad you did...and so will your loved ones.**

**For information about stroke and life after stroke, call us at 1-888-4-STROKE (1-888-478-7653) or contact your nearest American Heart Association. You can also visit us online at [StrokeAssociation.org](http://StrokeAssociation.org).**

## What should you do if a stroke strikes?

**Take action! If a stroke occurs, here are the most important things to remember:**

- Not all the warning signs occur in every stroke. Don't ignore signs of stroke, even if they go away!
- Check the time. When did the first symptom start? You will be asked this important question later.
- If you or someone with you has one or more stroke symptoms that last more than a few minutes, don't delay! Immediately call 9-1-1 or the emergency medical service (EMS) number so an ambulance (ideally with advanced life support) can quickly be sent for you.
- Stroke is a medical emergency. Every second counts!

## Stroke Warning Signs

- Sudden numbness or weakness of the face, arm or leg, especially on one side of the body
- Sudden confusion, trouble speaking or understanding
- Sudden trouble seeing in one or both eyes
- Sudden trouble walking, dizziness, loss of balance or coordination
- Sudden, severe headache with no known cause

If you or someone with you has one or more of these signs, don't delay! Immediately call 9-1-1 or the emergency medical services (EMS) number so an ambulance can be sent for you.

## Heart Attack Warning Signs

- Some heart attacks are sudden and intense, but most of them start slowly, with mild pain or discomfort. Here are some of the signs that can mean a heart attack is happening.
- Chest discomfort. Most heart attacks involve discomfort in the center of the chest that lasts more than a few minutes, or that goes away and comes back. It can feel like uncomfortable pressure, squeezing, fullness or pain.
- Discomfort in other areas of the upper body. Symptoms can include pain or discomfort in one or both arms, the back, neck, jaw or stomach.
- Shortness of breath. This may occur with or without chest discomfort.
- Other signs. These may include breaking out in a cold sweat, nausea or lightheadedness.

As with men, women's most common heart attack symptom is chest pain or discomfort. But women are somewhat more likely than men to experience some of the other common symptoms, particularly shortness of breath, nausea/vomiting, and back or jaw pain.

If you or someone you're with has any of these symptoms, call 9-1-1 immediately. Don't wait longer than five minutes before calling for help. You need to get to a hospital right away. (Calling 9-1-1 is almost always the fastest way to get lifesaving treatment.)