



Blood Pressure: Physiology and Effects

Peak Development Resources, LLC
P.O. Box 13267
Richmond, VA 23225

Phone: (804) 233-3707
Fax: (804) 233-3705
Email: editor@peakdev.com

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After reading the newsletter, the home health aide should be able to:

1. Identify factors that serve to control blood pressure.
2. Differentiate normal and abnormal blood pressure measurements.
3. Identify risk factors for hypertension and hypotension.
4. Describe techniques to measure blood pressure accurately.

Like all of the vital signs, blood pressure is an extremely important indicator of health. The cardiovascular system, as well as all body organs, depends on normal blood pressure to function. If blood pressure is too low, blood cannot circulate to the vital organs, resulting in organ damage and loss of consciousness. If blood pressure is too high, damage to the blood vessels and vital organs can result. Therefore, maintaining blood pressure within the normal range is very important.

As a home health aide, it is important to have an understanding of how blood pressure occurs, factors that affect it, and signs of abnormal function. This newsletter will discuss the effects of blood pressure on the body, including the physiology of blood pressure and factors affecting it. The role of the home health aide in measuring and understanding blood pressure readings will also be covered.



Regulation of Blood Pressure

Circulation occurs when the heart pumps, pushing blood through the vast network of blood vessels in the body. Blood pressure (BP) can be defined as the force of the circulating blood against the walls of the blood vessels. BP is determined by two main factors:

- cardiac output, which is the amount of blood pumped out of the heart. More blood being pumped out results in higher BP, and less blood pumped out lowers the BP. 
- the resistance of the blood vessels, also called systemic vascular resistance. This is determined mainly by the size and elasticity of the vessels. When vessels are smaller, or constricted, BP is higher. Larger, dilated blood vessels result in lower BP.

BP is controlled by special sensors, called pressure receptors, in the major arteries of the chest and neck. When these receptors sense that BP is either too high or too low, they transmit signals to the brain. The brain then takes action to change the BP, with the intention of bringing it back to normal. If the BP is too high, cardiac output is decreased by slowing the heart rate and the amount of blood pumped. Also, the blood vessels dilate. These actions lower the BP. If the BP is too low, adrenaline is released so that the heart rate increases and blood vessels constrict, raising the BP.

Blood Pressure and Normal Values

When blood pressure is measured, two values are obtained—the systolic and diastolic BP, written as 120/80. These values

are measured by a sphygmomanometer in millimeters of mercury (mm Hg). The top number is the systolic BP, which is the BP at its highest point, as the heart pumps blood out. The bottom number is the diastolic BP, which is the lowest BP, when the heart is resting between beats.



According to the American Heart Association, a normal adult BP is less than 120/80 mm Hg. Both the systolic (119 or less) and the diastolic (79 or less) numbers must meet these criteria in order to have normal BP. High blood pressure, hypertension, occurs when BP is 140/90 or higher. A disorder called pre-hypertension is diagnosed if the BP is 120/80–139/89. Low blood pressure, hypotension, may occur when BP drops to 90/50 or lower. Only one of the numbers, either systolic or diastolic, needs to be in the abnormal range in order to meet the criteria for these abnormal BP readings. For example, a blood pressure of 118/86 would be considered pre-hypertension, even though only one of the readings is abnormal.

The pulse pressure is also an important measurement. This is the difference between the systolic and diastolic BP. If the BP is 128/84, the pulse pressure is 44 mm Hg. Normal pulse pressure ranges from 30-50 mm Hg. Values over 60 may indicate stiffness of the arteries due to atherosclerosis (narrowed or blocked arteries).

Blood Pressure Risk Factors

Knowing how BP is regulated helps you to understand the factors that can result in high or low blood pressure for your clients. Both conditions can be very dangerous for your clients.

Hypertension can cause damage to blood vessels and vital organs, and may result in stroke, heart attack and atherosclerosis. There are usually no signs of hypertension. Risk factors may include increasing age, obesity, lack of exercise, African-American race, smoking, and a family history of hypertension.

Hypotension results in decreased blood flow to the brain and other vital organs. It can also cause dizziness, resulting in falls and injuries. Signs include dizziness, fainting, nausea, seeing “spots”, and cool, pale skin. It can be caused by:

Age: As people age, their ability to regulate BP

may become less effective. Postural hypotension is a drop in BP when rising to a standing position. This occurs because the brain is slow to constrict the blood vessels during position change, and hypotension results. The elderly are also at increased risk for hypotension after eating a large meal, which shunts more blood to the stomach.

Illnesses: Disease processes that can cause hypotension include dehydration, low blood sugar, heart failure, valve problems and hypothyroidism.

Medication: Medications that decrease cardiac output, increase the size of blood vessels, or decrease blood volume can cause hypotension. These include diuretics, heart medications such as beta blockers, and drugs to treat hypertension.



Taking Accurate Measurements

It is important to know how to take accurate BP readings, so that the client receives proper treatment. Choose the arm carefully. Do not take BP on an arm that has IV fluids, a surgical incision, injury, paralysis, a dialysis shunt, or cast. Also, do not use the arm on the side of breast surgery.

To ensure an accurate reading, the blood pressure cuff must be the correct size. It should be wide enough to cover about 2/3 of the upper arm. It should be long enough to wrap just once around the client’s arm. Remember, many elderly clients have very thin arms, and may need a pediatric-sized cuff. Wrap the cuff snugly around the client’s arm. Make sure the arm is supported on a pillow, table, or the bed to get the most accurate reading. Inflate the cuff only as high as you need to. Inflating it too high is very painful for the client. Feel the pulse as you inflate the cuff. When the pulse can no longer be felt, inflate the cuff another 30 mm Hg. Then release the valve and listen for the sounds indicating systolic and diastolic BP. Document the BP, including the position of the client when the BP was taken. BP can change based on position, such as sitting, standing, or lying down.

By understanding the factors that affect blood pressure and how to properly measure it, you can help to monitor and promote the health of your clients.



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NAME: _____ DATE: _____ UNIT: _____

Directions: Place the letter of the one best answer in the space provided.

- ____ 1. Blood pressure is best defined as the:
 - A. force of the blood against blood vessel walls
 - B. pumping action of the heart
 - C. amount of blood circulating through the blood vessels
 - D. pressure that occurs in the heart when a person sits or stands

- ____ 2. Blood pressure is determined mainly by the amount of blood pumped out by the heart and by the:
 - A. person's height and body weight
 - B. heart rate
 - C. resistance of the blood vessels
 - D. red blood cell count

- ____ 3. When blood vessels become larger, or dilate, blood pressure decreases.
 - A. True
 - B. False

- ____ 4. If blood pressure is too low, the body takes action to:
 - A. make the blood vessels larger
 - B. decrease cardiac output
 - C. release adrenaline
 - D. all of the above

- ____ 5. The bottom measurement of the blood pressure is called the diastolic BP.
 - A. True
 - B. False

- _____ 6. According to the American Heart Association, which of the following blood pressure measurements is considered normal?
- A. 106/80
 - B. 120/86
 - C. 136/92
 - D. none of the above
- _____ 7. A client with a blood pressure of 136/76 has a pulse pressure of:
- A. 36
 - B. 60
 - C. 76
 - D. 212
- _____ 8. Hypertension usually produces no signs or symptoms.
- A. True
 - B. False
- _____ 9. Which of the following clients is at highest risk for hypotension?
- A. Mr. M, who has atherosclerosis
 - B. Mrs. H, who is obese
 - C. Mr. R, who is African-American
 - D. Mrs. G, who has dehydration
- _____ 10. When taking a blood pressure, which of the following may lead to an **inaccurate** measurement?
- A. the arm is supported on a table, pillow, or bed
 - B. the width of the cuff covers about 2/3 of the upper arm
 - C. the cuff is wrapped twice around the arm
 - D. when the pulse is no longer felt, the cuff is inflated another 30 mm Hg

