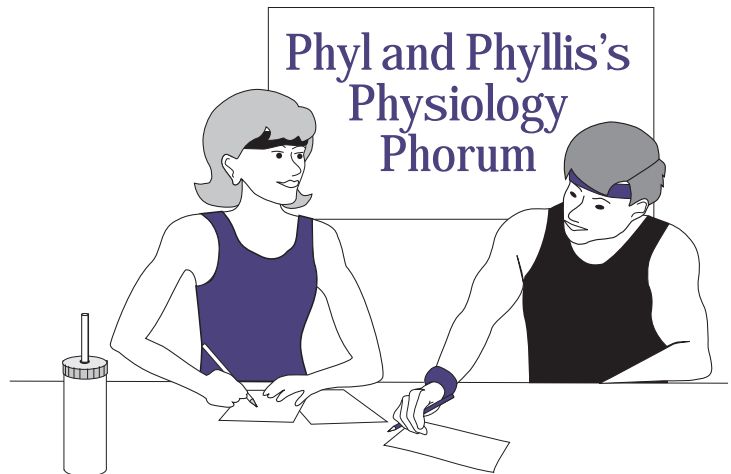


What is blood pressure?
How is it measured?
What is hypertension?



The cardiovascular system consists of the heart muscle and the blood vessels, the arteries and veins. The heart is a strong muscular pump that pumps blood to the lungs for gas exchange. It also pumps oxygen-rich blood throughout the body.

Blood is pumped out to tissues through a closed piping system of arteries of varying size. It is then returned from tissues by way of a piping system of veins of varying size.

This system of blood vessels is not rigid, but pliable. It varies throughout in its pliability. The system must be able to accommodate the rhythmic pulsations of the heart as well as fluctuations in pressure.

Blood is delivered selectively. Arterioles leading to capillaries rhythmically open and close depending on the second-to-second nutrient and oxygen demands of tissues. Speed and force of delivery must be appropriate.

Sometimes blood flows more slowly and less forcefully. Sometimes blood and its constituents surge through blood vessels like a rushing river. It flows turbulently and at high speeds to active tissues. Arterioles leading to active tissues open and those leading to inactive tissues contract or narrow.

Blood pressure is the force exerted by this rushing river of blood and its constituents on the inner walls of arteries. Blood pressure pushes blood and its nutrients and oxygen from larger blood vessels to the tiniest of capillaries that serve tissue cells.

Blood pressure is measured by an instrument called a sphygmomanometer. Two measurements of blood pressure are taken: systolic and diastolic. Systolic blood pressure is the force of blood exerted on the inner wall of arteries when the heart is contracted or in systole. Diastolic blood pressure is the force exerted when the heart is relaxed or in diastole.

Systolic pressure occurs when the heart is pumping a load of blood into an already-filled piping system of blood vessels. This creates higher pressure than when the heart is at rest or filling with blood during diastole. Normal blood pressures range from 90/60 to about 120/80. Blood pressure fluctuates according to body position and activity level.

The inner walls of arteries consist of a layer of cells that smoothly connect together, protecting the tissue beneath them. This protective layer is called the endothelial lining. It is designed to withstand the second-to-second fluctuations in pressure exerted against it.

Blood pressure is created by a combination of factors. The first factor is the push of the heart

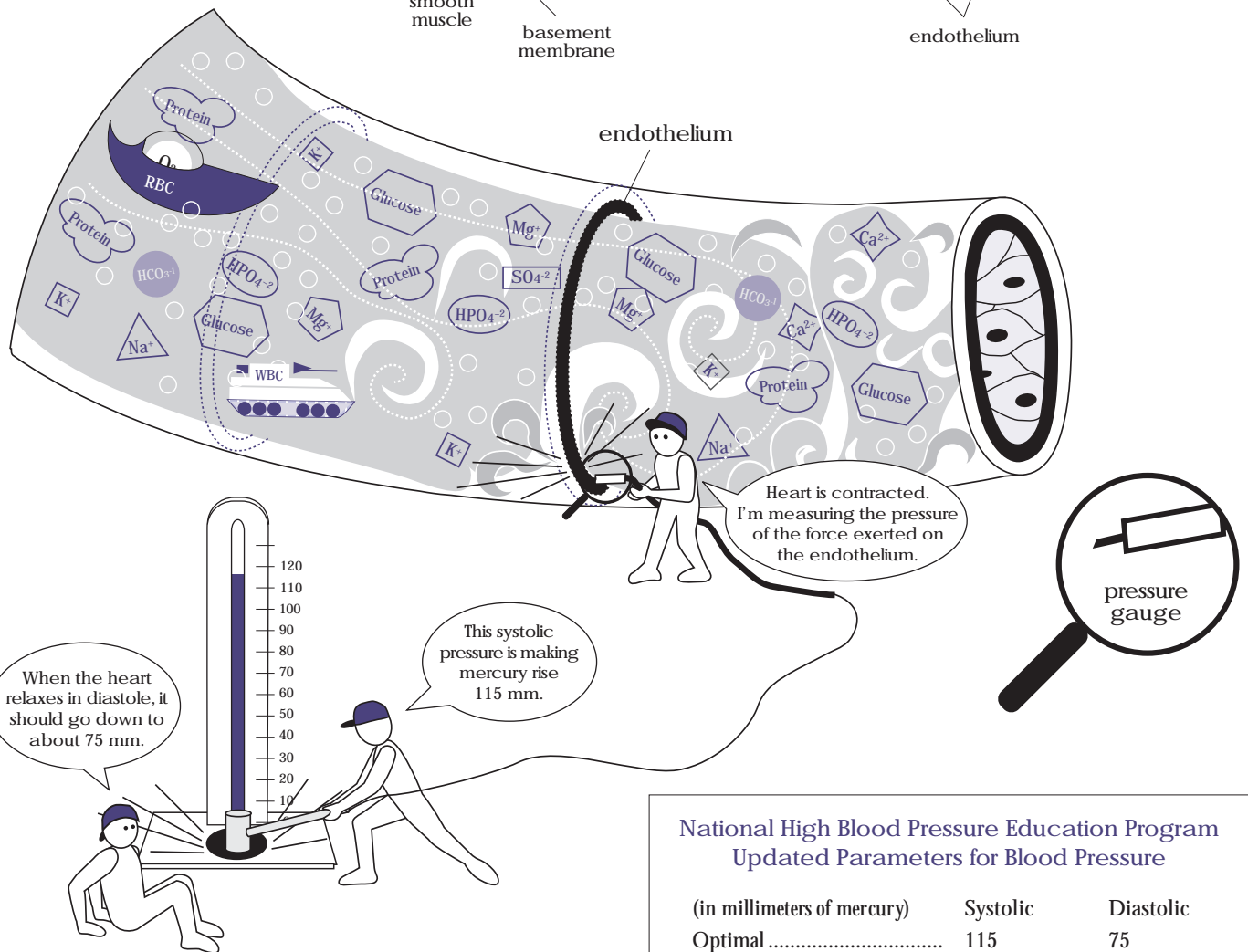
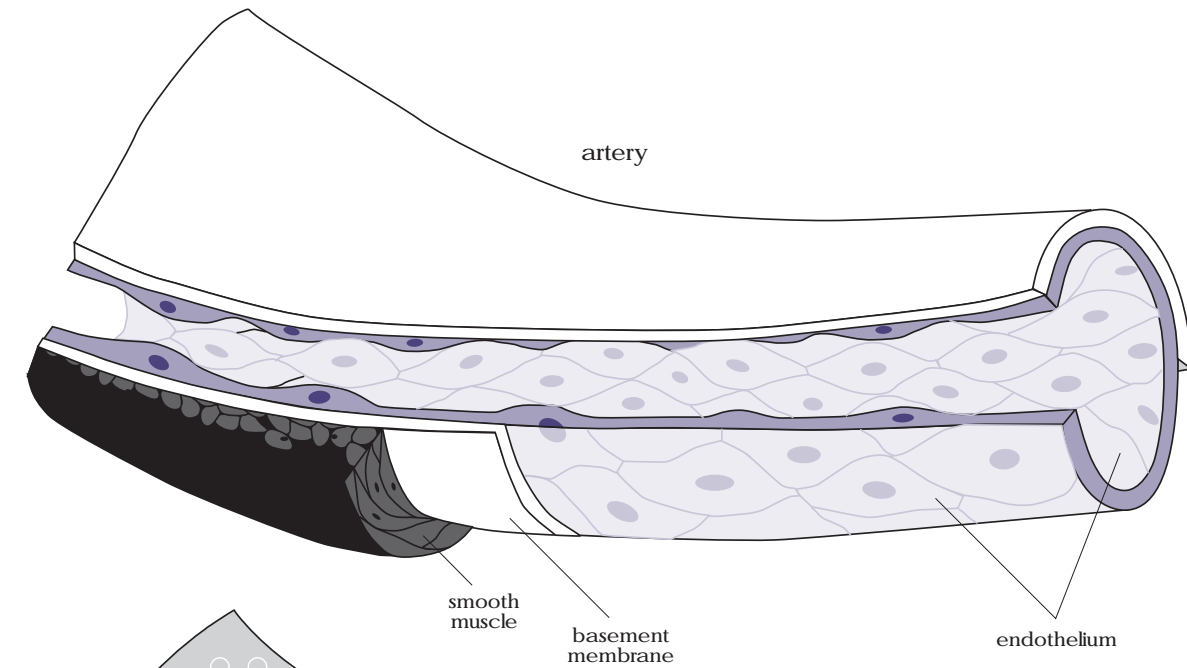
muscle as it pumps blood into the closed piping system. The second factor is the tightness of the piping system. The volume of fluid that fills the piping system influences its tightness. The tightness is also a matter of how many arterioles are open and how many are closed. If more are closed, the system is tighter and pressures are greater. If more are open, such as when the large muscles of the body are performing cardiovascular activity, pressures are lower.

The pressure resulting from constricted arterioles is called peripheral resistance; the greater the number of constricted arterioles, the greater the peripheral resistance. The heart has to exert more pressure to overcome this resistance.

Blood must arrive at active tissues quickly enough to deliver sufficient oxygen and nutrients. However, speed and pressure must be appropriate. When blood is not immediately required, turbulence and high pressure are not only unnecessary, but may in fact damage the smooth cell-to-cell connections of the endothelial lining. Chronically elevated blood pressure is a disorder called hypertension. A resting blood pressure of more than 120/80 is considered pre-hypertensive. A blood pressure of 140/90, once considered mildly hypertensive, is now considered high blood pressure and demands medical attention.

Hypertension damages the endothelial lining and exposes vulnerable tissues not only to more damage by elevated blood pressure, but also to invasion of this tissue by other blood constituents. The result of this damage and invasion contributes to the development of atherosclerosis. Atherosclerosis and hypertension are two of the most common diseases of the cardiovascular system.

Blood Pressure

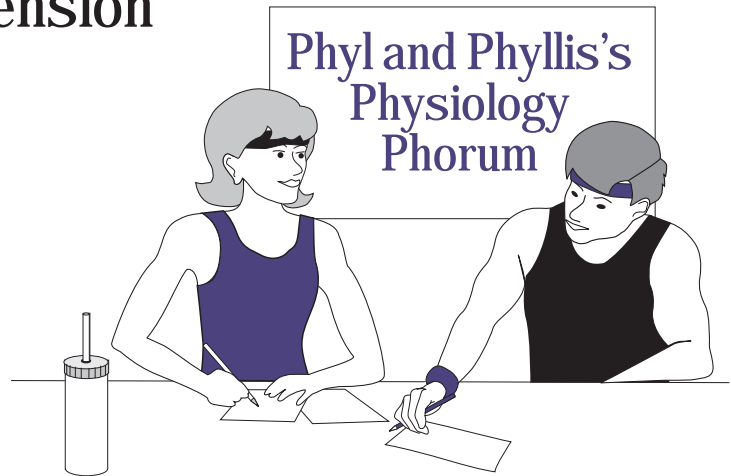


National High Blood Pressure Education Program Updated Parameters for Blood Pressure

(in millimeters of mercury)	Systolic	Diastolic
Optimal	115	75
Normal	120 or lower	80 or lower
Pre-hypertensive	120–139	80–85
High	140 or higher	90 or higher

How do diet and exercise help treat and prevent hypertension over the long term?

Regular cardiovascular exercise and a moderate-calorie, nutrient-dense, low-fat, low-sodium diet are beneficial to a hypertensive person for several reasons. First of all, excess body fat is lost so that the heart does not struggle to pump blood through a disproportionately over-fat body.



A heart that is exercised on a regular basis is a stronger and more efficient pump. The push of the heart muscle into the closed piping system requires less effort. More blood is pumped with greater ease and fewer beats. A diet low in sodium prevents excess fluid retention in the piping system.

Regular cardiovascular exercise helps to relax the arteries and stimulate the growth of additional networks of blood vessels. This loosening or spreading out of the piping system creates less peripheral resistance. These factors interact to result in lowered blood pressure at rest and during activity.

If hypertension cannot be controlled through diet and exercise, several antihypertensive medications may be prescribed. Once blood pressure is controlled, progressive resistance is encouraged. With a physician's approval, a low to moderate resistance program may be added to cardiovascular exercise.