

Hypertension

Blood pressure is a measurement of the force against the walls of your arteries as your heart pumps blood through your body. Hypertension is another term used to describe *high blood pressure*.

Blood pressure readings are usually given as two numbers -- for example, 120 over 80 (written as 120/80 mmHg). One or both of these numbers can be too high.

The top number is called the *systolic blood pressure*. The bottom number is called the *diastolic blood pressure*.

- Normal blood pressure is when your blood pressure is lower than 120/80 mmHg most of the time.
- High blood pressure (hypertension) is when your blood pressure is 140/90 mmHg or above most of the time.
- If your blood pressure numbers are 120/80 or higher, but below 140/90, it is called pre-hypertension.

If you have heart or kidney problems, or you had a stroke, your doctor may want your blood pressure to be even lower than that of people who do not have these conditions.

Alternative names: Hypertension; hbp

Types: Primary (1°) & Secondary (2°)

Causes

Causes of primary hypertension:

Hypertension is referred to as essential (primary) when the doctor is unable to identify a specific cause. It is by far the most common type of high blood pressure. The causes of this type, while unknown, are likely to be a complex combination of genetic, environmental, and other factors

Genetic factors. A number of genetic factors or interactions between genes play a major role in essential hypertension.

- After intense study, it has been revealed that the genes are those that regulate a group of hormones known collectively as the *angiotensin-renin-aldosterone system*. This system influences all aspects of blood pressure

control, including blood vessel contraction, sodium and water balance, and cell development in the heart.

- Studies suggest that some people with essential hypertension may inherit abnormalities of the *sympathetic nervous system*. This is the part of the autonomic nervous system that controls heart rate, blood pressure, and the diameter of the blood vessels.

Causes of secondary hypertension:

Secondary hypertension is caused by an underlying medical condition or other factor (such as medications) that elevates blood pressure. Many different medical conditions are associated with secondary hypertension. These conditions can also make high blood pressure more difficult to control. They include:

Diabetes. Hypertension is strongly associated with diabetes, both type 1 and type 2. Kidney damage (diabetic nephropathy) is generally the cause of high blood pressure in people with diabetes.

Kidney disease. Kidney disease is the most common cause of secondary hypertension, particularly in older people. In addition to diabetic nephropathy, many other types of kidney diseases can cause hypertension. Renal artery stenosis involves the narrowing of the renal artery and is usually caused by atherosclerosis. Other types of kidney disease associated with hypertension are polycystic kidney disease and renal parenchymal disease.

Coarctation of the aorta. Coarctation of the aorta is a birth defect that causes narrowing of the aorta, the main artery of the heart.

Endocrine disorders. Adrenal tumors (pheochromocytoma, aldosteronism), thyroid disorders, and Cushing syndrome can all cause secondary hypertension.

Medications. Many different prescription and over-the-counter drugs can temporarily raise blood pressure or worsen the existing high blood pressure. They include:

- Corticosteroids when given by oral or intravenously.
- Nonsteroidal anti-inflammatory drugs (NSAIDs) such as Ibuprofen, Naproxen and Aspirin

- Cold medicine decongestants containing pseudoephedrine can increase blood pressure in people with high blood pressure, although they appear to pose no danger for those with normal blood pressure.
- Oral contraceptives (birth control pills) increase the risk for high blood pressure, particularly in women who are older than 35 years, obese, smokers, have strong family history of hypertension, or some combination of these factors. Stopping the pill nearly always reduces blood pressure.

Symptoms:

Hypertension has aptly been called the "silent killer" because it usually produces no symptoms. Untreated hypertension increases slowly over the years. Everyone of 18 years and above should have their blood pressure measured on a regular basis. It is particularly important for anyone with risk factors to have their blood pressure checked regularly and to make appropriate lifestyle changes. Such recommendations are especially important for individuals who have prehypertension or hypertension, a family history of hypertension, are overweight, or are over age 40 years.

Symptoms of malignant hypertension:

In rare cases (less than 1% of all patients with hypertension), the blood pressure rises quickly (with diastolic pressure usually rising to 130 mm hg or higher), resulting in malignant or accelerated hypertension. This is a life-threatening condition and must be treated immediately. People with uncontrolled hypertension or a history of heart failure are at increased risk for this crisis.

People should call a doctor immediately if these symptoms occur:

- Drowsiness
- Confusion
- Headache
- Nausea
- Loss of vision
- Respiratory distress (difficulty in breathing)

Diagnosis:

Most physical examinations include a blood pressure measurement. Patients should not smoke, exercise, or drink caffeinated beverages within 30 minutes before their blood pressure measurement.

Measuring blood pressure:

- The standard instrument used to measure blood pressure is called a *sphygmomanometer*. Measurements are given as units of mercury, which has filled the central column in standard sphygmomanometers for years. (Modern devices are designed to prevent mercury spillage.)
- An inflatable cuff with a meter attached is placed around the patient's arm over the artery while the patient is seated, their back is supported, and the arm being used is around the level of the heart. The inflated cuff briefly interrupts the flow of blood in the artery, which then resumes as the cuff is slowly deflated.
- The person taking the blood pressure reading listens through a stethoscope. These pumping sounds register on a gauge attached to the cuff.
- The first pumping sound your health care provider hears is recorded as the *systolic pressure*, and the last sound is the *diastolic pressure*.
- If a first blood pressure reading is above normal, the health professional may take two or more measurements separated by 2 minutes with the patient sitting or lying down. Another measurement may be taken after the patient has been standing for 2 minutes. If the measurements are still elevated, your health care provider should take blood pressure readings from both arms.

Although this test has been used for more than 90 years, it is not completely accurate or sensitive. The following factors can cause a falsely low pressure reading:

- An arm cuff that is too wide
- Dehydration

Falsely high pressure can result from:

- An arm cuff that is too small
- Stress
- Recently consuming foods or beverages (such as coffee) that raise blood pressure

- Recent tobacco exposure
- Recent exercise

Blood pressure readings in a office/working place, taken by a doctor are more likely to be higher than readings measured at home. This can be caused by "*white coat hypertension*," which is blood pressure that is only elevated during a doctor's office visit. It is defined as a daytime blood pressure away from the doctor's office of less than 135/85 mmHg and no evidence of complications of blood pressure elsewhere in the body. Patients with white-coat hypertension may require follow up for additional blood pressure readings.

Ambulatory monitoring

Doctors may ask some patients to use special ambulatory monitoring device for a 24-hour period. The device checks blood pressure about every 15 - 30 minutes during the day and night and provides a read-out of blood pressure measurements for the doctor. Ambulatory monitoring may be used for patients who have borderline high blood pressure or for those who have had difficulty keeping their blood pressure under control. It can also help distinguishing between "true and white-coat hypertension". Ambulatory monitoring can also be helpful for diagnosing children with suspected high blood pressure.

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The AHA recommends:

- Purchase a blood pressure monitor with cuffs that fit on the upper arm. Wrist monitors are not recommended. Make sure that the cuff is of the right size (one size does not fit all).
- Ask your doctor to show you the proper way to use the monitor. Your arm should be supported, with the upper arm at heart level and feet on floor (back supported, legs uncrossed).
- Take two or three readings at a sitting, 1 minute apart, while resting in a seated position. It is important to take the readings at the same time each day, such as morning and night. Your doctor may suggest what specific times readings should be taken.
- The target goal of a reading is under 135/85mmHg or less than 130/80mmHg in high-risk patients.

Blood pressure variations at home. In general, everyone's blood pressure varies in the same way throughout a given day. In monitoring at home, it is important to note these changes:

- Blood pressure is usually highest from morning to mid-afternoon.
- It normally dips to its lowest level during sleep. Some people (particularly postmenopausal women) have a condition called *Nondipper hypertension*, in which blood pressure does not fall at night.
- Upon waking, blood pressure in most people typically increases suddenly. In people with severe high blood pressure, this is the highest risk period for heart attack and stroke.

Physical examination for complications of hypertension

If blood pressure is elevated, the doctor will check the patient's pulse rate, examine the back of the eye, examine the neck for distended veins or an enlarged thyroid gland, check the heart for enlargement and murmurs, and examine the abdomen and check the pulse in legs.

Medical history

If hypertension is suspected, the doctor should obtain the following information:

- A family and personal medical history, especially incidence of high blood pressure, stroke, heart problems, kidney disease, or Diabetes.
- Risk factors for heart disease and stroke, including tobacco use, high salt intake, obesity, physical inactivity, habit of smoking/consuming alcoholic drinks and unhealthy cholesterol levels.
- Any medications being taken.
- Any symptom that might indicate so-called secondary hypertension (that is, caused by another disorder). Such symptoms include headache, heart palpitations, excessive sweating, muscle cramps or weakness, or excessive urination.
- Any emotional or environmental factors that could affect blood pressure.

Laboratory and other tests

If a physical examination indicates hypertension, additional tests may help determine whether it is secondary hypertension caused by another medical disorder) and whether organ damage is present.

Blood tests and urine analysis. These tests are performed to check for a number of factors, including potassium levels, cholesterol, blood sugar (to screen for diabetes), infection, kidney function, and other possible problems. Measuring blood levels of the urine protein creatinine, for example, is important for all hypertensive patients in order to determine kidney damage.

Tests to evaluate the heart. These tests include:

- An *electrocardiogram* (ECG) is performed on most patients in the doctor's office.
- An exercise stress test may be needed for patients who also have symptoms of coronary artery disease.
- An *echocardiogram* (ECHO) is needed when it would help the doctor decide whether to start treatment. Most of the time this test is not necessary for patients who have only hypertension and no other symptoms.

Tests to evaluate the kidneys. These tests include:

- A *Doppler or Duplex test* may be performed to see whether one of the arteries supplying blood to the kidney is narrowed, a condition called *renal artery stenosis*.
- An ultrasound may also be performed to examine the kidneys.

Treatment

Patients with hypertension should work with their doctors to set blood pressure goals based on individual risk factors. Lifestyle changes are important for everyone, and patients should routinely monitor their blood pressure at home. Drug treatment needs to be planned on an individual basis. About 30% of patients with hypertension are not treated at all, and less than 50% have adequately controlled blood pressure.

It is not always clear when drugs should be started, particularly for people with prehypertension or mild high blood pressure. To help make treatment choices, the US national heart, lung, and blood institute has created categories (groups a, b, and c) according to a patient's risk factors for heart disease. Applying these categories to the severity of hypertension helps determine whether lifestyle changes alone or medications are needed.

Treatment recommendations by stage and risk groups			
Risk groups	Blood pressure stages (systolic/diastolic)		
	Prehypertension (120 - 139/80 - 89) mmHg	Mild (stage 1) blood pressure (140 - 159/90 - 99) mmHg	Moderate-to-severe (stage 2) blood pressure (systolic pressure over 160 or diastolic pressure over 100)
Risk group a			
Have no risk factors for heart disease.	Lifestyle changes only. (exercise and dietary program with regular monitoring.)	Year trial of lifestyle changes only. If blood pressure is not lowered after 1 year, add drug treatments.	Lifestyle changes and medications.
Risk group b			
Have at least one risk factor for heart disease* (excluding diabetes) but have no target organ damage (such as in the kidneys, eyes, or heart, or existing heart disease).	Lifestyle changes only.	6-month trial of lifestyle changes only. If blood pressure is not lowered after 6 months, add drug treatments. Medications considered for patients with multiple risk factors.	Lifestyle changes and medications.

Risk group c			
Have diabetes with or without target organ damage and existing heart disease (with or without risk factors for heart disease).	Lifestyle changes and medications.	Lifestyle changes and medications.	Lifestyle changes and medications.

Drug treatment

Most anti-hypertensive medications fall into the following categories:

- Diuretics rid the body of extra water and salt. Diuretics are usually the first-line treatment for high blood pressure.
- Beta blockers block the effects of adrenaline and ease the heart's pumping action.
- Angiotensin converting enzyme (ACE) inhibitors reduce the production of angiotensin, a chemical that causes arteries to narrow.
- Angiotensin-receptor blockers (ARBs) block angiotensin, another chemical that constricts the arteries.
- Calcium-channel blockers (CCBs) decrease the contractions of the heart and widen the blood vessels
- Vasodilators widen blood vessels.

In about half of the patients a single-drug regimen can control mild-to-moderate hypertension. More severe hypertension often requires a combination of two or more drugs. Each drug has specific benefits, but their effects may vary depending on the individual patient.

Side effects and problems in compliance. Whatever the difficulties, compliance with a drug and lifestyle program is worth the effort. It is very important that patients discuss medication concerns with their doctors. If current blood pressure drugs are causing uncomfortable side effects, the doctor may adjust dosages or combinations.

Withdrawal from anti-hypertensive medications. Patients whose blood pressure has been well-controlled and who are able to maintain a healthy life style may be able to withdraw from medications. They should do so in a step-

down manner (gradual reduction) and be monitored regularly. Stopping too quickly can have adverse effects, including serious effects on the heart. The highest success rates are more likely in those who lose weight and reduce salt intake, in patients who have been treated with a single drug, and in those who have maintained lower systolic blood pressure during treatment. People over 75 years old may have more trouble than younger adults in maintaining normal blood pressure after withdrawal.

Treatment of resistant hypertension

Some patients are unable to meet target blood pressure goals despite consistently following a treatment plan that includes three or more medications. Factors that contribute to *Resistant hypertension* include older age (especially age 75 or older), high baseline blood pressure, and medical conditions such as obesity, sleep apnea, diabetes, and chronic kidney disease. Treating any underlying medical condition is important for helping control blood pressure. Patients should be sure to adhere to lifestyle changes (weight loss and dietary changes) and may require modifications to their drug regimens. Patients with severe resistant hypertension should consider seeking a consultation with a doctor who specializes in treating high blood pressure.

Treatment of children

Children with high blood pressure should first be treated with lifestyle changes, including weight reduction, increased physical activity, and diet modification. If blood pressure is not controlled with lifestyle changes, drug treatment may be required. Results of studies evaluating outcomes of children with hypertension suggest that early abnormalities, including enlarged heart and abnormalities in the kidney and eyes, may occur even in children with mild hypertension. Children and adolescents with hypertension should be monitored and evaluated for any early organ damage. Secondary hypertension (high blood pressure due to another disease or drug) is more common in children than adults.

Outlook (prognosis)

Most of the time, high blood pressure can be controlled with medicine and lifestyle changes.

When blood pressure is not well controlled, you are at risk for:

- Bleeding from the aorta, the large blood vessel that supplies blood to the abdomen, pelvis, and legs
- chronic kidney disease
- Heart attack and heart failure
- Poor blood supply to the legs
- Problems with your vision
- stroke

When to contact a medical professional:

If you have high blood pressure, you need to have regular appointments with your doctor.

Even if you have not been diagnosed with high blood pressure, it is important to have your blood pressure checked during your yearly check-up, especially if someone in your family has or had high blood pressure.

Call your health care provider right away if home monitoring shows that your blood pressure is still high.

Prevention

The same lifestyle changes you may follow to help control your blood pressure will also help prevent high blood pressure from occurring in most people.