Patient education: High blood pressure treatment in adults (Beyond the Basics)

Author: Johannes FE Mann, MD
Section Editor: George L Bakris, MD
Deputy Editor: John P Forman, MD, MSc

All topics are updated as new evidence becomes available and our peer review process is complete.
Literature review current through: Sep 2016. | **This topic last updated:** Apr 18, 2016.

HIGH BLOOD PRESSURE OVERVIEW — Hypertension is the medical term for high blood pressure, namely a blood pressure above 140 mmHg systolic (upper value) and/or above 90 mmHg diastolic (lower value). Untreated hypertension increases the strain on the heart and arteries, eventually causing organ damage. Hypertension increases the risk of heart failure, heart attack (myocardial infarction), kidney failure leading to dialysis, and stroke. Fortunately, treatments to lower blood pressure are usually easy to take and can help prevent health problems.

This topic will review the treatment of primary hypertension (formerly called "essential" hypertension). Primary hypertension does not have a known underlying cause. Other topics about hypertension are also available. (See "Patient education: High blood pressure in adults (Beyond the Basics)" and "Patient education: High blood pressure, diet, and weight (Beyond the Basics)".)

LIFESTYLE CHANGES — Making lifestyle changes is an important first step in the treatment of high blood pressure. In some patients, lowering sodium and alcohol intake, keeping weight in the ideal range, engaging in regular aerobic exercise, and stopping smoking can be sufficient to control high blood pressure. As an example, most professional societies suggest that sodium intake should be less than 2.3 grams (2300 milligrams [mg]) per day, which equals 6 grams or less of table salt. Such lifestyle changes can lower blood pressure as effectively as therapy with one blood pressure-lowering drug. (See "Patient education: High blood pressure, diet, and weight (Beyond the Basics)".)

However, many patients also require one or more medications to lower the blood pressure. The following is an overview of the different types of drugs that may initially be prescribed.

HIGH BLOOD PRESSURE MEDICATIONS — There are various medications that are commonly used to treat high blood pressure.

Some people will respond well to one drug but not to another. Therefore, it may take time to determine the right drug(s) and proper dose to effectively lower blood pressure with a minimum of side effects.

Although generally well tolerated, high blood pressure medications can cause side effects; the side effects depend upon the specific drug given, dose, and other factors. Some side effects result from lowering of the blood pressure, usually if the blood pressure lowering is abrupt, and therefore can be caused by any high blood pressure medication. These include dizziness, drowsiness, lightheadedness, or feeling tired. They usually subside after a few weeks when the body has adapted to the lower blood pressure.

Diuretics — Diuretics lower blood pressure mainly by causing the kidneys to excrete more sodium and water, which reduces fluid volume throughout the body and widens (dilates) blood vessels.

The diuretics used to treat high blood pressure are thiazides (chlorthalidone, hydrochlorothiazide, and indapamide). In some cases, a potassium supplement or a potassium-sparing diuretic (amiloride, spironolactone, or triamterene) are given in combination with a thiazide diuretic because the thiazides can cause potassium deficiency since increased amounts of potassium are excreted in the urine.

Side effects — Side effects are uncommon with low doses of thiazide diuretics. Weakness, muscle cramps, and other symptoms can occur as a result of decreased sodium, potassium, and water level. Other symptoms may include reversible impotence and gout attacks.

ACE inhibitors — Angiotensin-converting enzyme (ACE) inhibitors block production of the hormone, angiotensin II, a compound in the blood that causes narrowing of blood vessels and increases blood pressure. By reducing production of angiotensin II, ACE inhibitors allow blood vessels to widen, which lowers blood pressure and improves heart output.

The available ACE inhibitors include benazepril, captopril, enalapril, fosinopril, lisinopril, moexipril, perindopril, quinapril, ramipril, and trandolapril.

Side effects — In some patients, ACE inhibitors cause a persistent dry hacking cough that is reversible when the medication is stopped. Less common side effects include dry mouth, nausea, rash, muscle pain, or occasionally, kidney dysfunction and elevated blood potassium.

A potentially serious complication of ACE inhibitors is angioedema, which occurs in 0.1 to 0.7 percent of people. People with angioedema rapidly (minutes to hours after taking the medication) develop swelling of the lips, tongue, and throat, which can interfere with breathing. These symptoms are a medical emergency, and the ACE inhibitor should be discontinued.

Angiotensin II receptor blockers — The angiotensin II receptor blockers (ARBs) block the effects of angiotensin II on cells in the heart and blood vessels. Similar to ACE inhibitors, ARBs can widen blood vessels, lower blood pressure, and improve heart output.

The available ARBs include azilsartan, candesartan, irbesartan, losartan, olmesartan, telmisartan, and valsartan.

Side effects — The main difference between ARBs and ACE inhibitors is that ARBs do not produce cough. Some people who take ARBs experience headache, nausea, dry mouth, abdominal pain, or other side effects. Angioedema is less common with ARBs than with ACE inhibitors.

Calcium channel blockers — Calcium channel blocker drugs reduce the amount of calcium that enters the smooth muscle in blood vessel walls and heart muscle. Muscle cells require calcium to contract. Thus, by inhibiting the flow of calcium across muscle cell membranes, calcium channel blockers cause muscle cells to relax and blood vessels to dilate, reducing blood pressure as well as reducing the force and rate of the heartbeat.

There are two major categories of calcium channel blockers:

- Dihydropyridines, including amlodipine, felodipine, isradipine, nicardipine, nifedipine, and nisoldipine
- Nondihydropyridines, including diltiazem and verapamil

Side effects — The side effects of calcium channel blockers vary with the specific agent used. Patients who take dihydropyridines may develop headache, flushing, nausea, overgrowth of the gum tissue (gingival hyperplasia), or swelling of the extremities (peripheral edema).

Nondihydropyridines can occasionally cause the heart rate to slow too much. Other side effects may include headache and nausea with diltiazem or constipation with verapamil.

Beta blockers — Beta blockers block some of the effects of the sympathetic nervous system, which increases the heart rate and raises blood pressure with stress and/or activity. Beta blockers lower blood pressure in part by decreasing the rate and force at which the heart pumps blood.

The available beta blockers include acebutolol, atenolol, betaxolol, bisoprolol, metoprolol, nadolol, nebivolol, pindolol, propranolol, and timolol.

Some beta blockers have combined activity, blocking both the beta and alpha receptors (see next section). These include labetalol and carvedilol.

Side effects — Beta blockers may worsen symptoms of asthma, other lung diseases, or blood vessel disease outside the heart (such as peripheral vascular disease). As a result, they normally are not prescribed for patients with such conditions. (See "Patient education: Peripheral artery disease and claudication (Beyond the Basics)".)

In addition, beta blockers may mask symptoms of low blood sugar (hypoglycemia) in people with diabetes who are treated with insulin. Beta blockers can also cause fatigue, insomnia, strange dreams, a decreased ability to exercise, a slow heart rate, rash, and cold hands and feet due to reduced blood flow to the limbs.

Alpha blockers — Alpha blockers relax or reduce the tone of involuntary (ie, smooth) muscle in the walls of blood vessels (vascular smooth muscle), allowing the vessels to widen, thereby lowering blood pressure. An increase in blood vessel diameter is known as "vasodilation." The available alpha blockers include doxazosin, prazosin, and terazosin.

Side effects — Alpha blockers can cause dizziness, particularly when standing up, and particularly with the first few doses, low blood pressure when standing, or other side effects. They also may increase the risk of developing heart failure. For these reasons, they are not frequently used as a first-line treatment of primary hypertension (formerly called "essential" hypertension). A possible exception is in an older man with symptoms related to enlargement of the prostate; such symptoms may be relieved by alpha blocker therapy. (See "Patient education: Benign prostatic hyperplasia (BPH) (Beyond the Basics)".)

Direct vasodilators — Direct vasodilators relax or reduce the tone of blood vessels. The two drugs in this class are hydralazine and minoxidil. Minoxidil is typically used in only severe or resistant high blood pressure.

Side effects — Side effects associated with direct vasodilators include headache, constipation, swelling in the lower legs, and rapid heartbeat. These effects are usually minimized by combining the vasodilator with a beta blocker. Minoxidil also may cause excessive hair growth. Rogaine, which is used to treat baldness, is a form of minoxidil that is applied to the skin.

THE PROPER HIGH BLOOD PRESSURE MEDICATION FOR YOU — A healthcare provider will take several factors into account when determining which antihypertensive drug should be tried first. In addition to considering the effectiveness and potential side effects, he or she will consider the person's general health, sex, age, and race; the severity of the high blood pressure; any additional, underlying medical conditions; and whether particular drugs should not be used.

Certain antihypertensive drugs are specifically recommended for the treatment of particular conditions, even if the person does not have high blood pressure. In many cases, a person with one of these conditions also has high blood pressure. As examples:

- An angiotensin-converting enzyme (ACE) inhibitor is recommended for people with diabetes mellitus who have increased levels of protein in the urine (proteinuria), heart failure, or a prior heart attack. (See "Patient education: Preventing complications in diabetes mellitus (Beyond the Basics)".)
- Beta blockers are recommended for people with heart failure or a prior heart attack. (See "Patient education: Heart failure (Beyond the Basics)" and "Patient education: Heart attack recovery (Beyond the Basics)".)
- Beta blockers or calcium channel blockers are recommended to control symptoms in people with angina pectoris, which is temporary chest pain caused by an inadequate oxygen supply to heart muscle in patients with coronary artery disease. (See "Patient education: Medications for angina (Beyond the Basics)".)

There are also certain antihypertensive agents that are not recommended in some people. Some examples include:

- ACE inhibitors and angiotensin II receptor blockers (ARBs) (and many other medications not used to treat high blood pressure) are not recommended during pregnancy.
- Diuretics can worsen gout. (See "Patient education: Gout (Beyond the Basics)".)

Thus, it is important to mention all current and previous medical problems to the healthcare provider to determine which medication is best.

Combination drug therapy — If a person has very high blood pressure (eg, 160/100 mmHg or higher), then combination therapy with two drugs at the same time rather than monotherapy with one drug may be the **initial step** in blood pressure treatment. In addition, some people who are first treated with one drug do not have an adequate response with good control of the blood pressure. If this happens, a second medication may be added. Other options include raising the dose of the first drug or substituting a different drug since some people will respond to a different type of high blood pressure medication.

Adding a second drug, particularly as a single-pill combination, may be:

- More effective than increasing the dose of the first drug
- Associated with fewer side effects, many of which occur more frequently with higher doses

WHERE TO GET MORE INFORMATION — Your healthcare provider is the best source of information for questions and concerns related to your medical problem.

This article will be updated as needed on our web site (www.uptodate.com/patients). Related topics for patients, as well as selected articles written for healthcare professionals, are also available. Some of the most relevant are listed below.

Patient level information — UpToDate offers two types of patient education materials.

The Basics — The Basics patient education pieces answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials.

Patient education: High blood pressure in adults (The Basics)
Patient education: Controlling your blood pressure through lifestyle (The Basics)
Patient education: Medicines for high blood pressure (The Basics)
Patient education: Preeclampsia (The Basics)
Patient education: Medicines for heart failure (The Basics)
Patient education: Medicines after an ischemic stroke (The Basics)
Patient education: Heart attack recovery (The Basics)
Patient education: Medicines after a heart attack (The Basics)
Patient education: Recovery after coronary artery bypass graft surgery (CABG) (The Basics)
Patient education: Lowering the risk of having another stroke (The Basics)
Patient education: Renovascular hypertension (The Basics)
Patient education: High blood pressure emergencies (The Basics)
Patient education: Glomerular disease (The Basics)

Beyond the Basics — Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are best for patients who want in-depth information and are comfortable with some medical jargon.

Patient education: High blood pressure in adults (Beyond the Basics)
Patient education: High blood pressure, diet, and weight (Beyond the Basics)
Patient education: Peripheral artery disease and claudication (Beyond the Basics)
Patient education: Benign prostatic hyperplasia (BPH) (Beyond the Basics)
Patient education: Preventing complications in diabetes mellitus (Beyond the Basics)
Patient education: Heart failure (Beyond the Basics)
Patient education: Heart attack recovery (Beyond the Basics)
Patient education: Medications for angina (Beyond the Basics)
Patient education: Gout (Beyond the Basics)

Professional level information — Professional level articles are designed to keep doctors and other health professionals up-to-date on the latest medical findings. These articles are thorough, long, and complex, and they contain multiple references to the research on which they are based. Professional level articles are best for people who are comfortable with a lot of medical terminology and who want to read the same materials their doctors are reading.

Ambulatory and home blood pressure monitoring and white coat hypertension in adults
Can therapy be discontinued in well-controlled hypertension?
Cardiovascular risks of hypertension
Choice of drug therapy in primary (essential) hypertension
Definition, risk factors, and evaluation of resistant hypertension
Diet in the treatment and prevention of hypertension
Hypertension: Who should be treated?
Overview of hypertension in adults
Patient adherence and the treatment of hypertension
Perioperative management of hypertension
Prehypertension
Salt intake, salt restriction, and primary (essential) hypertension
Blood pressure measurement in the diagnosis and management of hypertension in adults
Treatment of hypertension in the elderly patient, particularly isolated systolic hypertension
Treatment of resistant hypertension
What is goal blood pressure in the treatment of hypertension?

The following organizations also provide reliable health information.

- National Library of Medicine

  (www.nlm.nih.gov/medlineplus/highbloodpressure.html)

- National Heart, Lung, and Blood Institute (NHLBI)

  (www.nhlbi.nih.gov/health/dci/Diseases/Hbp/HBP_WhatIs.html)

- American Heart Association

  (www.heart.org/HEARTORG/Conditions/HighBloodPressure/AboutHighBloodPressure/About-High-Blood-Pressure_UCM_002050_Article.jsp)

- The Hormone Foundation

  (www.hormone.org)

[1-7]

Topic 4424 Version 20.0