

HYPERTENSION

- **Hypertension**, commonly referred to as "**high blood pressure**", is a medical condition in which the [blood pressure](#) is chronically elevated

- Hypertension can be classified as either **essential** (primary) or **secondary**.
Essential hypertension indicates that no specific medical cause can be found to explain a patient's condition.
Secondary hypertension indicates that the high blood pressure is a result of (i.e. secondary to) another condition, such as kidney disease or certain tumors (especially of the adrenal gland).

There are several categories of blood pressure, including:

- **Prehypertension:** 120-139/80-89
- **Stage 1 hypertension:** 140-159/90-99
- **Stage 2 hypertension:** 160-179/100-109
- Stage 3 hypertension: 180 and above/ 110 and above.

- Persistent hypertension is one of the risk factors for [strokes](#), [heart attacks](#), [heart failure](#) and arterial [aneurysm](#), and is a leading cause of [chronic renal failure](#)

- Hypertension is considered to be present when a person's systolic blood pressure is consistently 140mmHg or greater, and/or their diastolic blood pressure is consistently 90mmHg or greater

MEASURING BLOOD PRESSURE

- Diagnosis of hypertension is generally on the basis of a persistently high blood pressure. Usually this requires three separate measurements at least one week apart. Exceptionally, if the elevation is extreme, or end-organ damage is present then the diagnosis may be applied and treatment commenced immediately.

- Obtaining reliable blood pressure measurements relies on following several rules and understanding the many factors that influence blood pressure reading

For instance, measurements in control of hypertension should be at least 1 hour after caffeine, 30 minutes after smoking and without any stress.

- Cuff size is also important. The bladder should encircle and cover two-thirds of the length of the upper arm.

- The patient should be sitting for a minimum of five minutes.
- The patient should not be on any adrenergic stimulants, such as those found in many cold medications.

ETIOLOGY OF SECONDARY HYPERTENSION

Renal hypertension

- Hypertension produced by diseases of the [kidney](#). A simple explanation for renal vascular hypertension is that decreased perfusion of renal tissue due to [stenosis](#) of a main or branch renal artery activates the renin-angiotensin system.

Adrenal hypertension

- Hypertension is a feature of a variety of adrenal cortical abnormalities. In primary aldosteronism there is a clear relationship between the aldosterone-induced sodium retention and the hypertension.

- In patients with [pheochromocytoma](#) increased secretion of [catecholamines](#) such as [epinephrine](#) and [norepinephrine](#) by a tumor (most often located in the adrenal medulla) causes excessive stimulation of [adrenergic receptors], which results in peripheral vasoconstriction and cardiac stimulation. This diagnosis is confirmed by demonstrating increased urinary excretion of epinephrine and norepinephrine and/or their metabolites.

- [Hypercalcemia](#)
- Coarctation of the aorta
- Diet
- Certain medications, especially NSAIDs and steroids can cause hypertension. they inhibits the 11-hydroxysteroid hydrogenase enzyme which allows cortisol to stimulate the Mineralocorticoid Receptor (MR) which will lead to effects similar to hyperaldosteronism, which itself is a cause of hypertension.

Advanced Age

- Over time, the number of [collagen](#) fibers in artery and arteriole walls increases, making blood vessels stiffer. With the reduced elasticity comes a smaller cross-sectional area in systole, and so a raised mean arterial blood pressure.

PATHOPHYSIOLOGY

- Most of the secondary mechanisms associated with hypertension are generally fully understood, and are outlined at [secondary hypertension](#). However, those associated with essential (primary) hypertension are far less understood. What is known is that [cardiac output](#) is raised early in the disease course, with [total peripheral resistance](#) (TPR) normal; over time cardiac output drops to normal levels but TPR is increased. Three theories have been proposed to explain this:

- Inability of the kidneys to excrete sodium, resulting in [natriuretic](#) factors such as [Atrial Natriuretic Factor](#) being secreted to promote salt excretion with the side-effect of raising total peripheral resistance.
- An overactive [renin / angiotension system](#) leads to [vasoconstriction](#) and retention of sodium and water. The increase in blood volume leads to hypertension.
- An overactive [sympathetic nervous system](#), leading to increased stress responses.

- It is also known that hypertension is highly heritable and polygenic (caused by more than one gene) and a few candidate genes have been postulated in the etiology of this condition.

SIGNS & SYMPTOMS

- Hypertension is usually found incidentally - "case finding" - by healthcare professionals during a routine checkup. The only test for hypertension is a blood pressure measurement. Hypertension in isolation usually produces no symptoms although some people report headaches, fatigue, facial flushing or [tinnitus](#)

- Malignant hypertension (or accelerated hypertension) is distinct as a late phase in the condition, and may present with headaches, blurred vision and end-organ damage.
- It is recognized that stressful situations can increase the blood pressure;

- Hypertension is often confused with mental tension, stress and anxiety. While chronic anxiety is associated with poor outcomes in people with hypertension, it alone does not cause it. Accelerated hypertension is associated with somnolence, confusion, visual disturbances, and nausea and vomiting (hypertensive encephalopathy).

TESTS COMMONLY PERFORMED IN NEWLY DIAGNOSED HPTN

- Tests are undertaken to identify possible causes of secondary hypertension, and seek evidence for end-organ damage to the heart itself or the eyes (retina) and kidneys. Diabetes and raised cholesterol levels being additional risk factors for the development of cardiovascular disease are also tested for as they will also require management.

Blood tests commonly performed include:

- Creatinine (renal function) - to identify both underlying renal disease as a cause of hypertension and conversely hypertension causing onset of kidney damage. Also a baseline for later monitoring the possible side-effects of certain antihypertensive drugs.
- Electrolytes (sodium, potassium)
- Glucose - to identify diabetes mellitus
- Cholesterol

Additional tests often include:

- Testing of urine samples for [proteinuria](#) - again to pick up underlying kidney disease or evidence of hypertensive renal damage.

- [Electrocardiogram](#) (EKG/ECG) - for evidence of the heart being under strain from working against a high blood pressure. Also may show resulting thickening of the heart muscle ([left ventricular hypertrophy](#)) or of the occurrence of previous silent cardiac disease
- [Chest X-ray](#) - again for signs of cardiac enlargement or evidence of [cardiac failure](#).

HYPERTENSION URGENCIES AND EMERGENCIES

- Hypertension is rarely severe enough to cause symptoms. These typically only surface with a systolic blood pressure over 240 mmHg and/or a diastolic blood pressure over 120 mmHg. These pressures without signs of end-organ damage (such as renal failure) are termed "accelerated" hypertension. When end-organ damage is possible or already ongoing, but in absence of raised intracranial pressure, it is called hypertensive emergency.

- Hypertension under this circumstance needs to be controlled, but prolonged hospitalization is not necessarily required. When hypertension causes increased intracranial pressure, it is called [malignant hypertension](#). Increased intracranial pressure causes [papilledema](#), which is visible on [ophthalmoscopic](#) examination of the [retina](#).

TREATMENT

LIFE STYLE MODIFICATION

- Doctors recommend [weight loss](#) and regular [exercise](#) as the first steps in treating mild to moderate hypertension. These steps are highly effective in reducing blood pressure, although most patients with moderate or severe hypertension end up requiring indefinite drug therapy to bring their blood pressure down to a safe level.

- Discontinuing [smoking](#) does not directly reduce blood pressure, but is very important for people with hypertension because it reduces the risk of many dangerous outcomes of hypertension, such as stroke and heart attack. An increase in daily calcium intake has also been shown to be highly effective in reducing blood pressure.

- Mild hypertension is usually treated by [diet](#), exercise and improved physical fitness. A diet rich in fruits and vegetables and low fat or fat-free dairy foods and moderate or low in sodium lowers blood pressure in people with hypertension.

- Dietary [sodium \(salt\)](#) may worsen hypertension in some people and reducing salt intake decreases blood pressure in a third of people. Many people choose to use a [salt substitute](#) to reduce their salt intake.
- Regular mild exercise improves blood flow, and helps to lower blood pressure. In addition, fruits, vegetables, and nuts have the added benefit of increasing dietary [potassium](#), which offsets the effect of sodium and acts on the kidney to decrease blood pressure.

- Reduction of environmental stressors such as high sound levels and over-illumination can be an additional method of ameliorating hypertension.

MEDICATIONS

- There are many classes of medications for treating hypertension, together called [antihypertensives](#), which — by varying means — act by lowering blood pressure. Evidence suggests that reduction of the blood pressure by 5-6 mmHg can decrease the risk of stroke by 40%, of coronary heart disease by 15-20%, and reduces the likelihood of dementia, heart failure, and mortality from vascular disease.

- The aim of treatment should be blood pressure control to $<140/90$ mmHg for most patients, and lower in certain contexts such as diabetes or kidney disease (some medical professionals recommend keeping levels below 120/80 mmHg). Each added drug may reduce the systolic blood pressure by 5-10 mmHg, so often multiple drugs are necessary to achieve blood pressure control.

Commonly used drugs include:

- ACE inhibitors such as captopril, enalapril, fosinopril (Monopril), lisinopril (Zestril), quinapril, ramipril (Altace)
- Angiotensin II receptor antagonists: eg, telmisartan (Micardis, Pritor), irbesartan (Avapro), losartan (Cozaar), valsartan (Diovan), candesartan (Atacand)
- Alpha blockers such as doxazosin, prazosin, or terazosin
- Beta blockers such as atenolol, labetalol, metoprolol (Lopressor, Toprol-XL), propranolol.
- Calcium channel blockers such as amlodipine (Norvasc), diltiazem, verapamil
- Direct renin inhibitors such as aliskiren (Tekturna)
- Diuretics: eg, bendroflumethiazide, chlortalidone, hydrochlorothiazide (also called HCTZ)
- Combination products (which usually contain HCTZ and one other drug)

CHOICE OF INITIAL MEDICATION

- Which type of many medications should be used initially for hypertension has been the subject of several large studies and various national guidelines.

- Whilst thiazides are cheap, effective, and recommended as the best first-line drug for hypertension by many experts, they are not prescribed as often as some newer drugs.

physicians may start with non-thiazide antihypertensive medications if there is a compelling reason to do so. An example is the use of ACE-inhibitors in diabetic patients who have evidence of kidney disease, as they have been shown to both reduce blood pressure and slow the progression of [diabetic nephropathy](#).

In patients with coronary artery disease or a history of a heart attack, beta blockers and ACE-inhibitors both lower blood pressure and protect heart muscle over a lifetime, leading to reduced mortality.

HPTN EMERGENCIES

- A **hypertensive emergency** is severe [hypertension](#) with acute impairment of an [organ system](#) (especially the [central nervous system](#), [cardiovascular system](#) and/or the [renal system](#)) and the possibility of [irreversible](#) organ-damage. In case of a hypertensive emergency, the [blood pressure](#) should be lowered aggressively over minutes to hours with an [antihypertensive](#) agent.

- Several classes of antihypertensive agents are recommended and the choice for the antihypertensive agent depends on the cause for the hypertensive crisis, the severity of elevated blood pressure and the patients usual blood pressure before the hypertensive crisis.

- In most cases, the administration of an intravenous sodium nitroprusside injection which has an almost immediate antihypertensive effect is suitable but in many cases not readily available. In less urgent cases, oral agents like captopril, clonidine, labetalol, prazosin, which have all a delayed onset of action by several minutes compared to sodium nitroprusside, can also be used.

- It is also important that the blood pressure is lowered not too abruptly, but smoothly. The diagnosis of a hypertensive emergency is not only based on the absolute level of blood pressure, but also on the individual regular level of blood pressure before the hypertensive crisis. Individuals with a history of [chronic](#) hypertension may not tolerate a "normal" blood pressure.

COMPLICATIONS

While elevated blood pressure alone is not an illness, it often requires treatment due to its short- and long-term effects on many organs. The risk is increased for:

- Cerebrovascular accident (CVAs or strokes)
- Myocardial infarction (heart attack)
- Hypertensive cardiomyopathy (heart failure due to chronically high blood pressure)
- Hypertensive retinopathy - damage to the retina
- Hypertensive nephropathy - chronic renal failure due to chronically high blood pressure