# Definitions

The following definitions have been suggested by the seventh report of the Joint National Committee (JNC 7). Based upon the average of two or more readings at each of two or more visits after an initial screen, the following classification is used.

1. The prehypertension category recognizes that the correlation between the risk of adverse outcomes (including stroke and death) and blood pressure level is a continuous variable in which there is an increased incidence of poor outcomes as the blood pressure rises, even within the previously delineated "normal" range.

#  Etiology/risk factors

**A. Essential hypertension** has been associated with a number of risk factors:

**1.** Hypertension is about twice as common in subjects who have one or two hypertensive parents.

**2.** Increased salt intake is a necessary but not a sufficient cause for hypertension.

**3.** There is a clear association between excess alcohol intake and hypertension.

**4.** Obesity and weight gain appears to be a main determinant of the rise in blood pressure (BP).

**B. Secondary hypertension**

**1. Primary renal disease.** Hypertension is a frequent finding in renal disease, particularly with glomerular or vascular disorders.

**2. Oral contraceptives** can induce hypertension.

**3. Pheochromocytoma.** About one-half of patients with pheochromocytoma have paroxysmal hypertension; most of the rest have what appears to be essential hypertension.

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| **Classification and Management of Blood Pressure for Adults****Aged 18 Years or Older** |
|  | **Initial drug therapy** |
| **BP clas- sification** | **Systolic****BP** | **Diastolic****BP** | **Lifestyle Modification** | **Without compelling indication** | **With compelling indications** |
| Normal | <120 and | <60 | Encourage |  |  |
| Prehypertension | 120-139 or | 80-89 | Yes | No antihypertensive drug indicated | Drug(s) for the compelling indications |
| Stage 1 hypertension | 140-159 or | 90-99 | Yes | Thiazide- type diuretics for most, may consider ACE inhibitor, ARB, beta blocker, CCB, or combination | Drug(s) for the compel- ling indicationsOther anti- hypertensive drugs (diuretics, ACE inhibitor, ARB, beta blocker, CCB) as needed |
| Stage 2 hypertension | >160 or | >100 | Yes | 2-drug combination for most (usually thiazide- type diuretic and ACE inhibitor or ARB or beta blocker, CCB) | Drug(s) for the compelling indicationsOther anti- hypertensive drugs (diuretics, ACE inhibitor, ARB, beta blocker, CCB) as needed |

**4. Primary hyperaldosteronism.** The presence of primary mineralocorticoid excess, primarily aldosterone, should be suspected in any patient with the triad of hypertension, unexplained hypokalemia and metabolic alkalosis. Some patients have a normal plasma potassium concentration.

**5. Cushing’s syndrome.** Moderate diastolic hypertension is a major cause of morbidity and death in patients with Cushing's syndrome.

**6. Other endocrine disorders.** Hypertension may be induced by hypothyroidism, hyperthyroidism, and hyperparathyroidism.

**7. Sleep apnea syndrome.** Disordered breathing during sleep is an independent risk factor for awake systemic hypertension.

**8. Coarctation of the aorta** is one of the major causes of hypertension in young children.

# Complications of hypertension

**A.** Hypertension is the major risk factor for premature cardiovascular disease, being more common than cigarette smoking, dyslipidemia, and diabetes, the other major risk factors.

**B.** Hypertension increases the risk of heart failure.

**C.** Left ventricular hypertrophy is a common problem in patients with hypertension, and is associated with an enhanced incidence of heart failure, ventricular arrhythmias, death following myocardial infarction, and sudden cardiac death.

**D.** Hypertension is the most common and most important risk factor for stroke.

**E.** Hypertension is the most important risk factor for intracerebral hemorrhage.

**F.** Hypertension is a risk factor for chronic renal insufficiency.

# Diagnosis

**A.** Blood pressure should be measured at each office visit for patients over the age of 21.

**B.** In the absence of end-organ damage, the diagnosis of mild hypertension should not be made until the blood pressure has been measured on at least three to six visits, spaced over a period of weeks to months.

**C. White-coat hypertension and ambulatory monitoring.** 20 to 25 percent of patients with mild office hypertension (diastolic pressure 90 to 104 mm Hg) have "white-coat" or isolated office hypertension in that their blood pressure is repeatedly normal when measured at home, at work, or by ambulatory blood pressure monitoring. Ambulatory monitoring can be used to confirm the presence of white-coat hypertension.

# Evaluation

**A. History.** The history should search for the presence of precipitating or aggravating factors, the natural course of the blood pressure, the extent of target organ damage, and the presence of other risk factors for cardiovascular disease.

**B. Physical examination** should evaluate for signs of end-organ damage (such as retinopathy) and for evidence of a cause of secondary hypertension.

**C. Laboratory testing**

**1.** Hematocrit, urinalysis, and routine blood chemistries (glucose, creatinine, electrolytes).

**2.** Fasting (9 to 12 hours) lipid profile (total and HDL-cholesterol, triglycerides).

**3.** Electrocardiogram.**History in the Patient with Hypertension**

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| **Duration of hypertension**Last known normal blood pressureCourse of the blood pressure**Prior treatment of hypertension**Drugs: doses, side effects **Intake of agents that may cause hypertension**Estrogens, sympathomimetics, adrenal steroids, excessive sodium**Family history**HypertensionPremature cardiovascular disease or deathFamilial diseases: pheochromocytoma, renal disease, diabetes, gout**Symptoms of secondary cause**Muscle weaknessSpells of tachycardia, sweating, tremorThinning of the skinFlank pain**Symptoms of target organ dam- age**HeadachesTransient weakness or blindnessLoss of visual acuityChest pain Dyspnea Claudication**Other risk factors** Smoking Diabetes DyslipidemiasPhysical inactivity**Dietary history** Sodium Alcohol Saturated fats |

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| **Physical Examination in the Patient with Hypertension** |
| Accurate measurement of blood pressureGeneral appearance: distribution of body fat, skin lesions, muscle strength, alertnessFunduscopeNeck: palpation and auscultation of carotids, thyroidHeart: size, rhythm, sounds Lungs: rhonchi, ralesAbdomen: renal masses, bruits over aorta or renal arteries, femoral pulsesExtremities: peripheral pulses, edemaNeurologic assessment |

**D. Testing for renovascular hypertension.** Renovascular hyper- tension is the most common correctable cause of secondary hypertension. It occurs in less than one percent of patients with mild hypertension. In comparison, between 10 and 45 percent of white patients with severe or malignant hypertension have renal artery stenosis.

**1.** Signs suggesting renovascular hypertension or other cause of secondary hypertension:

**a. Severe** or refractory hypertension, including retinal hemorrhages or papilledema; bilateral renovascular disease may be present in patients who also have a plasma creatinine above 1.5 mg/dL (132 µmol/L).

**b. An** acute rise in blood pressure over a previously stable baseline.

**c. Age** of onset before puberty or above 50.

**d.** An acute elevation in the plasma creatinine concentration that is either unexplained or occurs after the institution of an angiotensin converting enzyme inhibitor or angiotensin II receptor blocker (in the absence of an excessive reduction in blood pressure).

**e. Moderate**-to-severe hypertension in a patient with diffuse atherosclerosis or an incidentally discovered asymmetry in renal disease. A unilateral small kidney (<9 cm) has a 75 percent correlation with the presence of large vessel occlusive disease.

**f.** A systolic-diastolic abdominal bruit that lateralizes to one side.

**g. Negative** family history for hypertension.

**h.** Moderate-to-severe hypertension in patients with recurrent episodes of acute (flash) pulmonary edema or otherwise unexplained congestive heart failure.

**2.** Spiral CT scanning or 3D time-of-flight MR angiography is minimally invasive diagnostic methods. Duplex Doppler ultrasonography may be useful both for diagnosis and for predicting the outcome of therapy.

**E. Testing for other causes of secondary hypertension**

**1.** The presence of primary renal disease is suggested by an elevated plasma creatinine concentration and/or an abnormal urinalysis.

**2. Pheochromocytoma** should be suspected if there are paroxysmal elevations in blood pressure, particularly if associated with the triad of headache (usually pounding), palpitations, and sweating.

**3. Plasma renin activity** is usually performed only in patients with possible low-renin forms of hypertension, such as primary hyperaldosteronism. Otherwise unexplained hypokalemia is the primary clinical clue to the latter disorder in which the plasma aldosterone to plasma renin activity ratio is a screening test.

**4. Cushing's syndrome** (including that due to corticosteroid administration) is usually suggested by cushingoid facies, central obesity, ecchymoses, and muscle weakness.

**5. Sleep apnea syndrome** should be suspected in obese individuals who snore loudly while asleep, awake with headache, and fall asleep inappropriately during the day.

**6.** Coarctation of the aorta is characterized by decreased or lagging peripheral pulses and a vascular bruit over the back.**7.** Hypertension may be induced by both hypothyroidism and primary hyperparathyroidism, suspected because of hypercalcemia.

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| **Evaluation of Secondary Hypertension** |
| **Renovascular****Hypertension** | Captopril test: Plasma renin level before and 1 hr after captopril 25 mg. A greater than 150% increase in renin is positiveCaptopril renography: Renal scan before and after25 mgMRI angiographyArteriography (DSA) |
| **Hyperaldosteronism** | Serum potassiumSerum aldosterone and plasma renin activityCT scan of adrenals |
| **Pheochromocytoma** | 24 hr urine catecholaminesCT scanNuclear MIBG scan |
| **Cushing's Syn- drome** | Plasma cortisolDexamethasone suppression test |
| **Hyperparathyroidism** | Serum calciumSerum parathyroid hormone |

# Treatment of essential hypertension

**A. Benefits of blood pressure control.** Antihypertensive therapy is associated with 35 to 40 percent reduction in stroke incidence; 20 to 25 percent in myocardial infarction; and more than 50 percent in heart failure. Optimal control to below 130/80 mm Hg could prevent 37 and 56 percent of coronary heart disease events.

**B.** All patients should undergo lifestyle modification. A patient should not be labelled as having hypertension unless the blood pressure is persistently elevated after three to six visits over a several-month period.

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| **Lifestyle Modifications in the Management of Hypertension** |
| **Modification** | **Recommendation** | **Approximate systolic BP reduction, range\*** |
| Weight reduction | Maintain normal body weight (BMI), 18.5 to 24.9 kg/m2 | 5 to 20 mm Hg per10-kg weight loss |
| DASH eating plan | Consume a diet rich in fruits, vegetables, and low-fat dairy products, with a re- duced content of saturated and total fat | 8 to 14 mm Hg |
| Dietary sodium reduction | Reduce dietary so- dium intake to no more than 100 meq/day (2.4 sodium or 6 g sodium chloride) | 2 to 8 mm Hg |
| Physical activity | Regular aerobic physical activity, such as brisk walking (at least30 minutes per day, most days of the week) | 4 to 9 mm Hg |
| Moderate consumption of alcohol con- sumption | Limit consumption to no more than 2 drinks per day in most men and no more than 1 drink per day in women | 2 to 4 mm Hg |

**C.** Antihypertensive medications should be begun if the systolic pressure is persistently >140 mm Hg and/or the diastolic pressure is persistently >90 mm Hg in the office and at home despite attempted nonpharmacologic therapy. Starting with two drugs may be considered in patients with a baseline blood pressure more than 20/10 mm Hg above goal.

**D.** In patients with diabetes or chronic renal failure, antihypertensive therapy is indicated when the systolic pres- sure is persistently above 130 mm Hg and/or the diastolic pressure is above 80 mm Hg.

**E.** Patients with office hypertension, normal values at home, and no evidence of end-organ damage should undergo ambulatory blood pressure monitoring.

**F. Lifestyle modifications**

**1.** Treatment of hypertension generally begins with nonpharmacologic therapy, including dietary sodium restriction, weight reduction in the obese, avoidance of ex- cess alcohol, and regular aerobic exercise.

**2.** A low-sodium diet will usually lower high blood pressure and may prevent the onset of hypertension. The overall impact of moderate sodium reduction is a fall in bloodpressure of 4.8/2.5 mm Hg. Dietary intake should be reduced to 2.3 g of sodium or 6 g of salt.

**3.** Weight loss in obese individuals can lead to a significant fall in blood pressure.

**4. Goal blood pressure**

**a.** The goal of antihypertensive therapy in patients with uncomplicated combined systolic and diastolic hypertension is a blood pressure of below 140/90 mm Hg.

**b.** For individuals over age 65 with isolated systolic hypertension (eg, a diastolic blood pressure below 90 mm Hg), caution is needed not to inadvertently lower the diastolic blood pressure to below 65 mm Hg to attain a goal systolic pressure <140 mm Hg, since this level of diastolic pressure has been associated with an in- creased risk of stroke.

**c.** A goal blood pressure of less than 130/80 mm Hg is recommended in patients with diabetes mellitus; and patients with slowly progressive chronic renal failure, particularly those excreting more than 1 g of protein per day

# Drug therapy in essential hypertension

**A.** Each of the antihypertensive agents is roughly equally effective, producing a good antihypertensive response in 30 to 50 percent of cases.

**B.** A thiazide diuretic is recommended as initial drug therapy in most patients. African American patients generally responding better to monotherapy with a thiazide diuretic or calcium channel blocker and relatively poorly to an ACE inhibitor or beta-blocker.

**C. Initial therapy**

**1.** The seventh Joint National Committee (JNC 7) report recommends initiating therapy in uncomplicated hypertensives with a thiazide diuretic (eg, 12.5 to 25 mg of hydrochlorothiazide or chlorthalidone). This regimen is associated with a low rate of metabolic complications, such as hypokalemia, glucose intolerance, and hyperuricemia.

**2.** If low-dose thiazide monotherapy fails to attain goal blood pressure in uncomplicated hypertensives, an ACE inhibi- tor/ARB, beta-blocker, or calcium channel blocker can be sequentially added or substituted. Most often an ACE inhibitor/ARB, which acts synergistically with a diuretic, is used.

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| **Considerations for Individualizing Antihypertensive Therapy** |
| **Indication** | **Antihypertensive drugs** |
| **Compelling indications (major improvement in outcome independent of blood pressure)** |
| Systolic heart failure | ACE inhibitor or ARB, beta blocker, diuretic, aldosterone antagonist |
| Post-myocardial infarction | beta blocker, ACE inhibitor, aldosterone antagonist |
| Proteinuric chronic renal failure | ACE inhibitor and/or ARB |
| High coronary disease risk | Diuretic, perhaps ACE inhibitor |
| Diabetes mellitus (no proteinuria) | Diuretic, perhaps ACE inhibitor |
| Angina pectoris | Beta blocker, calcium channel blocker |
| Atrial fibrillation rate control | Beta blocker, nondihydropyridine calcium channel blocker |
| Atrial flutter rate control | Beta blocker, nondihydropyridine calcium channel blocker |
| **Likely to have a favorable effect on symptoms in comorbid conditions** |
| Essential tremor | Beta blocker (noncardioselective) |
| Hyperthyroidism | Beta blocker |
| Migraine | Beta blocker, calcium channel blocker |
| Osteoporosis | Thiazide diuretic |
| Raynaud's syndrome | Dihydropyridine calcium channel blocker |

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| **Contraindications to Specific Antihypertensive Agents** |
| **Indication** | **Antihypertensive drugs** |
| Bronchospastic disease | Beta blocker |
| Pregnancy | ACE inhibitor, ARB (includes women likely to become pregnant) |

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| **Indication** | **Antihypertensive drugs** |
| Second or third degree heart block | Beta blocker, nondihydropyridine calcium channel blocker |
| **May have adverse effect on comorbid conditions** |
| Depression | Beta blocker, central alpha agonist |
| Gout | Diuretic |
| Hyperkalemia | Aldosterone antagonist, ACE inhibitor, ARB |
| Hyponatremia | Thiazide diuretic |
| Renovascular disease | ACE inhibitor or ARB |

**D. Diuretics**

**1.** A low-dose thiazide diuretic provides better cardioprotection than an ACE inhibitor or a calcium channel blocker in patients with risk factors for coronary artery disease, including left ventricular hypertrophy, type 2 diabetes, previous myocardial infarction or stroke, current cigarette smoking habits, hyperlipidemia, or atherosclerotic cardiovascular disease.

**2.** Diuretics should also be given for fluid control in patients with heart failure or nephrotic syndrome; these settings usually require loop diuretics. In addition, an aldosterone antagonist is indicated in patients with advanced HF who have relatively preserved renal function and for the treatment of hypokalemia.

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| **Thiazide Diuretics** |
| **Drug** | **Usual dose** |
| Hydrochlorothiazide (HCTZ, Hydrodiuril) | 12.5-25 mg qd |
| Chlorthalidone (Hygroton) | 12.5-25 mg qd |
| Chlorothiazide (Diuril) | 125-500 mg qd |
| Indapamide (Lozol) | 1.25 mg qd |
| Metolazone (Zaroxolyn) | 1.25-5 mg qd |

**E. ACE inhibitors provide** survival benefits in heart failure and myocardial infarction (particularly ST elevation) and renal bene- fits in proteinuric chronic renal failure. Thus, an ACE inhibitor should be used in heart failure, prior myocardial infarction, asymptomatic left ventricular dysfunction, type 1 diabetics with nephropathy, and nondiabetic proteinuric chronic renal failure. The use of ACE inhibitors in these settings is independent of the need for BP control.

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| **Angiotensin-converting enzyme inhibitors** |
| **Drug** | **Usual doses** | **Maximum dose** |
| Benazepril (Lotensin) | 10-40 mg qd or divided bid | 80 mg/d |
| Captopril (Capoten) | 50 mg bid-qid | 450 mg/d |
| Enalapril (Vasotec, Vasotec IV) | 10-40 mg qd or divided bid | 40 mg/d |
| Fosinopril (Monopril) | 20-40 mg qd or divided bid | 80 mg/d |
| Lisinopril (Prinivil, Zestril) | 20-40 mg qd | 40 mg/d |
| Moexipril (Univasc) | 15-30 mg qd | 30 mg/d |
| Quinapril (Accupril) | 20-80 mg qd or divided bid | 80 mg/d |
| Ramipril (AItace) | 5-20 mg qd or divided bid | 20 mg/d |
| Trandolapril (Mavik) | 1-4 mg qd | 8 mg/d |
| Perindopril (Aceon) | 4-8 mg qd-bid | 8 mg/d |

**F. ARBs.** The indications for and efficacy of ARBs are the same as those with ACE inhibitors. An ARB is particularly indicated in patients who do not tolerate ACE inhibitors (mostly because of cough).

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| **Angiotensin II Receptor Blockers** |
| **Drug** | **Usual dose** | **Maximum dose** |
| Losartan (Cozaar) | 50 mg qd | 100 mg/d |
| Candesartan (Atacand) | 4-8 mg qd | 16 mg/d |
| Eprosartan (Teveten) | 400-800 mg qd | 800 mg/d |
| Irbesartan (Avapro) | 150-300 mg qd | 300 mg/d |
| Telmisartan (Micardis) | 40-80 mg qd | 80 mg/d |
| Valsartan (Diovan) | 80 mg qd | 320 mg/d |

**G.Beta-blockers.** A beta-blocker without intrinsic sympathomimetic activity should be given after an acute myocardial infarction and to stable patients with heart failure or asymptomatic left ventricular dysfunction (beginning with very low doses). The use of beta-blockers in these settings is in addition to the recommendations for ACE inhibitors in these disorders. Beta-blockers are also given for rate control in atrial fibrillation and for angina.

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| **Beta-blockers** |
| **Drug** | **Usual dose** | **Maximum dose** |
| Acebutolol (Sectral) | 200-800 mg/d (qd or bid) | 1.2 g/d (bid) |
| Atenolol (Tenormin) | 50-100 mg qd | 100 mg qd |
| Betaxolol (Kerlone) | 10 mg qd | 20 mg qd |
| Bisoprolol (Zebeta) | 5 mg qd | 20 mg qd |
| Carteolol (Cartrol) | 2.5 mg qd | 10 mg qd |
| Carvedilol (Coreg) | 6.26-25 mg bid | 100 mg/d |
| Labetalol (Normodyne, Trandate) | 100-600 mg bid | 1200 mg/d |
| Metoprolol (Toprol XL) | 100-200 mg qd | 400 mg qd |
| Metoprolol (Lopressor) | 100-200 mg/d (qd or bid) | 450 mg/d (qd or bid) |
| Nadolol (Corgard) | 40 mg qd | 320 mg/d |
| Penbutolol(Levatol) | 20 mg qd | NA |
| Pindolol (Visken) | 5 mg bid | 60 mg/d |
| Propranolol (Inderal, Inderal LA) | 120-160 mg qd (LA640 mg/d) |  |
| Timolol (Blocadren) | 10-20 mg bid | 60 mg/d (bid) |

**H. Calcium channel blockers.** Like beta-blockers, they can be given for rate control in patients with atrial fibrillation or for control of angina. Calcium channel blockers may be preferred in obstructive airways disease.

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| **Calcium channel blockers** |
| **Drug** | **Dosage** |
| Diltiazem extended-release(Cardizem SR) | 120-360 mg in 2 doses |
| Diltiazem CD (Cardizem CD) | 120-360 mg in 1 dose |
| Diltiazem XR (Dilacor XR) | 120-480 mg in 1 dose |
| Verapamil (Calan) | 120-480 mg in 2 or 3 doses |
| Verapamil extended-release(Calan SR) | 120-480 mg in 1 or 2 doses |
| Verapamil HS (Covera-HS) | 180-480 mg in 1 dose |
| **Dihydropyridines** |
| Amlodipine (Norvasc) | 2.5-10 mg in 1 dose |
| Felodipine (Plendil) | 2.5-10 mg in 1 dose |
| Isradipine (DynaCirc) | 5-10 mg in 2 doses |
| Isradipine extended-release(DynaCirc CR) | 5-10 mg in 1 dose |
| Nicardipine (Cardene) | 60-120 mg in 3 doses |
| Nicardipine extended-release(Cardene SR) | 60-120 mg in 2 doses |
| Nifedipine extended-release(Adalat CC, Procardia XL) | 30-90 mg in 1 dose |

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| **Drug** | **Dosage** |
| Nisoldipine (Sular) | 10-60 mg in 1 dose |

**I. Combination therapy**

**1.** If two drugs are required, use of a low dose of a thiazide diuretic as one of the drugs increases the response rate to all other agents. By minimizing volume expansion, diuretics increase the antihypertensive effect of all other antihypertensive drugs.

**2.** The combination of a thiazide diuretic with a beta-blocker, an ACE inhibitor, or an ARB has a synergistic effect, controlling the BP in up to 85 percent of patients.

**3. Fixed-dose combination.** A wide variety of (low) dose combination preparations are available, including low doses of a diuretic with a beta-blocker, ACE inhibitor, or ARB. Combination preparations include:

**a. Sustained**-release verapamil (180 mg) - trandolapril (2 mg).

**b. Atenolol** (100 mg) - chlorthalidone (25 mg).

**c. Lisinopril** (20 mg) - hydrochlorothiazide (12.5 mg).

**d. The** three combinations were equally effective, normalizing the blood pressure or lowering the diastolic pressure by more than 10 mm Hg in 69 to 76 percent of patients. All are well tolerated.

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| **Combination Agents for Hypertension** |
| **Drug** | **Initial dose** | **Comments** |
| **Beta-Blocker/Diuretic** |
| Atenolol/chlorthalidone(Tenoretic) | 50 mg/25 mg, 1 tab qd | Additive vasodilation |
| Bisoprolol/HCTZ (Ziac) | 2.5 mg/6.25 mg, 1 tab qd |
| Metoprolol/HCTZ (Lopressor HCTZ) | 100 mg/25 mg, 1 tab qd |
| Nadolol/HCTZ (Corzide) | 40 mg/5 mg, 1 tab qd |
| Propranolol/HCTZ (Inderide LA) | 80 mg/50 mg, 1 tab qd |
| Timolol/HCTZ (Timolide) | 10 mg/25 mg, 1 tab qd |
| **ACE inhibitor/Diuretic** |
| Benazepril/HCTZ (Lotensin HCT) | 5 mg/6.25 mg, 1 tab qd | ACE inhibitor con- serves potassium and magnesium; combination benefi- cial for CHF patients with HTN |
| Captopril/HCTZ (Capozide) | 25 mg/15 mg, 1 tab qd |
| Enalapril/HCTZ (Vaseretic) | 5 mg/12.5 mg, 1 tab qd |
| Lisinopril/HCTZ (Zestoretic, Prinzide) | 10 mg/12.5 mg, 1 tab qd |
| Moexipril/HCTZ (Uniretic) | 7.5 mg/12.5 mg, 1 tab qd |
| **ACE inhibitor/Calcium-channel blocker** |
| Benazepril/amlodipine(Lotrel) | 2.5 mg/10 mg, 1 tab qd |  |
| Enalapril/felodipine(Lexxel) | 5 mg/5 mg, 1 tab qd |
| Enalapril/diltiazem(Teczem) | 5 mg/180 mg, 1 tab qd |
| Trandolapril/verapamil(Tarka) | 2 mg/180 mg, 1 tab qd |
| **Angiotensin II receptor blocker/Diuretic** |
| Losartan/HCTZ (Hyzaar) | 50 mg/12.5 mg, 1 tab qd |  |
| Valsartan/HCTZ (Diovan HCT) | 80 mg/12.5 mg, 1 tab qd |
| **Alpha-1-Blocker/Diuretic** |
| Prazosin/polythiazide(Minizide) | 1 mg/0.5 mg, 1 cap bid | Synergistic vasodilation |
| **K+-sparing diuretic/Thiazide** |
| Amiloride/HCTZ (Moduretic) | 5 mg/50 mg, 1 tab qd | Electrolyte-sparing effect |
| Triamterene/HCTZ (Dyazide, Maxzide) | 37.5 mg/25 mg, 1/2 tab qd |