Hypertension

General Management Principals (from the JNC7)

- In persons older than 50 years, systolic blood pressure greater than 140 mmHg is a much more important cardiovascular disease (CVD) risk factor than diastolic blood pressure.

- The risk of CVD beginning at 115/75 mmHg doubles with each increment of 20/10 mmHg; individuals who are normotensive at age 55 have a 90 percent lifetime risk for developing hypertension.

- Individuals with a systolic blood pressure of 120–139 mmHg or a diastolic blood pressure of 80–89 mmHg should be considered as prehypertensive and require health-promoting lifestyle modifications to prevent CVD.

- Thiazide-type diuretics should be used in drug treatment for most patients with uncomplicated hypertension, either alone or combined with drugs from other classes.

- Certain high-risk conditions are compelling indications for the initial use of other antihypertensive drug classes (angiotensin converting enzyme inhibitors, angiotensin receptor blockers, beta-blockers, calcium channel blockers).

- Most patients with hypertension will require two or more antihypertensive medications to achieve goal blood pressure (<140/90 mmHg, or <130/80 mmHg for patients with diabetes or chronic kidney disease).

- If blood pressure is >20/10 mmHg above goal blood pressure, consideration should be given to initiating therapy with two agents, one of which usually should be a thiazide-type diuretic.

- The most effective therapy prescribed by the most careful clinician will control hypertension only if patients are motivated. Motivation improves when patients have positive experiences with, and trust in, the clinician. Empathy builds trust and is a potent motivator.

- In presenting these guidelines, the JNC7committee recognizes that the responsible physician's judgment remains paramount.

Table One: Life-style Modification in Hypertension from JNC7 Guideline

Modification	Recommendation	Approximate SBP Reduction (Range)
Weight reduction	Maintain normal body weight (body mass index 18.5–24.9 kg/m^2).	5–20 mmHg/10 kg weight loss[23,24]
Adopt DASH eating plan	Consume a diet rich in fruits, vegetables, and lowfat dairy products with a reduced content of saturated and total fat.	8–14 mmHg[25,26]
Dietary sodium reduction	Reduce dietary sodium intake to no more than 100 mmol per day (2.4 g sodium or 6 g sodium chloride).	2–8 mmHg[25,27]
Physical activity	Engage in regular aerobic physical activity such as brisk walking (at least 30 min per day, most days of the week).	4–9 mmHg[28,29]
Moderation of alcohol consumption	Limit consumption to no more than 2 drinks (1 oz or 30 mL ethanol; e.g., 24 oz beer, 10 oz wine, or 3 oz 80-proof whiskey) per day in most men and to no more than 1 drink per day in women and lighter weight persons.	2–4 mmHg[30]

DASH, Dietary Approaches to Stop Hypertension.

* For overall cardiovascular risk reduction, stop smoking.
† The effects of implementing these modifications are dose and time dependent, and could be greater for some individuals.

Table Two: Clinical Management of Hypertension, by Stage, from JNC7

BP Classification	SBP* mmHg	DBP* mmHg	Lifestyle Modification	Initial Drug Therapy	
				Without Compelling Indication	With Compelling Indications (See Table 8)
Normal	<120	and <80	Encourage	No antihypertensive drug indicated.	Drug(s) for compelling indications.‡
Prehypertension	120–139	or 80–89	Yes		
Stage 1 Hypertension	140–159	or 90–99	Yes	Thiazide-type diuretics for most. May consider ACEI, ARB, BB, CCB, or combination.	Drug(s) for the compelling indications.‡ Other antihypertensive drugs (diuretics, ACEI, ARB, BB, CCB) as needed.
Stage 2 Hypertension	≥160	or ≥100	Yes	Two-drug combination for most† (usually thiazide-type diuretic and ACEI or ARB or BB or CCB).	

DBP, diastolic blood pressure; SBP, systolic blood pressure.
Drug abbreviations: ACEI, angiotensin converting enzyme inhibitor; ARB, angiotensin receptor blocker; BB, beta-blocker; CCB, calcium channel blocker.

* Treatment determined by highest BP category.
† Initial combined therapy should be used cautiously in those at risk for orthostatic hypotension.
‡ Treat patients with chronic kidney disease or diabetes to BP goal of <130/80 mmHg.

Table Three: Identifiable Causes of Hypertension

Sleep apnea
Drug-induced or related causes (see table 9)
Chronic kidney disease
Primary aldosteronism
Renovascular disease
Chronic steroid therapy and Cushing's syndrome
Pheochromocytoma
Coarctation of the aorta
Thyroid or parathyroid disease

Table Four: Antihypertensive Drugs and Doses

Class	Drug (Trade Name)	Usual dose range in mg/day	Usual Daily Frequency
Thiazide diuretics	Chlorothiazide (Diuril)	125-500	1-2
	chlorthalidone (generic)	12.5-25	1
	hydrochlorothiazide (Microzide, HydroDIURIL†)	12.5-50	1
	polythiazide (Renese)	2-4	1
	indapamide (Lozol†)	1.25-2.5	1
	metolazone (Mykrox)	0.5-1.0	1
	metolazone (Zaroxolyn)	2.5-5	1
Loop diuretics	bumetanide (Bumex†)	0.5-2	2
	furosemide (Lasix†)	20-80	2
	torsemide (Demadex†)	2.5-10	1
Potassium-sparing diuretics	amiloride (Midamor†)	5-10	1-2
	triamterene (Dyrenium)	50-100	1-2
Aldosterone receptor blockers	eplerenone (Inspra)	50-100	1
	spironolactone (Aldactone†)	25-50	1
BBs	atenolol (Tenormin†)	25-100	1
	betaxolol (Kerlone†)	5-20	1
	bisoprolol (Zebeta†)	2.5-10	1
	metoprolol (Lopressor†)	50-100	1-2
	metoprolol extended release (Toprol XL)	50-100	1
	nadolol (Corgard†)	40-120	1
	propranolol (Inderal†)	40-160	2
	propranolol long-acting (Inderal LA†)	60-180	1
	timolol (Blocadren†)	20-40	2
BBs with intrinsic sympathomimetic activity	acebutolol (Sectral†)	200-800	2
	penbutolol (Levatol)	10-40	1
	pindolol (generic)	10-40	2
Combined alpha- and BBs	carvedilol (Coreg)	12.5-50	2
	labetalol (Normodyne, Trandate†)	200-800	2

Class	Drug (Trade Name)	Usual dose range in mg/day	Usual Daily Frequency
ACEIs	benazepril (Lotensin†)	10-40	1
	captopril (Capoten†)	25-100	2
	enalapril (Vasotec†)	5-40	1-2
	fosinopril (Monopril)	10-40	1
	lisinopril (Prinivil, Zestril†)	10-40	1
	moexipril (Univasc)	7.5-30	1
	perindopril (Aceon)	4-8	1
	quinapril (Accupril)	10-80	1
	ramipril (Altace)	2.5-20	1
	trandolapril (Mavik)	1-4	1
Angiotensin II antagonists	candesartan (Atacand)	8-32	1
	eprosartan (Teveten)	400-800	1-2
	irbesartan (Avapro)	150-300	1
	losartan (Cozaar)	25-100	1-2
	olmesartan (Benicar)	20-40	1
	telmisartan (Micardis)	20-80	1
	valsartan (Diovan)	80-320	1-2
CCBs—non-Dihydropyridines	Diltiazem extended release (Cardizem CD, Dilacor XR, Tiazac†)	180-420	1
	diltiazem extended release (Cardizem LA)	120-540	1
	verapamil immediate release (Calan, Isoptin†)	80-320	2
	verapamil long acting (Calan SR, Isoptin SR†)	120-480	1-2
	verapamil—Coer, Covera HS, Verelan PM)	120-360	1
CCBs—Dihydropyridines	amlodipine (Norvasc)	2.5-10	1
	felodipine (Plendil)	2.5-20	1
	isradipine (Dynacirc CR)	2.5-10	2
	nicardipine sustained release (Cardene SR)	60-120	2
	nifedipine long-acting (Adalat CC, Procardia XL)	30-60	1
	nisoldipine (Sular)	10-40	1

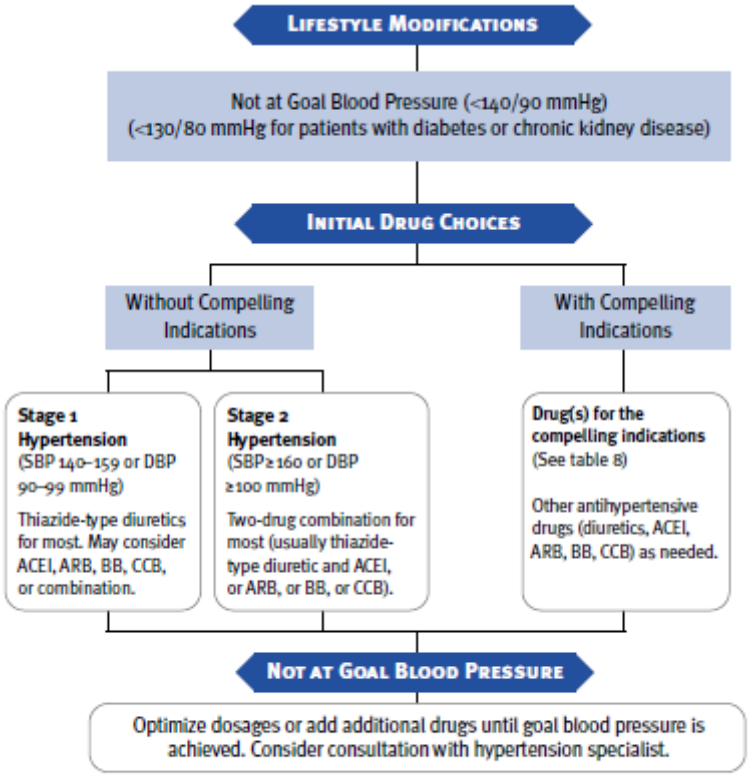
Class	Drug (Trade Name)	Usual dose range in mg/day	Usual Daily Frequency
Alpha-1 blockers	doxazosin (Cardura)	1-16	1
	prazosin (Minipress†)	2-20	2-3
	terazosin (Hytrin)	1-20	1-2
Central alpha-2 agonists and other centrally acting drugs	clonidine (Catapres†)	0.1-0.8	2
	clonidine patch (Catapres-TTS)	0.1-0.3	1 wkly
	methyldopa (Aldomet†)	250-1,000	2
	reserpine (generic)	0.1-0.25	1
	guanfacine (Tenex†)	0.5-2	1
Direct vasodilators	hydralazine (Apresoline†)	25-100	2
	minoxidil (Loniten†)	2.5-80	1-2

* In some patients treated once daily, the antihypertensive effect may diminish toward the end of the dosing interval (trough effect). BP should be measured just prior to dosing to determine if satisfactory BP control is obtained. Accordingly, an increase in dosage or frequency may need to be considered. These dosages may vary from those listed in the "Physicians Desk Reference, 57th ed."

† Available now or soon to become available in generic preparations.

Source: Physicians' Desk Reference. 57 ed. Montvale, NJ: Thomson PDR, 2003

Table Five: Treatment Algorithm, JNC7 Guideline



DBP, diastolic blood pressure; SBP, systolic blood pressure.
Drug abbreviations: ACEI, angiotensin converting enzyme inhibitor; ARB, angiotensin receptor blocker; BB, beta-blocker; CCB, calcium channel blocker.

Table Eight: Reasons for Targeted HTN Drug Use, JNC7

Compelling Indication*	Recommended Drugs†						Clinical Trial Basis‡
	Diuretic	BB	ACEI	ARB	CCB	Aldo ANT	
Heart failure	•	•	•	•		•	ACC/AHA Heart Failure Guideline,[45] MERIT-HF,[46] COPERNICUS,[47] CIBIS,[48] SOLVD,[49] AIRE,[50] TRACE,[51] ValHEFT,[52] RALES[53]
Postmyocardial infarction		•	•			•	ACC/AHA Post-MI Guideline,[54] BHAT,[55] SAVE,[56] Capricorn,[57] EPHESUS[58]
High coronary disease risk	•	•	•		•		ALLHAT,[22] HOPE,[59] ANBP2,[60] LIFE,[61] CONVINCE[62]
Diabetes	•	•	•	•	•		NKF-ADA Guideline,[63,64] UKPDS,[65] ALLHAT[22]
Chronic kidney disease			•	•			NFK Guideline,[66] Captopril Trial,[67] RENAAL,[68] IDNT,[69] REIN,[70] AASK[71]
Recurrent stroke prevention	•		•				PROGRESS[72]

* Compelling indications for antihypertensive drugs are based on benefits from outcome studies or existing clinical guidelines; the compelling indication is managed in parallel with the BP.
† Drug abbreviations: ACEI, angiotensin converting enzyme inhibitor; ARB, angiotensin receptor blocker; Aldo ANT, aldosterone antagonist; BB, beta-blocker; CCB, calcium channel blocker.
‡ Conditions for which clinical trials demonstrate benefit of specific classes of antihypertensive drugs.

Table Nine: Reasons for Treatment Failure, JNC7

Improper BP Measurement
Volume Overload and Pseudotolerance • Excess sodium intake • Volume retention from kidney disease • Inadequate diuretic therapy
Drug-Induced or Other Causes • Nonadherence • Inadequate doses • Inappropriate combinations • Nonsteroidal anti-inflammatory drugs; cyclooxygenase 2 inhibitors • Cocaine, amphetamines, other illicit drugs • Sympathomimetics (decongestants, anorectics) • Oral contraceptives • Adrenal steroids • Cyclosporine and tacrolimus • Erythropoietin • Licorice (including some chewing tobacco) • Selected over-the-counter dietary supplements and medicines (e.g., ephedra, ma haung, bitter orange)
Associated Conditions • Obesity • Excess alcohol intake

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