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Treatment of Hypertension

Updated September 2025

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WITHOUT CVD or CKD	CAD[b]	Stroke/ TIA[b]	CKD[b]	HF*r*EF[b]	HF*p*EF[b]	Other CVD
One, or low-dose combo[b] of two, of these: ACEI[h] or ARB,[h] thiazide,[a] long-acting DHP CCB[1,2,e]	Evidence-based ACEI,[h] ARB,[h] or BB[d] (BB especially for recent MI or ACS, or angina)[1,11] Add-ons: long-acting DHP CCB,[e] thiazide,[a] MRA[g,1,11]	Thiazide,[a] ACEI,[h] or ARB[1,h]	ACEI[h] or ARB.[1,h] Can add a long-acting DHP CCB[e] or thiazide (loop if eGFR <30 mL/min/1.73m^2).[1,4] Consider adding finerenone for diabetic kidney disease.[17]	Evidence-based BB;[d] MRA[g] (if symptomatic, eGFR >30 mL/min/1.73m^2, potassium <5 mEq/L); sacubitril/valsartan (NYHA Class II to III [preferred over ACEI[h] or ARB[h]]), and SGLT2 inhibitor (if symptomatic)[1] Loop diuretic as needed.[1] Can add hydralazine plus isosorbide dinitrate in Black patients, or other patients who can't take sacubitril/ valsartan, ACEI[h] or ARB.[1,h]	SGLT2 inhibitor.[1,5] Consider MRA[g] or sacubitril/ valsartan or ARB.[1,5,h] Loop diuretic as needed.[1] **HF*mr*EF[b]** SGLT2 inhibitor.[5] Consider MRA[g] or sacubitril/ valsartan or ARB.[5] Consider Evidence-based BB.[d,5]	**A-fib[b]** ACEI,[h] ARB,[h] or MRA[f,g,1,3] **Aortic disease[b]** BB[d] (largely extrapolated from acute management)[1] **Aortic VALVE regurgitation[b]** ACE,[h] ARB[h] (note: antihypertensives that reduce HR may increase SBP)

- Optimize dose, then add another appropriate first-line agent (e.g., thiazide,[a] ACEI,[h] ARB,[h] long-acting dihydropyridine CCB[e]).[2,4]
  - DO NOT combine an ACEI plus ARB and/or aliskiren.[1]
- Consider SGLT2 inhibitor (for diabetes, HF) or GLP-1 agonist (diabetes, obesity) for appropriate patients.[1,18]

Investigate resistant HTN (i.e., BP >goal despite optimal dosing of three antihypertensives from different classes,[6,7] or BP controlled with four antihypertensives.[6]) Consider pseudoresistance and secondary HTN. **See footnote c** for more information on resistant HTN.

Add a drug(s) from a class not currently in use.

Spironolactone (preferred[1,2,4]) or eplerenone[1,6,g] *OR* **Amiloride**[4,7,13]	If HR ≥70 bpm: **Beta-blocker** (consider carvedilol)[6,14,d] *OR* **Clonidine**[4,6] *OR* **Guanfacine**[6] *OR* **Long-acting diltiazem or verapamil**[6,e]	**Doxazosin** Consider for BPH[1,4] Risk of orthostatic hypotension, especially with first dose and in older patients.[1]	**Hydralazine** Max dose 50 mg TID to reduce lupus risk.[6] Use with BB and diuretic to counteract reflex tachycardia and fluid retention.[1] Add nitrate for HFrEF.[6] *OR* **Minoxidil**[6] Causes hirsutism.[6] Use with BB and diuretic to counteract reflex tachycardia and fluid retention.[1]	**Aprocitentan** (Tryvio [US]).[12] Risk of embryo-fetal toxicity. Lacks CV risk reduction data. Can cause fluid retention, hepatotoxicity, hemoglobin eGFR reduction, reduced sperm count.

Therapy Optimization (consider during all steps above)

- Optimize lifestyle interventions (e.g., healthy diet, exercise, weight loss, sodium restriction [e.g., 2,400 mg/day], increased dietary potassium [if appropriate], alcohol restriction, stress reduction).[1,6,7]
- Consider discontinuation or dose reduction of drugs or substances that may increase blood pressure.
- Consider use of once-daily antihypertensives (to improve adherence), giving at least one dose at bedtime; patients with resistant HTN often have BP that doesn't "dip" at night like it should.[6,10]
- Consider choosing indapamide or chlorthalidone (with azilsartan for resistant HTN) over hydrochlorothiazide.[6,7,a] See footnote a for details.
- Consider switching amlodipine to long-acting nifedipine.[6]

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Footnotes

a. **Thiazide considerations**. "Thiazide" includes thiazide-like diuretics. Chlorthalidone or indapamide have a longer duration of action than hydrochlorothiazide and may be preferable in patients with resistant HTN.[1,7] Chlorthalidone may provide better CV outcomes in patients with a history of stroke or MI, at the expense of higher risk of hypokalemia.[1,2] Thiazides are effective to eGFR 25 to 30 mL/min/1.73m^2.[6] Chlorthalidone is about twice as potent as hydrochlorothiazide.[9] Chlorthalidone is available alone or in combination with azilsartan (Edarbyclor).Azilsartan may provide more BP reduction than other ARBs or ACEIs.[6]

b. Combination Therapy vs. Stepped-Care
- Consider starting with a **combo** of two meds, especially if baseline BP ≥140/90 mm Hg, Black, or CV risk >7.5%.[1] Hypertension Canada recommends starting with a combo in all patients.[2]
  - Monitor older adults for orthostatic hypotension.[1]
  - Choose a single-pill combination with two meds to promote adherence.[1,2,4] Available single-pill combinations include ACEI/CCB, ARB/CCB, ACEI/diuretic, ARB/diuretic.
- Consider starting with a single agent, carefully uptitrating, then adding other agents if needed (**stepped care**) when starting antihypertensives in frail patients, patients with a history of adverse effects with antihypertensives (e.g., hypotension), and/or baseline BP 130 to 139/80 to 89 mm Hg.[1]

c. Resistant Hypertension
- Hypertension Canada recommends specialist referral for patients not at goal with three agents.[7]
- Consider pseudoresistance due to nonadherence, blood pressure measurement error, or white coat HTN.[6,7]
- Consider secondary HTN due to obstructive sleep apnea (very common),[8] primary hyperaldosteronism (AHA guidelines recommend screening all patients[6]), CKD, renal artery stenosis, chromaffin cell tumors (e.g., pheochromocytoma), coarctation of the aorta (even post-repair), Cushing's disease, rare endocrine disorders.[6]
- Adverse effects are an important consideration when choosing an add-on antihypertensive because evidence that BP reduction improves CV outcomes in resistant HTN is lacking.[7]

d. Beta-blocker considerations:
- BB are not recommended first-line for HTN unless the patient has CAD or HF.[1]
  - In **HTN**, BBs do not reduce stroke risk as much as ACEIs, ARBs, thiazides. or dihydropyridine CCBs.[2]
- For **CAD**, evidence-based BB choices include carvedilol, metoprolol succinate, nadolol, bisoprolol, propranolol, or timolol.[11]
- Avoid atenolol; it is inferior to other BBs for reducing CV events.[11]
- For **HF**, evidence-based BB choices include metoprolol succinate, bisoprolol, or carvedilol.[1]
- Avoid combining a BB with clonidine or a non-DHP CCB (diltiazem, verapamil).[12]
- For indications and dosing, see our chart, *Comparison of Oral Beta-Blockers*.

e. Calcium channel blocker considerations
- Do not use short-acting nifedipine.[1]
- Consider use of long-acting nifedipine over amlodipine for potentially better BP control; however, nifedipine may cause more edema than amlodipine.[6]
- Do not use a non-DHP CCB (diltiazem, verapamil) in patients with HF*r*EF.[1]
- A nondihydropyridine CCB (diltiazem, verapamil) can be used **instead of** a BB for angina unless the patient has significant left ventricular dysfunction.[11]
- DHP and non-DHP (diltiazem, verapamil) can be combined.[1]

f. Some evidence suggests that ACEIs or ARBs may reduce A-fib recurrence, and MRAs may reduce A-fib burden.[1,3]

g. Mineralocorticoid receptor antagonist considerations
- Do not combine MRAs (spironolactone, eplerenone, finerenone).[1]
- MRAs with evidence in HF*r*EF are spironolactone and eplerenone.[5]
- In HF*p*EF, consider MRAs (spironolactone or finerenone) for females, or males with ejection fraction <55% to 60%).[5,15,16]
- MRAs with evidence in HF*mr*EF are spironolactone and finerenone.[5,16]
- Spironolactone has been studied for BP control in resistant HTN, and is a first-line-add-on.[1]
- Eplerenone is dosed BID for HTN, but poses lower risk of gynecomastia and erectile dysfunction than spironolactone.[1]
- Like eplerenone, finerenone is less likely than spironolactone to cause gynecomastia.[17]

h. ACEIs and ARBs: for indications and dosing, see our chart, *Angiotensin Receptor Blockers and Angiotensin-Converting Enzyme Inhibitors*.

Abbreviations: ACEI = Angiotensin converting enzyme inhibitor; A-fib = atrial fibrillation; ARB = angiotensin receptor blocker; BB = beta-blocker; BID = twice daily; BNP = brain natriuretic peptide; BP = blood pressure; BPH = benign prostatic hypertrophy; bpm = beats per minute; CCB = calcium channel blocker; CKD = chronic kidney disease; CVD = cardiovascular disease; DBP = diastolic blood pressure; DHP = dihydropyridine; DM = diabetes mellitus; GLP-1 = glucagon-like peptide-1; HF = heart failure; HR = heart rate; HTN = hypertension; ISH = isolated systolic hypertension; LVH = left ventricular hypertrophy; MI = myocardial infarction; MRA = mineralocorticoid receptor antagonist; NT-proBNP = N terminal pro-B-type natriuretic peptide; NYHA = New York Heart Association; SGLT2 = sodium-glucose cotransporter-2

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Hypertension Goals in Adults

Modified August 2025

Clinical scenario	Start pharmacotherapy (at)...[b]	Goal[a,b,c]
Patients without comorbidities and without older age		
Patients with BP 130-139/80-89 mm Hg with 10-year CV risk <7.5%.[1]	after a three- to six month trial of lifestyle interventions alone (AHA/ACC)[1]	SBP <130 mm Hg, with encouragement to achieve SBP <120 mm Hg. Consider a DBP target <80 mm Hg. (AHA/ACA)[1]
Patients with BP ≥140/90 mm Hg with 10-year CV risk <7.5%[1]	immediately (AHA/ACC)[1]	
Patients <75 years of age (Hypertension Canada)[2]	140/90 mm Hg (Hypertension Canada)[2]	SBP <130 mm Hg (Hypertension Canada)[2]
Patients with BP ≥160/100 mm Hg (Int Soc HTN)[3]	immediately (Int Soc HTN)[3]	See footnote d (Int Soc HTN).[3]
Patients with BP 140-159/90-99 mm Hg (Int Soc HTN)[3]	after a three- to six-month trial of lifestyle interventions alone (Int Soc HTN)[3]	See footnote d (Int Soc HTN)[3]
Patients <60 years of age (JNC8)[4]	140/90 mm Hg (JNC8)[4]	<140/90 mmHg (JNC8)[4]
Cardiovascular Disease		
Clinical CV disease (e.g., CAD, cerebrovascular disease, heart failure, PAD)[1,2]	• 130/80 mm Hg (AHA/ACC)[1] • SBP 130 to 139 mm Hg (Hypertension Canada)[2] • 140/90 mmHg (Int Soc HTN)[3]	• CAD:<130/80 mm Hg (if elderly, <140/80 mm Hg [Int Soc HTN])[3,10] • SBP <130 mm Hg (Hypertension Canada)[2]
Secondary stroke prevention	• 130/80 mm Hg (AHA/ACC)[1] • 140/90 mm Hg (Int Soc HTN)[3]	• ·<130/80 mm Hg (AHA/ACC; Int Soc HTN)[1,3] • <140/80 in elderly patients (Int Soc HTN)[3]
Cardiovascular Risk		
10-year atherosclerotic CV risk ≥7.5% (AHA/ACC)[1]	130/80 mm Hg (AHA/ACC)[1]	<130/80 mm Hg, with encouragement to achieve SBP <120 mm Hg (AHA/ACC)[1]
10-year Framingham Risk Score ≥20% (Hypertension Canada)[2]	SBP 130 to 139 mm Hg (Hypertension Canada)[2]	SBP <130 mm Hg (Hypertension Canada)[2]
Heart Failure		
Heart failure	• 130/80 mm Hg (AHA/ACC)[1] • SBP 130 to 139 mm Hg (Hypertension Canada)[2] • 140/90 mm Hg (Int Soc HTN)[3]	• <130/80 mm Hg but >120/70 mm Hg (Int Soc HTN)[3] • SBP <130 mm Hg (Hypertension Canada)[2]
Diabetes		
Diabetes	• 130/80 mm Hg (AHA/ACC)[1] • SBP 130 to 139 mm Hg (Hypertension Canada)[2] • 140/90 mmHg (Int Soc HTN; JNC8)[3,4]	• 130/80 mm Hg (AHA/ACC; Diabetes Canada; ADA)[1,7,8] AHA/ACC: can encourage achievement of SBP <120 mm Hg).[1] • SBP <130 mm Hg (Hypertension Canada)[2] • <140/90 mm Hg (JNC8)[4] • See footnote d (Int Soc HTN)[3]
Kidney Insufficiency		
CKD (e.g., eGFR <60 mL/min/1.73 m^2 or albuminuria [≥30 mg albumin/g creatinine (Canada: ≥3 mg/mmol)][1,2,4]	• 130/80 mm Hg (AHA/ACC)[1] • SBP 130 to 139 mm Hg (Hypertension Canada)[2] • 140/90 mmHg (Int Soc HTN; JNC8)[3,4]	• SBP <130 mm Hg (AHA/ACC; Hypertension Canada)[1,2] • <140/90 mm Hg (JNC8)[4] • <130/80 mm Hg (if elderly, <140/80 mm Hg [Int Soc HTN])[3]
Older Age (also see comorbidities, above)		
≥75 years of age (Hypertension Canada)[2]	SBP 130 to 139 mm Hg (Hypertension Canada)[2]	SBP <130 mm Hg (Hypertension Canada)[2]
≥60 years of age (JNC8)[4]	150/90 mm Hg (JNC8)[4]	150/90 mm Hg (JNC8)[4]

Hypertension Goals in Adults

Modified August 2025

Footnotes

a. Individualizing BP Goals: Consider factors such as life expectancy, frailty, independence, comorbidities, and patient goals in older adults.[1]
Age. Age itself does not preclude a lower goal; almost 30% of the patients randomized to intensive treatment in SPRINT were 75 years of age or older.[9]
Comorbidities. The higher the baseline CV risk, the greater the absolute benefit from lower goals.[7,9] As SBP decreases, so does CV risk.[1]
Intensive Targets. Some patients will benefit from a SBP <120 mm Hg, particularly those with high CV risk.[1] Although SPRINT showed benefit of a SBP target of <120 mm Hg vs a target of <140 mm Hg, most patients in trials targeting a SBP <120 mm Hg were not able to reach this goal.[2] Also, in clinical trials, BP measurements are ~5 to 10 mm Hg below those measured in practice.[2] Intensive control increases the risk of syncope, falls, electrolyte disturbances, and kidney injury.[2]

b. Hypertension goals may differ among guidelines. AHA/ACC guidelines considered results of studies of intensive targets (SPRINT , ACCORD, SPS-3, and meta-analyses.[1] Hypertension Canada considered studies of intensive targets, plus input from clinicians and patients.[2] A DBP goal was not specified in the Canadian guidelines because patients with SBP <130 mm Hg have low CV risk if DBP is 70 to 90 mm Hg.[2] At the time of JNC8, there were no studies proving a clear benefit of targets lower than 140 mm Hg.[4]

c. The American Academy of Family Practice recommends a target of <140/90 mm Hg for most patients, to reduce all-cause and CV mortality.[5] Using shared decision-making, consider a target of <135/85 mm Hg to further reduce MI risk.[5] These recommendations were based largely on the results of a meta-analysis [Evidence Level A-2].[6]

d. Int Soc HTN: at minimum reduce BP by at least 20/10 mm Hg, ideally to <140/90 mm Hg.[3] If <65 years of age, optimally target <130/80 mm Hg (but >120/70 mm Hg).If ≥65 years of age, target <140/90 mm Hg if tolerated, but consider frailty, function, and treatment tolerability.[3]

Abbreviations: ADA = American Diabetes Association; ACC = American College of Cardiology; AHA = American Heart Association; CAD = coronary artery disease; CV = cardiovascular; DBP = diastolic blood pressure; HTN = hypertension; Int Soc HTN = International Society of Hypertension; MI = myocardial infarction; PAD = peripheral artery disease; SBP = systolic blood pressure

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Meds That Can Increase Blood Pressure

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--List not all-inclusive--

Acetaminophen	• Limit to <4 g/day in patients with HTN.[1] • Scheduled doses (1,000 mg PO four times daily for ~2 weeks) in patients with HTN increased SBP ~5 mm Hg vs placebo [Evidence Level B-1].[7] ○ It is unknown if patients without HTN are affected; if lower doses/shorter durations affect BP; if BP elevation persists with long-term use; or if CV risk is affected.[8]
ADHD stimulants (e.g., methylphenidate, amphetamines, atomoxetine[2])	• **Management**: consider dose reduction or switching to a nonstimulant (e.g., clonidine ER [US], guanfacine ER).[1] See our charts, *Comparison of ADHD Medications* (US)(Canada) for help.
Antiandrogens	• Most common with abiraterone, apalutamide, enzalutamide (≥10% incidence).[17]
Bupropion	• Product labeling carries a warning about BP elevation, but data are conflicting.[3,5,6] • BP elevation may be more common when used with nicotine for smoking cessation.[2]
Caffeine	• Limit to <300 mg/day in patients with HTN, or one cup/day if HTN is severe and uncontrolled.[1] • Caffeine intake of about 200 to 300 mg (1 to 2 cups of coffee) may increase SBP by about 8 mm Hg and DBP by about 6 mm Hg.[4] ○ Effects may be more evident within 2 to 3 hours of periodic use, as tolerance to BP elevations seems to occur with regular caffeine intake (e.g., daily coffee).[4]

Calcineurin Inhibitors (cyclosporine, tacrolimus [not topical[2]])	• **Management**. Consider:
	  ○ switching from cyclosporine to tacrolimus (lesser effect on BP).[1]
	  ○ use of a thiazide (monitor for prerenal uremia) or DHP CCB to treat HTN.[12]

CGRP antagonists	• Erenumab (Aimovig)(and possibly other CGRP antagonists) has been associated with new or worsening hypertension.[19] • Onset is often within the first week of treatment.[2]
Clonidine	• Consider clonidine patch over immediate-release oral clonidine due to higher risk of rebound HTN if discontinued without tapering.[1,18] • See our chart, *Common Oral Medications that May Need Tapering* for help
Corticosteroids	• Consider nonsystemic alternative (e.g., topical, inhaled).[1] • Use lowest effective dose for shortest duration necessary.[13] • Consider a diuretic, ACEI, or ARB to treat HTN.[4]
Dietary supplements (e.g., ephedra, black licorice [Glycyrrhiza glabra], blue cohosh [Caulophyllum thalictroides], bitter orange [Citrus aurantium], hoodia [Hoodia gordonii])	• **Management**: discontinue.[1] • See our *NatMed* database for help identifying other supplements' effects on BP.

Erythropoietin	• Common (10% to 20% of patients). Usually starts two weeks to 4 months after starting treatment.[15] May be temporary in some patients.[15]
	• **Management**. Consider:[15]
	  ○ antihypertensive(s).
	  ○ dose reduction or temporary discontinuation.
	  ○ switch from intravenous to subcutaneous route

Estrogen-containing contraceptives	• See our chart, *Choosing a Contraceptive and Emergency Contraception* for information on use in patients with HTN, and alternatives.
Ethanol	• Limit to 1 drink/day for women or 2 drinks/day for men.[1]
Lasmiditan	• BP may transiently increase for one to two hours post-dose.[2]

NSAIDs	• Avoid in patients with HTN, if possible.[1] Consider topical diclofenac instead.[1]
	• **Management**. Consider:
	  ○ dose reduction.[4]
	  ○ switching to celecoxib (lower risk).[9]
	  ○ use of a thiazide or DHP CCB (e.g., amlodipine, felodipine) to treat HTN.[10,11]

Pseudoephedrine	• Limit to shortest duration necessary.[1] • Avoid if HTN is severe or uncontrolled.[1]
Testosterone	• Avoid if HTN is uncontrolled.[2] • Monitor BP in all patients, especially those with HTN.[2] • Topical products have less of an effect on BP than oral or injectable products.[2]
Tizanidine	• Risk of rebound HTN if discontinued without tapering.[1] • Generally reserve for spasticity; consider alternate muscle relaxants (e.g., cyclobenzaprine).[1,14] See our chart, *Muscle Relaxants*, for more alternatives. • See our chart, *Common Oral Medications that May Need Tapering* for tapering help.

VEGF inhibitors (e.g., bevacizumab, sorafenib, sunitinib)	• Risk varies among agents, but is very common, occurs within hours to days, and can be severe.[16]
	• **Management**:
	  ○ Advise patients to monitor BP at home daily during the first cycle or dosage increase, then every two to three weeks.[17]
	  ○ Consider with an ACEIs, ARBs, or DHP CCB to treat HTN.[16]
	  ▪ When VEGF inhibitor treatment is stopped, reduce/stop antihypertensive therapy as appropriate.[17]

Venlafaxine	• May increase DBP by up to 15 mm Hg.[2]
	• **Management**. Consider:
	  ○ dose reduction.[2]
	  ○ switching from immediate-release to extended-release venlafaxine.[3]
	  ○ switching to duloxetine (low risk with therapeutic doses) or SSRI (unlikely to significantly increase blood pressure).[1,3]

Weight Loss Meds (diethylpropion, phentermine)	• Monitor blood pressure.[2] • Avoid in severe hypertension.[2]

Meds That Can Increase Blood Pressure

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Abbreviations: ADHD = attention deficit hyperactivity disorder; BP = blood pressure; CCB = calcium channel blocker; CGRP = calcitonin gene-related peptide; DBP = diastolic blood pressure; DHP = dihydropyridine; NSAID = nonsteroidal anti-inflammatory drug; MAP = mean arterial pressure; SBP = systolic blood pressure; VEGF = vascular endothelial growth factor

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