



Hypertension treatment

Kamyar Amin MD

Interventional cardiologist

Goals of Therapy

Antihypertensive therapy should be started when:

- (1) the patient has a confirmed diagnosis of hypertension, meaning more than two separate readings at separate times with BP levels consistently above **130/80** mm Hg and
- (2) dietary and lifestyle intervention has been tried for a brief period.

If BP is greater than 20/10 mm Hg above the goal, then both lifestyle and antihypertensive therapy should be started **concomitantly**.

GUIDELINE DIFFERENCES	AMERICAN COLLEGE OF CARDIOLOGY/AMERICAN HEART ASSOCIATION (ACC/AHA)		EUROPEAN SOCIETY OF CARDIOLOGY/EUROPEAN SOCIETY OF HYPERTENSION (ESC/ESH)	
Level of Blood Pressure (BP) Defining Hypertension	Systolic and/or Diastolic		Systolic and/or Diastolic	
	(mm Hg)	(mm Hg)	(mm Hg)	(mm Hg)
Office/clinic BP	≥130	≥80	≥140	≥90
Daytime mean	≥130	≥80	≥135	≥85
Nighttime mean	≥110	≥65	≥120	≥70
24-hr mean	≥125	≥75	≥130	≥80
Home BP mean	≥130	≥80	≥135	≥85
BP targets for treatment	<130/80		Systolic targets	<140 and close to 130
Initial combination therapy	Initial single-pill combination therapy		Initial single-pill combination in patients >20/10 mm Hg above BP goal therapy in patients ≥ 140/90 mm Hg	
Hypertensive requiring	>130/80 mm Hg		≥140/90 mm Hg intervention	

In CKD:

- Almost all people with an eGFR of less than 60 mL/min/1.73 m² and hypertension will require two or more medications to achieve a BP goal of less than 140/90 mm Hg.
- Single-pill combinations, including the combination of a **RAAS blocker with either a calcium antagonist or diuretic**, are preferred agents.

Best Proven Nonpharmacologic Interventions for Prevention and Treatment of Hypertension

	NONPHARMACOLOGIC INTERVENTION	DOSE	APPROXIMATE IMPACT ON SBP HYPERTENSION	NORMOTENSION
Physical activity	Aerobic	<ul style="list-style-type: none"> • 90–150 min/wk • 65%–75% heart rate reserve 	–5/8 mm Hg	–2/4 mm Hg
	Dynamic resistance	<ul style="list-style-type: none"> • 90–150 min/wk • 50%–80% 1 rep maximum • 6 exercises, 3 sets/exercise, 10 repetitions/set 	–4 mm Hg	–2 mm Hg
	Isometric resistance	<ul style="list-style-type: none"> • 4× 2 min (hand grip), 1 min rest between exercises, 30%–40% maximum voluntary contraction, 3 sessions/wk • 8–10 wk 	–5 mm Hg	–4 mm Hg
Healthy diet	DASH dietary pattern	Diet rich in fruits, vegetables, whole grains, and low-fat dairy products with reduced content of saturated and total fat	–11 mm Hg	–3 mm Hg
Weight loss	Weight/body fat	Ideal body weight is best goal but at least 1 kg reduction in body weight for most adults who are overweight	–5 mm Hg	–2/3 mm Hg

Reduced intake of dietary sodium	Dietary sodium	<1500 mg/day is optimal goal but at least 1000 mg/day reduction in most adults	-5/6 mm Hg	-2/3 mm Hg
Enhanced intake of dietary potassium	Dietary potassium	3500-5000 mg/day, preferably by consumption of a diet rich in potassium	-4/5 mm Hg	-2 mm Hg
Moderation in alcohol intake	Alcohol consumption	In individuals who drink alcohol, reduce alcohol to: <ul style="list-style-type: none"> • Men: <2 drinks daily • Women: <1 drink daily 	-4 mm Hg	-3 mm Hg

•Good Potassium sources

Dried fruits (raisins, apricots)

Beans, lentils.

Potatoes.

Butternut

Spinach, broccoli.

Beet greens.

Avocado.

Bananas.

Orang

Tomato

BLOOD PRESSURE–LOWERING MEDICATIONS

- Different Guidelines agree that either a **RAAS blocker, CCB, or thiazide-type diuretic** be the initial treatment started in patients.
- the European guidelines mandate initial therapy be a combination of a RAAS blocker with either a diuretic or calcium blocker, while US guidelines recommend single-pill combinations for those who are 20/10 mm Hg above the goal BP(130/80) or higher.
- **Pharmacologic Intervention in the Older People (>65 years):**

The primary agents used in the treatment of hypertension in older people with the greatest efficacy are thiazide-type diuretics and CCBs.

Thiazide diuretics such as hydrochlorothiazide, chlorthalidone, indapamide, and bendrofluazide, as well as calcium antagonists, are recommended for initiating therapy in the older patient.

- Diuretics cause an initial reduction of intravascular volume, peripheral vascular resistance, and BP in more than 50% of patients.
- However, they can cause hypokalemia, hypomagnesemia, and hyponatremia and are therefore not recommended in patients with baseline electrolyte abnormalities or those with a history of hyponatremia.
- Calcium antagonists are well suited for older patients whose hypertensive profile is based on increasing arterial dysfunction secondary to decreased atrial and ventricular compliance. This class of drugs dilates coronary and peripheral arteries in doses that do not severely affect myocardial contractility.
- First generation immediate-release drugs, such as nifedipine, verapamil, and diltiazem, should be avoided in patients with left ventricular dysfunction. Non-DHPs can precipitate heart blocks in older adults with underlying conduction defects.

- ACE inhibitors and ARBs and Direct renin inhibitors in elderly can be used but:
- 1- Less effective due to lowered level of Angiotensin in elderly, causing less blood pressure lowering potency.
- 2- Lower fluid intake in elderly, causing vulnerability to kidney dysfunction caused by this class of drugs
- Potassium-sparing diuretics are useful when combined with other agents only in people with an eGFR greater than 45 mL/min.
- Aldosterone-blocking agents like spironolactone and eplerenone reduce vascular stiffness and SBP. They are very helpful for patients with hypertension with heart failure or primary hyperaldosteronism.
- Alpha blockers, centrally acting drugs (e.g., clonidine), and nonspecific vasodilators (e.g., minoxidil), should not be used as first- or second-line agents in an older adult with hypertension.

MANAGEMENT OF HYPERTENSION IN CHRONIC KIDNEY DISEASE

- There is weaker evidence to support RAAS-blocker use in people with CKD without proteinuria, and very weak evidence supporting a BP of less than 130/80 mm Hg even for those who have a urine albumin level of 1 g or more and an eGFR of less than 60 mL/min/1.73 m².
- The BP goal of 130/80 mm Hg should be adhered to despite no further renal benefit, although there is CV risk reduction at this level.
- Three risk predictors of hyperkalemia in CKD: (1) eGFR of less than 45 mL/min/1.73 m², (2) serum potassium level above 4.5 mEq/L, and (3) body mass index of less than 25.
- The effect of RAAS blockers in **diabetic nephropathy** to retard hard kidney endpoints such as ESRD has been well documented. However, this class of agents does not possess any specific advantages over other antihypertensive classes in people with diabetes who do not have nephropathy or albuminuria with levels at or above 300 mg/day

In ESRD on dialysis

- In patients on dialysis , BP should be consistently above **120** mm Hg and below **150** mm Hg.
- The most representative BP is the one taken the **morning after dialysis**.
- There should be a minimum of **two and ideally three** readings obtained 1 to 2 minutes apart during those morning readings and then averaged.
- Given that heart failure and sudden death are the most common causes of death in dialysis patients, **beta blockers** have an important role in the BP-lowering armamentarium, unlike the general population.

In Heart failure patients

- Efficacy of **thiazide diuretics**, *especially chlorthalidone*, compared with other antihypertensive drug classes is proven for heart failure prevention at 10 years.
- Most effective antihypertensive drug classes for reducing heart failure were thiazide diuretics, ACEIs, and ARBs.
- Thiazide diuretics were marginally superior.
- Alpha blockers were the least effective agents.
- For **every 10–mm Hg** reduction in SBP the risk of heart failure was reduced by **27%**.
- ACCF/AHA guidelines reflect the uncertainty from HFpEF trials by not recommending any specific agents with class I indications for HFpEF. Instead, guidelines recommend following hypertension guidelines for BP management and treating with diuretics for volume control.

Resistant hypertension

- Resistant hypertension is defined as the failure to achieve a goal BP of less than 140/90 mm Hg in patients who are adherent with maximal tolerated doses of **three** antihypertensive drugs, one of which must be a diuretic appropriate for kidney function.
- The prevalence of resistant hypertension is approximately **8% to 12%**.
- A **mineralocorticoid inhibitor** such as spironolactone has demonstrated significant benefit in controlling BP in these patients.
- There are multiple different nondrug therapy approaches involving different devices for treatment of resistant hypertension. None of these are currently approved. (Renal denervation or stimulation of the carotid body baroreceptors.
- **Renal Denervation**
Stimulation of renal sympathetic nerves **increases renal vascular resistance**, **tubular reabsorption of NaCl**, and **renin release** depending on stimulation frequency.

HYPERTENSIVE URGENCY AND EMERGENCY

- **HYPERTENSIVE URGENCY:** significantly elevated BP levels usually above an SBP of 180 mm Hg, but no acute, ongoing target-organ damage. They were observed for a few hours after treatment with one or more oral antihypertensive agents and then discharged.

- **HYPERTENSIVE EMERGENCY:** signs or symptoms of acute, ongoing target-organ damage

Intravenous drug treatment: **Nitroprusside** , **Fenoldopam** mesylate (acutely improves several parameters of renal function), short acting **Clevidipine** (and its older, longer-acting cousin, nicardipine, are often used for patients with coronary disease), **Nimodipine** is typically used only for subarachnoid hemorrhage, **Labetalol**.

- The quickest therapeutic response to a hypertensive emergency is recommended for an acute aortic dissection. In this condition the BP should be lowered *within 20 minutes* to an SBP *below 120* mm Hg.

- **In the setting of an acute ischemic stroke:**

If the patient is a candidate for acute thrombolytic therapy and the BP is higher than 180/110 mm Hg, acute BP lowering is recommended. Most authorities suggest attempting slow and gradual BP lowering only if the BP is “very high” (e.g., $\geq 180/110$ mm Hg) with a short-acting, rapidly titratable drug.

All other types of hypertensive emergencies can be handled with a gradual lowering of BP (typically **10% to 15%** during the *first hour* and a further **10% to 20%** during the *next hour*, for a total of approximately **25%**).

Patients who present with hypertensive crises involving **cardiac ischemia**/infarction or pulmonary edema can be managed with **nitroglycerin**, **clevidipine**, **nicardipine**, or **nitroprusside**, although typically a combination of drugs (including an ACEI for heart failure or left ventricular dysfunction) is used in these settings.

- In Hypertensive emergency, oral antihypertensive therapy should be instituted, usually after approximately 8 to 24 hours of parenteral therapy.
- Hypertensive emergency resulting from catecholamine excess states (e.g., pheochromocytoma, monoamine oxidase inhibitor crisis, cocaine intoxication) are most appropriately managed with an **intravenous alpha blocker** (e.g., **phentolamine**), with a beta blocker added later, if needed.
- Hypertensive emergency during pregnancy : **Magnesium sulfate, methyldopa, and hydralazine** are the drugs of choice, with **oral labetalol and nifedipine** being drugs of second choice and nitroprusside, ACEIs, and ARBs are contraindicated.