KIDNEY HEALTH FOR ALL

PREPARING FOR THE UNEXPECTED,
SUPPORTING THE VULNERABLE!

به نام خداوند جان و خرد

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Hypertension

By:

Hamed Mohamadian Shoeili

(Nephrologist)

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Clinical manifestations

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- *No specific complains or manifestations other than elevated systolic and/or diastolic BP (**Silent Killer**)*
- *Morning occipital headache*
- *Dizziness*
- *Fatigue*
- *In severe hypertension, epistaxis or blurred vision*

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Target Organ Damage

- *Heart*
  - *Left ventricular hypertrophy*
  - *Angina or myocardial infarction*
  - *Heart failure*
- *Brain*
  - *Stroke or transient ischemic attack*
- *Chronic kidney disease*
- *Peripheral arterial disease*
- *Retinopathy*

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Office BP Readings: Checklist for Accurate Measurements

Key Points	*Specific Instructions*
Step 1: Prepare patient	*-Have patient relax, sitting in a chair (feet on floor, back supported) for >5 min.* *-Avoid caffeine, exercise, and smoking for ≥ 30 min before measurement.* *-Ensure bladder emptied.* *-No talking during rest period or measurement.* *-Remove clothing covering location of cuff placement.* *-Measurements while patient sitting/lying on exam table do not fulfill criteria.*
Step 2: Use proper technique	*-Use validated BP measurement device that is calibrated periodically.* *-Support patient's arm (e.g., resting on a desk).* *-Position middle of cuff on patient's upper arm at mid-sternum (right atrium).* *-Use correct cuff size, such that the bladder encircles 80% of the arm.* *-Either stethoscope diaphragm or bell may be used for auscultatory readings.*
Step 3: Take proper measurements	*-At first visit, record BP in both arms. Subsequently, use arm with higherBP.* *-Separate repeated measurements by 1–2 min.* *-For auscultatory readings, estimate SBP by palpation and inflate cuff 20–30 mm Hg above. Deflate 2 mm Hg per second and listen for Korotkoff sounds.*
Step 4: Document BP readings	*-Note time of most recent BP medication before measurements.* *-Record SBP and DBP.*
Step 5: Average readings	*-Use average of ≥2 readings obtained on ≥2 occasions to estimate level of BP.*
Step 6: Provide readings to patient	*-Provide patients SBP/DBP readings both verbally and in writing.*

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Self-Measurement of BP

- ***Provides information on:***
  1. ***Response to antihypertensive therapy***
  2. ***Improving adherence with therapy***
  3. ***Evaluating white-coat HTN***

- ***Home measurement of >135/85 mmHg is generally considered to be hypertensive.***

- ***Home measurement devices should be checked regularly.***

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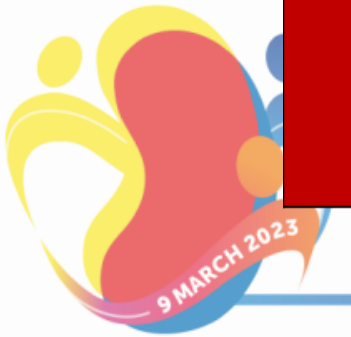
Basic and Optional Laboratory Tests for Primary Hypertension

Basic testing	***Fasting blood glucose****
	Complete blood count
	Lipid profile
	Serum creatinine with eGFR*
	Serum sodium, potassium, calcium*
	Thyroid-stimulating hormone
	Urinalysis
	Electrocardiogram
Optional testing	***Echocardiogram***
	Uric acid
	Urinary albumin to creatinine ratio



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BP Classification (JNC 7 and ACC/AHA Guidelines)

SBP		DBP	2003 JNC7	2017 ACC/AHA
<120	and	<80	Normal BP	Normal BP
120–129	and	<80	Prehypertension	Elevated BP
130–139	or	80–89		Stage 1 hypertension
140–159	or	90-99	Stage 1 hypertension	Stage 2 hypertension
≥160	or	≥100	Stage 2 hypertension	Stage 2 hypertension

- Blood Pressure should be based on an average of ≥2 careful readings on ≥2 occasions
- Adults with SBP or DBP in two categories should be designated to the higher BP category

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Out of Office BP Readings

Greater use of out of office BP measurements (ABPM or HBPM) for confirmation of office hypertension and recognition of White Coat/Masked Hypertension

- ***Confirmed (Sustained) Hypertension***
  - ***Elevated office and out of office average BP***
  - ***Substantially higher risk of CVD compared to adults with normal office and out of office BPs***
  - ***Require therapy (nonpharmacological or combined nonpharmacological and antihypertensive drug therapy)***
- ***White Coat Hypertension (WCH)***
  - ***Office Hypertension not confirmed by out of office BP readings***
  - ***Present in about 10-25% of adults with office hypertension***
  - ***CVD risk profile more like adults with normal BP than adults with sustained hypertension***
  - ***May not need treatment for hypertension (should be monitored for development of sustained hypertension)***

Masked Hypertension (MH)

- ***Normal office BP but out of office BP hypertension***
- ***Present in about 10-25% of adults with normal office BP***
- ***CVD risk profile more like adults with sustained hypertension than adults without hypertension***
- ***Should be considered for antihypertensive drug therapy***

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Secondary Hypertension

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Underlying cause of high BP in about 10% of adults with hypertension

Common causes
Renal parenchymal disease
Renovascular disease
Primary aldosteronism
Obstructive sleep apnea
Drug or alcohol induced
Uncommon causes
Pheochromocytoma/paraganglioma
Cushing's syndrome
Hypothyroidism
Hyperthyroidism
Aortic coarctation (undiagnosed or repaired)
Primary hyperparathyroidism
Congenital adrenal hyperplasia
Mineralocorticoid excess syndromes other than primary aldosteronism
Acromegaly

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2017 ACC/AHA BP Guideline: Thresholds for Treatment

SBP		DBP		CVD Risk/other circumstances	Recommended Treatment
<120	and	<80		N/A	Healthy Lifestyle
120–129	and	<80		N/A	Nonpharmacological therapy
130-139	or	80-89		No CVD/10-yr ASCVD risk <10%*	Nonpharmacological therapy
130–139	or	80–89	+	CVD/10-year ASCVD risk ≥ 10%	Antihypertensive drug therapy (plus nonpharmacological therapy)
≥130	or	≥80		Diabetes or CKD	
≥130				Age ≥65 years	
≥140	or	≥90		N/A	

* AHA/ACC 2013 Pooled Cohort CVD Risk Equations

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Non pharmacological Treatment of hypertension

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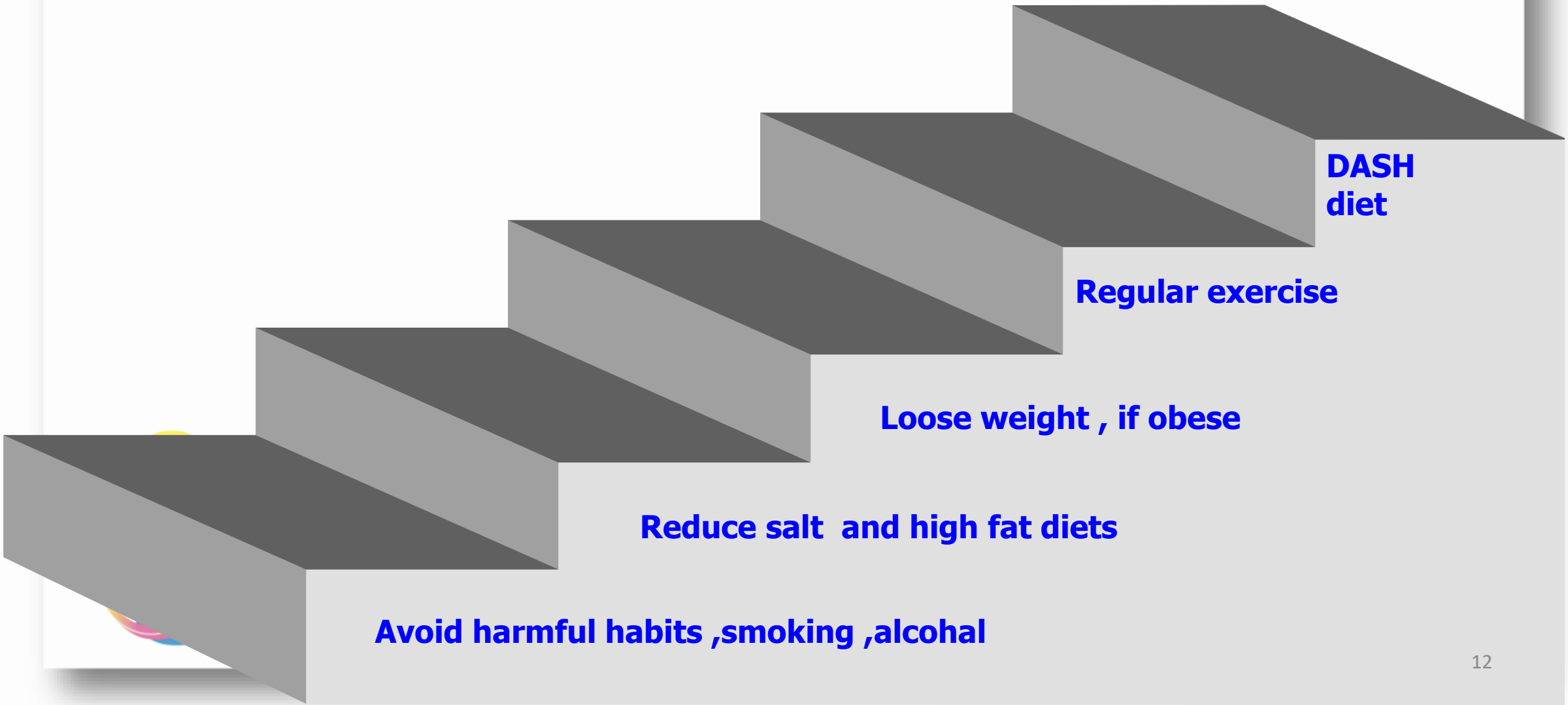

Best Proven Nonpharmacological Interventions for Prevention and Treatment of Hypertension

	Intervention	Dose	Approximate Impact on SBP	
			Hypertension	Normotension
Weight loss	Calorie reduction & physical activity	Best goal is ideal body weight. Expect about 1 mm Hg for every 1-kg reduction in weight.	-5 mm Hg	-2/3 mm Hg
Healthy diet	DASH diet	Diet rich in fruits, vegetables, whole grains, and low-fat dairy products, with reduced saturated and total fat.	-11 mm Hg	-3 mm Hg
Dietary sodium	Reduced intake	Optimal goal <1500 mg/d, but at least a 1000-mg/d reduction in most adults.	-5/6 mm Hg	-2/3 mm Hg
Dietary potassium	Enhanced intake through diet	3500–5000 mg/d, preferably by diet rich in potassium.	-4/5 mm Hg	-2 mm Hg
Physical activity	Aerobic	• 90–150 min/wk (65%–75% heart rate reserve)	-5/8 mm Hg	-2/4 mm Hg
	Dynamic resistance	• 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	• 4 × 2 min (hand grip), 1 min between exercises, 30%–40% max. voluntary contraction, 3 sessions/wk (8–10 wk)	-5 mm Hg	-4 mm Hg
Moderation in alcohol intake	Alcohol consumption	In individuals who drink alcohol, reduce alcohol to: • Men: ≤2 drinks daily • Women: ≤1 drink daily	-4 mm Hg	-3 mm Hg

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Lifestyle Modification

Modification	***Approximate SBP reduction (range)***
Weight reduction	*5–20 mmHg / 10 kg weight loss*
Adopt DASH eating plan	*8–14 mmHg*
Dietary sodium reduction	*2–8 mmHg*
Physical activity	*4–9 mmHg*
Moderation of alcohol consumption	*2–4 mmHg*

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Drug therapy for hypertension

Class of drug	Example dose	Initiating dose	Usual maintenance
Diuretics	Hydrochlorothiazide	12.5 mg o.d	12.5-25 mg o.d
β-blockers	Atenolol	25-50 mg o.d.	50-100 mg o.d.
Calcium channel blockers	Amlodipine	2.5-5 mg o.d.	5-10 mg o.d
α-blockers	prazosin	2.5 mg o.d	2.5-10mg o.d.
ACE- inhibitors	captopril	25 mg q8-12hr	25-150mg q8-12hr
Angiotensin-II receptor blockers	Losartan valsartan	25-50 mg o.d. 80-160 mg o.d.	50-100 mg o.d 80-360 mg o.d

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Diuretics

Example: Hydrochlorothiazide

- *Act by decreasing blood volume and cardiac output*
- *Decrease peripheral resistance during chronic therapy*
- *Drugs of choice in elderly hypertensives*

Side effects-

- *Hypokalaemia*
- *Hyponatraemia*
- *Hyperlipidaemia*
- *Hyperuricaemia (hence contraindicated in gout)*
- *Hyperglycaemia (hence not safe in diabetes)*
- *Not safe in renal and hepatic insufficiency*

ACE inhibitors

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***Example:* Ramipril, Lisinopril, Enalapril, Captopril**

- *Inhibit ACE and formation of angiotensin II and block its effects*
- *Drugs of choice in co-existent diabetes mellitus, Heart failure*

Side effects-

dry cough, hypotension, angioedema

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Angiotensin II receptor blockers

Example: ***Losartan, Valsartan***

- *Block the angiotensin II receptor and inhibit effects of angiotensin II*
- *Drugs of choice in patients with co-existing diabetes mellitus*

Side effects-

safer than ACEI, hypotension,

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Calcium channel blockers

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Example: Amlodipine

- Block entry of calcium through calcium channels
- Cause vasodilation and reduce peripheral resistance
- Drugs of choice in elderly hypertensives and those with co-existing asthma
- Neutral effect on glucose and lipid levels

Side effects

Flushing, headache, Pedal edema

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Beta blockers

Example: ***Atenolol, Metoprolol, Carvedilol, Bisoprolol***

- *Block β_1 receptors on the heart*
- *Block β_2 receptors on kidney and inhibit release of renin*
- *Decrease rate and force of contraction and thus reduce cardiac output*
- *Drugs of choice in patients with co-existent coronary heart disease*

Side effects-

- *lethargy, impotency, bradycardia*
- *Not safe in patients with co-existing asthma and diabetes*
- *Have an adverse effect on the lipid profile*

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Alpha blockers

Example: ***prazosin, Terazosin***

- *Block α-1 receptors and cause vasodilation*
- *Reduce peripheral resistance and venous return*
- *Exert beneficial effects on lipids and insulin sensitivity*
- *Drugs of choice in patients with co-existing BPH*

Side effects-

Postural hypotension,

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Antihypertensive Drug Treatment: Older Adults

- *In adults ≥65 years, with average SBP ≥130 mm Hg:*
  - *if non institutionalized ambulatory community-dwelling adult, treat to <130 mm Hg*
  - *If high burden of comorbidity and limited life expectancy, treatment decisions should be based on clinical judgment and patient preference, using a team-based approach to assess risk/benefit of potential treatment*

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Antihypertensive Drug Treatment: Diabetes Mellitus

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- *In adults with hypertension and DM,*
- *If average BP ≥130/90 mm Hg, initiate antihypertensive drug therapy and treat to <130/90 mm Hg*
- *All first-line classes of antihypertensives (i.e., diuretics, ACE inhibitors, ARBs, and CCBs) useful and effective*
- *Consider ACEI or ARBs in presence of albuminuria*

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Antihypertensive Drug Treatment: Heart Failure

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Hypertension and heart failure with reduced ejection factor (HFrEF)

- *Prescribe guideline directed medical therapy (GDMT)*
- *Nondihydropyridine CCBs not recommended*
- *BP goal: <130/80 mm Hg*

Hypertension and heart failure with preserved ejection factor (HFpEF)

- *If symptoms of volume overload, prescribe diuretics*
- *If high BP persists, prescribe ACE inhibitors or ARBs and beta blockers*
- *BP goal: <130 mm Hg*

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Antihypertensive Drug Treatment: Ischemic Heart Disease

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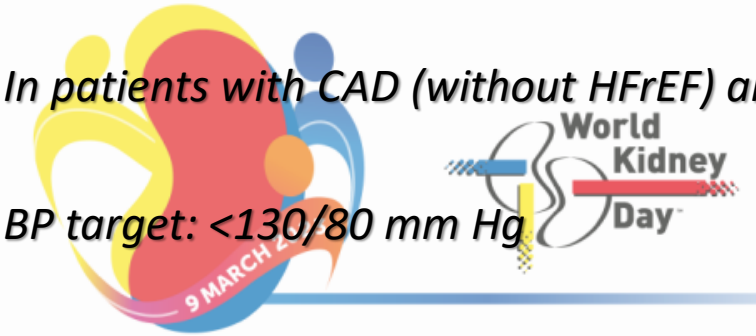
- *Adults with hypertension and stable ischemic heart disease (SIHD)*
  - *Use GDMT medications (e.g., beta blockers, ACE inhibitors, or ARBs) for compelling indications (e.g., previous MI, stable angina)*
  - *Add other drugs (e.g. dihydropyridine CCBs, thiazide diuretics, and/or mineralocorticoid receptor antagonists) as needed to control hypertension*
  - *If hypertension persistent and angina, add dihydropyridine CCBs to GDMT beta blockers*
  - *In adults who have had an MI or ACS, reasonable to continue GDMT beta blockers for treatment of hypertension beyond 3 years*
  - *In patients with CAD (without HFrEF) and angina who had MI > 3 years previously, consider beta blockers and/or CCBs*
  - *BP target: <130/80 mm Hg*



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Antihypertensive Drug Treatment: CKD

- *Adults with hypertension and CKD*
  - *Treatment with ACE inhibitors reasonable to slow kidney disease progression:*
    - *Stage 3 or higher*
    - *Stage 1 or 2 with albuminuria ≥300 mg/d, or ≥300 mg/g albumin-to-creatinine ratio [or equivalent in first morning void]*
  - *Use of ARBs reasonable if ACE inhibitors not tolerated*
  - *BP goal: SBP <130/80 mm Hg*

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Causes of Resistant Hypertension

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- *Improper BP measurement*
- *Excess sodium intake*
- *Inadequate diuretic therapy*
- *Medication*
  - *Inadequate doses*
  - *Drug actions and interactions (e.g., (NSAIDs), illicit drugs, sympathomimetics, OCP)*
  - *Over-the-counter drugs and some herbal supplements*
- *Excess alcohol intake*
- *Identifiable causes of HTN*

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Hypertensive Emergency and Urgency

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- *Severe hypertension (BP >180/120 mmHg):*

- ***Emergency:*** *if acute, life-threatening manifestations of target organ damage (hypertensive encephalopathy, subarachnoid or intracerebral hemorrhage, acute ischemic stroke or MI, pulmonary edema, unstable angina, aortic dissection, acute renal failure), severe preeclampsia/eclampsia, or pheochromocytoma crisis:*
  - *Admit to ICU for continuous BP monitoring and parenteral antihypertensive drug therapy*
  - *Reduce SBP to <140 within first hour (<120 mm Hg for aortic dissection)*
- ***Urgency:*** *if no compelling indication:*
  - *Reduce SBP no more than 25% in first hour and if stable to 160/100 within next 2-6 hours and cautiously to normal during next 24-48 hours*

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