Hypertension: JNC-7

Southern California University of Health Sciences
Physician Assistant Program

Management and Treatment of Hypertension
April 17, 2018, presented by
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**Algorithm for Treatment of Hypertension**

**Principles of Hypertension Treatment**

- Treat to BP <140/90 mmHg or BP <130/80 mmHg in patients with diabetes or chronic kidney disease.
- Majority of patients will require two medications to reach goal.

**Algorithm for Treatment of Hypertension**

**Lifestyle Modifications**

Not at Goal Blood Pressure (<140/90 mmHg)
(<130/80 mmHg for patients with diabetes or chronic kidney disease)

See Strategies for Improving Adherence to Therapy

**Initial Drug Choices**

Without Compelling Indications

- Stage 1 Hypertension (SBP 140–159 or DBP 90–99 mmHg)
  - Thiazide-type diuretics for most. May consider ACEI, ARB, BB, CCB, or combination.
- Stage 2 Hypertension (SBP ≥160 or DBP ≥100 mmHg)
  - 2-drug combination for most (usually thiazide-type diuretic and ACEI, ARB, or BB, or CCB).

With Compelling Indications

- Drug(s) for the compelling indications
  - See Compelling Indications for Individual Drug Classes
  - Other antihypertensive drugs (diuretics, ACEI, ARB, BB, CCB) as needed.

**Not at Goal Blood Pressure**

- Optimize dosages or add additional drugs until goal blood pressure is achieved. Consider consultation with hypertension specialist.

See Strategies for Improving Adherence to Therapy

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**Classification of Blood Pressure (BP)**

<table>
<thead>
<tr>
<th>Category</th>
<th>SBP mmHg</th>
<th>DBP mmHg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;120</td>
<td>&lt;80</td>
</tr>
<tr>
<td>Prehypertension</td>
<td>120–139</td>
<td>80–89</td>
</tr>
<tr>
<td>Hypertension, Stage 1</td>
<td>140–159</td>
<td>90–99</td>
</tr>
<tr>
<td>Hypertension, Stage 2</td>
<td>≥160</td>
<td>≥100</td>
</tr>
</tbody>
</table>

*See Blood Pressure Measurement Techniques (reverse side)

Key: SBP = systolic blood pressure  DBP = diastolic blood pressure

**Diagnostic Workup of Hypertension**

- Assess risk factors and comorbidities.
- Reveal identifiable causes of hypertension.
- Assess presence of target organ damage.
- Conduct history and physical examination.
- Obtain laboratory tests: urinalysis, blood glucose, hematocrit and lipid panel, serum potassium, creatinine, and calcium. Optional: urinary albumin/creatinine ratio.
- Obtain electrocardiogram.
**Compelling Indication Initial Therapy Options**

- Heart failure: THIAZ, BB, ACEI, ARB, ALDO ANT
- Post myocardial infarction: BB, ACEI, ALDO ANT
- High CVD risk: THIAZ, BB, ACEI, CCB
- Diabetes: THIAZ, BB, ACEI, ARB, CCB
- Chronic kidney disease: ACEI, ARB
- Recurrent stroke prevention: THIAZ, ACEI

**Causes of Resistant Hypertension**

- Improper BP measurement
- Excess sodium intake
- Inadequate diuretic therapy
- Medication:
  - Inadequate doses
  - Drug actions and interactions (e.g., nonsteroidal anti-inflammatory drugs (NSAIDs), illicit drugs, sympathomimetics, oral contraceptives)
  - Over-the-counter (OTC) drugs and herbal supplements
- Excess alcohol intake
- Identifiable causes of hypertension (see reverse side)

**Blood Pressure Measurement Techniques**

<table>
<thead>
<tr>
<th>Method</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-office</td>
<td>Two readings, 5 minutes apart, sitting in chair. Confirm elevated reading in contralateral arm.</td>
</tr>
<tr>
<td>Ambulatory BP monitoring</td>
<td>Indicated for evaluation of “white coat hypertension.” Absence of 10–20 percent BP decrease during sleep may indicate increased CVD risk.</td>
</tr>
<tr>
<td>Patient self-check</td>
<td>Provides information on response to therapy. May help improve adherence to therapy and is useful for evaluating “white coat hypertension.”</td>
</tr>
</tbody>
</table>

**Principles of Lifestyle Modification**

- Encourage healthy lifestyles for all individuals.
- Prescribe lifestyle modifications for all patients with prehypertension and hypertension.
- Components of lifestyle modifications include weight reduction, DASH eating plan, dietary sodium reduction, aerobic physical activity, and moderation of alcohol consumption.

**Lifestyle Modification Recommendations**

<table>
<thead>
<tr>
<th>Modification</th>
<th>Recommendation</th>
<th>Avg. SBP Reduction Range†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight reduction</td>
<td>Maintain normal body weight (body mass index 18.5–24.9 kg/m²).</td>
<td>5–20 mmHg/10 kg</td>
</tr>
<tr>
<td>DASH eating plan</td>
<td>Adopt a diet rich in fruits, vegetables, and lowfat dairy products with reduced content of saturated and total fat.</td>
<td>8–14 mmHg</td>
</tr>
<tr>
<td>Dietary sodium reduction</td>
<td>Reduce dietary sodium intake to ≤100 mmol per day (2.4 g sodium or 6 g sodium chloride).</td>
<td>2–8 mmHg</td>
</tr>
<tr>
<td>Aerobic physical activity</td>
<td>Regular aerobic physical activity (e.g., brisk walking) at least 30 minutes per day, most days of the week.</td>
<td>4–9 mmHg</td>
</tr>
<tr>
<td>Moderation of alcohol consumption</td>
<td>Men: limit to ≤2 drinks* per day. Women and lighter weight persons: limit to ≤1 drink* per day.</td>
<td>2–4 mmHg</td>
</tr>
</tbody>
</table>

* 1 drink = 1/2 oz or 15 mL ethanol (e.g., 12 oz beer, 5 oz wine, 1.5 oz 80-proof whiskey).
† Effects are dose and time dependent.

**Strategies for Improving Adherence to Therapy**

- Clinician empathy increases patient trust, motivation, and adherence to therapy.
- Physicians should consider their patients’ cultural beliefs and individual attitudes in formulating therapy.

The National High Blood Pressure Education Program is coordinated by the National Heart, Lung, and Blood Institute (NHLBI) at the National Institutes of Health. Copies of the JNC 7 Report are available on the NHLBI Web site at [http://www.nhlbi.nih.gov](http://www.nhlbi.nih.gov) or from the NHLBI Health Information Center, P.O. Box 30105, Bethesda, MD 20824-0105; Phone: 301-592-8573 or 240-629-3255 (TTY); Fax: 301-592-8563.
Blood Pressure (BP) Thresholds and Recommendations for Treatment and Follow-Up

**Normal BP** (BP <120/80 mm Hg)
- Promote optimal lifestyle habits
- Reassess in 1 y (Class IIa)

**Elevated BP** (BP 120–129/<80 mm Hg)
- Nonpharmacologic therapy (Class I)
- Reassess in 3–6 mo (Class I)

**Stage 1 Hypertension** (BP 130–139/80–89 mm Hg)
- Nonpharmacologic therapy (Class I)
- Reassess in 3–6 mo (Class I)

**Stage 2 Hypertension** (BP ≥ 140/90 mm Hg)
- Nonpharmacologic therapy and BP-lowering medication (Class I)
- Reassess in 1 mo (Class I)

![Figure 4](image)

*Using the ACC/AHA Pooled Cohort Equations. Note that patients with DM or CKD are automatically placed in the high-risk category. For initiation of RAS inhibitor or diuretic therapy, assess blood tests for electrolytes and renal function 2 to 4 weeks after initiating therapy.

†Consider initiation of pharmacological therapy for stage 2 hypertension with 2 antihypertensive agents of different classes. Patients with stage 2 hypertension and BP ≥160/100 mm Hg should be promptly treated, carefully monitored, and subject to upward medication dose adjustment as necessary to control BP. Reassessment includes BP measurement, detection of orthostatic hypotension in selected patients (e.g., older or with postural symptoms), identification of white coat hypertension or a white coat effect, documentation of adherence, monitoring of the response to therapy, reinforcement of the importance of adherence, reinforcement of the importance of treatment, and assistance with treatment to achieve BP target.
Heart Failure with Reduced Ejection Fraction (HFrEF)

**Recommendations for Treatment of Hypertension in Patients with Heart Failure with Reduced Ejection Fraction (HFrEF)**

Referenced studies that support recommendations are summarized in online Data Supplement 34

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>C-E0</td>
<td>1. Adults with HFrEF and hypertension should be prescribed GDMT* titrated to attain a BP less than 130/80 mm Hg.</td>
</tr>
<tr>
<td>III:</td>
<td></td>
<td>2. Nondihydropyridine CCBs are not recommended in the treatment of hypertension in adults with HFrEF.</td>
</tr>
</tbody>
</table>

Heart Failure with Preserved Ejection Fraction (HFP EF)

**Recommendations for Treatment of Hypertension in Patients with Heart Failure with Preserved Ejection Fraction (HFP EF)**

Referenced studies that support recommendations are summarized in online Data Supplement 35, 36

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>C-E0</td>
<td>1. In adults with HFP EF who present with symptoms of volume overload, diuretics should be prescribed to control hypertension.</td>
</tr>
<tr>
<td>I</td>
<td>C-LD</td>
<td>2. Adults with HFP EF and persistent hypertension after management of volume overload should be prescribed ACE inhibitors or ARB and beta blockers titrated to attain systolic BP less than 130 mm Hg.</td>
</tr>
</tbody>
</table>
Management of Hypertension in Patients with Stable Ischemic Heart Disease (SIHD)

Hypertension With SIHD

Reduce BP to <130/80 mm Hg with GDMT beta blockers*, ACE inhibitor, or ARB† (Class I)

BP goal not met

Angina pectoris

Yes

Add dihydropyridine CCBs if needed (Class I)

No

Add dihydropyridine CCBs, thiazide-type diuretics, and/or MRAs as needed (Class I)

* GDMT beta blockers for BP control or relief of angina include carvedilol, metoprolol tartrate, metoprolol succinate, nadolol, bisoprolol, propranolol, and timolol. Avoid beta blockers with intrinsic sympathomimetic activity. The beta blocker atenolol should not be used because it is less effective than placebo in reducing cardiovascular events.

† If needed for BP control.

Figure 5
Management of Hypertension in Patients with Chronic Kidney Disease

Treatment of Hypertension in Patients with CKD

BP goal <130/80 mm Hg *(Class I)*

Albuminuria
(≥ 300 mg/d or ≥300 mg/g creatinine)

Yes

ACE inhibitor *(Class IIa)*

No

Usual “first line” medication choices

ACE inhibitor intolerant

Yes

ARB* *(Class IIb)*

No

ACE inhibitor* *(Class IIa)*

*CKD stage 3 or higher or stage 1 or 2 with albuminuria ≥300 mg/d or ≥300 mg/g creatinine.

Figure 6
Diagnosis and Management of a Hypertensive Crisis

SBP >180 mm Hg and/or DBP >120 mm Hg

Target organ damage new/progressive/worsening

Yes

Hypertensive emergency

Admit to ICU (Class I)

Conditions
• Aortic dissection;
• Severe pre-eclampsia or eclampsia;
• Pheochromocytoma crisis

Yes

Reduce SBP to <140 mm Hg during 1st h† and to <120 mm Hg in aortic dissection† (Class I)

No

Markedly elevated BP

Reinstitute/intensify oral antihypertensive drug therapy and arrange follow-up

Reduce BP by max 25% over 1st h†, then to 160/100-110 mm Hg over next 2-6 h, then to normal over next 24-48 h (Class I)

†If other comorbidities are present, select a drug specified in Table 20.

Figure 11

Use drug(s) specified in Table 19.