### 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.

### Assess for Major Cardiovascular Disease (CVD) Risk Factors

- Hypertension
- Obesity (body mass index ≥30 kg/m²)
- Dyslipidemia
- Diabetes mellitus
- Cigarette smoking
- Physical inactivity
- Microalbuminuria, estimated glomerular filtration rate <60 mL/min
- Age (>55 for men, >65 for women)
- Family history of premature CVD (men age <55, women age <65)

### Assess for Identifiable Causes of Hypertension

- Sleep apnea
- Drug induced/related
- Chronic kidney disease
- Primary aldosteronism
- Renovascular disease
- Cushing's syndrome or steroid therapy
- Pheochromocytoma
- Coarctation of aorta
- Thyroid/parathyroid disease

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### Treatment

#### 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
- With 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, or ARB, or BB, or CCB).

**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
**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>

**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)

**Compelling Indications for Individual Drug Classes**

<table>
<thead>
<tr>
<th>Compelling Indication</th>
<th>Initial Therapy Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart failure</td>
<td>THIAZ, BB, ACEI, ARB, ALDO ANT</td>
</tr>
<tr>
<td>Post myocardial infarction</td>
<td>BB, ACEI, ALDO ANT</td>
</tr>
<tr>
<td>High CVD risk</td>
<td>THIAZ, BB, ACEI, CCB</td>
</tr>
<tr>
<td>Diabetes</td>
<td>THIAZ, BB, ACEI, ARB, CCB</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>ACEI, ARB</td>
</tr>
<tr>
<td>Recurrent stroke prevention</td>
<td>THIAZ, ACEI</td>
</tr>
</tbody>
</table>

Key: THIAZ = thiazide diuretic, ACEI = angiotensin converting enzyme inhibitor, ARB = angiotensin receptor blocker, BB = beta blocker, CCB = calcium channel blocker, ALDO ANT = aldosterone antagonist

**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.

**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 &lt;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.

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.