Learning Objective

- Determine a blood pressure goal for a patient with heart failure (HF) and/or coronary disease.
- Given a patient case, develop an anti-hypertensive regimen for a patient with heart failure (HF) and/or coronary disease.

Hypertension Statistics

- General Population
  - 22.6% or 80 million people in the US have HTN
  - Stroke
  - 77% of patients suffering a stroke have history of HTN
  - Heart Failure
  - 75% of patients have prior history of HTN

US, United States; HTN, hypertension

Circulation. 2015;131:e29–e322

National Hypertension Guidelines

- Kidney Disease: Improving Global Outcomes (2012)
- American Society of Hypertension/International Society of Hypertension (2014)
- Eight Joint National Committee (2014)
- American Heart Association/American College of Cardiology/American Society of Hypertension – Cardiovascular Disease (2015)
- American Diabetes Association (2015)

Eighth Joint National Committee Guidelines

- Lifestyle Modification (Diet, Exercise, Weight, Alcohol)

Guideline/Statement | Year | Patient Group | Goal (mm Hg)
--- | --- | --- | ---
Kidney Disease: Improving Global Outcomes | 2012 | No proteinuria | ≤ 140/90
Kidney Disease: Improving Global Outcomes | 2012 | Proteinuria | ≤ 130/90
Eighth Joint National Committee | 2014 | Age < 60 | < 140/90
Eighth Joint National Committee | 2014 | Age ≥ 60 | < 150/90
American Society of Hypertension/International Society of Hypertension | 2012 | Age 26-75 | < 140/90
American Society of Hypertension/International Society of Hypertension | 2012 | Age ≥ 76 | < 140/90
American Heart Association Prevention/American College of Cardiology/American Hypertension Society (Patients with Cardiovascular Disease) | 2015 | All ages | < 140/90
American Heart Association Prevention/American College of Cardiology/American Hypertension Society (Patients with Cardiovascular Disease) | 2015 | Age ≥ 80 | < 150/90
American Heart Association Prevention/American College of Cardiology/American Hypertension Society (Patients with Cardiovascular Disease) | 2015 | CAD, ACS, or HF | < 140/90
American Heart Association Prevention/American College of Cardiology/American Hypertension Society (Patients with Cardiovascular Disease) | 2015 | CAD, post-MI, stroke/TIA, cardiac artery disease, PAD, or AAA | < 130/80
American Diabetes Association | 2015 | Diabetes | < 140/90

CVD, cardiovascular disease; ACS, acute coronary syndrome; HTN, hypertension; HF, heart failure; MI, myocardial infarction; TIA, transient ischemia attack; PAD, peripheral arterial disease; AAA, abdominal aortic aneurysm
Eighth Joint National Committee Guidelines - Concerns

- No recommendations for patients with coronary disease or HF
- Medication selection for special populations not addressed
- Definition of older patient as age > 60 inconsistent with other guidelines

Hypertension Management with CAD

- Reduce excess morbidity and unnecessary deaths
- "Lower is better" blood pressure target
- Lower blood pressure target still intensely debated
  - Not consistently supported by high-quality, randomized, clinical trials

ACCORD Trial

- Type 2 diabetic patients
- Intensive blood pressure control (BP < 120/80 mm Hg) vs. standard (BP < 140/90 mm Hg)
- No significant difference in CVD outcomes except:
  - Stroke: 0.32% vs. 0.53% (Hazard ratio 0.59, 95% CI: 0.39-0.89, P = 0.02)
  - Mean achieved DBP of 60-65 mm Hg in intensive BP control group
    - Statistically nonsignificant decrease in CVD events

Blood Pressure Goal in CAD

<table>
<thead>
<tr>
<th>Disease State</th>
<th>BP Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary prevention of CVD events</td>
<td>&lt; 140/90 mm Hg</td>
</tr>
<tr>
<td>High-risk patients with CAD:</td>
<td>&lt; 130/80 mm Hg</td>
</tr>
<tr>
<td>Previous MI</td>
<td></td>
</tr>
<tr>
<td>Previous stroke/TIA</td>
<td></td>
</tr>
<tr>
<td>Certain CAD risk equivalents</td>
<td></td>
</tr>
<tr>
<td>CVD, cardiovascular disease</td>
<td></td>
</tr>
<tr>
<td>CAD, coronary artery disease</td>
<td></td>
</tr>
<tr>
<td>MI, myocardial infarction</td>
<td></td>
</tr>
<tr>
<td>TIA, transient ischemic attack</td>
<td></td>
</tr>
</tbody>
</table>

SPRINT Trial

- Non-diabetic patients at high risk for CVD disease

Hazard ratio with intensive treatment, 0.75 (95% CI, 0.64–0.89)

Standard treatment

Intensive treatment

CVD, cardiovascular; CAD, coronary artery disease; MI, myocardial infarction; TIA, transient ischemic attack.
Blood Pressure Goal in ACS
- Not been well-studied in literature
- Target blood pressure < 140/90 mm Hg immediately post-ACS
- Goal of 130/80 mm Hg at discharge reasonable

ACS, acute coronary syndrome; Circulation. 2005;111:435-70

Blood Pressure Goal for Heart Failure
- No definitive data for optimal blood pressure goal
- Conservative recommendation of < 140/90 mm Hg
- Consideration of < 130/80 mm Hg in select heart failure patients

Circulation. 2005;111:435-70

Hypertension Treatment in CAD

Past Medical History
- CAD or Chronic Stable Angina

First-line Therapies
- Beta Blockers + ACE-I or ARB

Sequential Therapies
- Thiazide for BP control
- DHP CCB for ischemic or BP control

Acute Coronary Syndrome
- Beta Blockers + ACE-I or ARB
- Thiazide or DHP CCB if normal LVEF
- Aldosterone antagonists if LV dysfunction

CAD, coronary artery disease; ACE-I, angiotensin-converting enzyme inhibitors; ARB, angiotensin receptor blockers; BP, blood pressure; CCB, calcium channel blockers; LVEF, left ventricular ejection fraction; LV, left ventricle; ACS, acute coronary syndrome.

Evidence in HF
- SBP lowered to 110-130 mm Hg in most trials with clear benefit
- COPERNICUS trial
  - Evaluated carvedilol in severe chronic HF
  - Entry criteria included SBP as low as 85 mm Hg with mean pretreatment BP of 129/76 mm Hg
  - 27% reduction in combined risk of death or hospitalization for a cardiovascular reason (p = 0.00002)

SBP, systolic blood pressure; HF, heart failure
Circulation. 2002;106:2194-2199

EXCEED Trial: Blood Pressure Control in HFpEF
Greater improvement in diastolic relaxation with lower SBP

Hypertension Treatment in Heart Failure
- Heart Failure with Reduced Ejection Fraction

First-line Therapies
- Beta Blockers* + ACE-I or ARB + Aldosterone Antagonist

Sequential Therapies
- Thiazide or Thiazide-like diuretics for BP control of mild HF and normal renal failure
- Loop Diuretics for volume control if moderate-to-severe HF and GFR < 30 mL/min
- Hydralazine/nitrates combination if African American

*Metoprolol succinate, bisoprolol, or carvedilol only since these have been shown to reduce mortality; HF, heart failure; ACE-I, angiotensin-converting enzyme inhibitors; ARB, angiotensin receptor blockers; BP, blood pressure; LVEF, left ventricular ejection fraction; HFpEF, heart failure with preserved ejection fraction; GFR, glomerular filtration rate
Circulation. 2005;111:435-70
Conclusion

- Blood pressure goal should be patient-specific

- Eighth Joint National Committee guidelines for general population and patients with diabetes and/or chronic kidney disease

- Refer to disease-specific guidelines for management of CVD conditions and heart failure

<table>
<thead>
<tr>
<th>Disease State</th>
<th>BP Goal*</th>
<th>First-Line Therapies</th>
<th>Sequential Therapies</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAD or Chronic</td>
<td>&lt; 140/90</td>
<td>Beta blocker</td>
<td>Diuretic</td>
</tr>
<tr>
<td>Stable Angina</td>
<td></td>
<td>ACE-I or ARB</td>
<td>DHP CCB</td>
</tr>
<tr>
<td>Acute Coronary Syndrome</td>
<td>&lt; 140/90</td>
<td>Beta blocker</td>
<td>Diuretic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ACE-I or ARB</td>
<td>DHP CCB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DHP CCB</td>
<td>Aldosterone-Antagonist</td>
</tr>
<tr>
<td>Heart Failure</td>
<td>&lt; 140/90</td>
<td>Beta blocker</td>
<td>Aldosterone-Antagonist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ACE-I or ARB</td>
<td>Thiazide or thiazide-like diuretics if mild HF and not/mild renal impairment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aldosterone-Antagonist</td>
<td>Losartan diuretics if moderate-to-severe HF and/or GFR &lt; 30 mL/min</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hydralazine/nitrate combination if African American</td>
</tr>
</tbody>
</table>

* BP goal should be < 150/90 if Age > 80 yrs.