## Controlling Blood Pressure for Non-Diabetic People with Hypertension: Ages 18-85

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>MY2016</td>
<td>66.95</td>
</tr>
<tr>
<td>MY2017</td>
<td>50.45</td>
</tr>
<tr>
<td>MY2018</td>
<td>74.07</td>
</tr>
</tbody>
</table>

## Diabetes Care: Blood Pressure Control <140/90 mm Hg

<table>
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<tr>
<th>Year</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>MY2016</td>
<td>74.07</td>
</tr>
<tr>
<td>MY2017</td>
<td>60.33</td>
</tr>
<tr>
<td>MY2018</td>
<td>80.21</td>
</tr>
</tbody>
</table>

*Provider organization self-reported data.

Data source: IHA AMP Reporting Portal
UCDAVIS HEALTH HYPERTENSION PROGRAM 2016–2018

1. Attention to BP remeasurement in alignment with the Measure Up Pressure down program. Training was given to MA, LVN, RN regarding proper BP measurement with a requirement to repeat any BP >140/90. Many times 2nd bp readings were normal and for those that were persistently high they were flagged for action on the part of the physician seeing the patient to assure it was addressed. This was for all patients not simply patients with a diagnosis of hypertension.

2. **Better Blood pressure program through HME.** This program has been presented previously at the Right Care Initiative meeting in Sacramento and involves connecting a pharmacist with a patient to try to improve BP control in patients with poorly controlled HTN. It involves a wireless bp cuff connected to a smart phone that can send BP readings obtained by the patient to the pharmacist and treating physicians to help with medication management. This program has gone through some tweaks in the last 2 years in order to expand its scope and improve efficiency. We have continued to take patients into the program by referral but have added a population health approach by identifying patients with poorly controlled HTN with our analytics and proactively reached out to the PCP to solicit a referral to enter the program. This has vastly increased the number of patients who we are able to reach with the program not all of which have required the total BBP program but have had interventions by RN case managers and social workers in some cases. The result has been effectively the development of a CDM program for HTN. We have recently added the option of video visits between the patient and pharmacist which we feel will be a significant value add in improving control of selected patients.

3. **Rollout of Healthy Planet in EPIC** has allowed us to have many quality metrics available for physicians to view in EPIC. The result is that physicians can see their performance vs clinic performance and system performance in these metrics including HTN in both diabetics and non-diabetics. These results are also reviewed by clinic leadership and at least in the Neighborhood clinics have been used to alter physician compensation based on performance.
GETTING TO ZERO: REDUCING EVENTS AND COSTS OF CARDIOVASCULAR DISEASE

WILLIAM BOMMER

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November 18, 2019
GETTING TO ZERO: REDUCING EVENTS AND COSTS OF CARDIOVASCULAR DISEASE

CALIFORNIA AND SACRAMENTO PROGRAMS

- Secondary Disease Interventions
- Secondary Disease Treatment
- Getting to Zero Risk Equations
- Primary Treatment
- Primary Lifestyle for All
- Starting Early- Children
GETTING TO ZERO: CALIFORNIA INTERVENTIONS

SENATE BILL 891
SENATE BILL 357
SENATE BILL 906

California Ambulatory Surgery Center Interventions
California Transcutaneous Aortic Valve Replacement

Concept and Product Development
- Feature Iteration
- Hypothesis Generation
- New Technology Development
- Surrogate Assessment

Evidence Generation
- Pragmatic Trials
- Implementation Science

Adoption and Engagement
- Real World Adherence
- Registries
- Technology Transfer

Outcomes Measures
- Clinical Endpoints
- Patient Reported Outcomes
- Cost and Cost Effectiveness

Performance Measures
- Scalability
- Patient and Provider Usability
- Implementation Factors

Guidelines
- Levels of Evidence
- Real World Evidence

California Elective Offsite PCI
California Transcutaneous Aortic Valve Replacement
Secondary Prevention in Patients with Clinical ASCVD
LIPIDS

Clinical ASCVD

Healthy Lifestyle

ASCVD not at very high-risk*

Age ≤75 yrs

High-intensity statin (Goal: \( \downarrow \) LDL-C ≥50%) (Class I)

If high-intensity statin not tolerated, use moderate-intensity statin (Class I)

If on maximal statin & LDL-C ≥70 mg/dL (≥1.8 mmol/L), adding ezetimibe may be reasonable (Class IIa)

Initiation of moderate or high-intensity statin is reasonable (Class IIa)

Continuation of high-intensity statin is reasonable (Class IIa)

Very high-risk* ASCVD

Age >75

High-intensity or maximal statin (Class I)

If on maximal statin & LDL-C ≥70 mg/dL (≥1.8 mmol/L), adding ezetimibe is reasonable (Class IIa)

If PCSK9-I is considered, add ezetimibe to maximal statin before adding PCSK9-I (Class I)

Dashed arrow indicates RCT-supported efficacy, but is less cost effective

If on clinically judged-maximal LDL-C lowering therapy & LDL-C ≥70 mg/dL (≥1.8 mmol/L), or non-HDL-C ≥100 mg/dL (≥2.6 mmol/L), adding PCSK9-I is reasonable (Class IIa)
GETTING TO ZERO: PREVENTION – EQUATIONS

- Inter-heart OR(MI) = \[3.27 \text{ ApoB/A1}] [2.87 \text{ smoking}] [2.67 \text{ psychosocial}] [2.37 \text{ diabetes}] [1.91 \text{ hypertension}] [1.62 \text{ abd obesity}] / [1.42 \text{ fruits/vegetables}] [1.16 \text{ physical activity}] [1.09 \text{ alcohol}]

- Pooled Cohort: ARIC, CHS, CARDIA, Framingham Original and Offspring 10-year risk = \((1 - S_{10})^e(\text{IndX'B-MeanX'B})\) with \(\ln\) (age, total cholesterol, HDL-C, systolic BP) sum of coefficient X value for specific race and sex

- Non-significant variables: diastolic BP, FH ASCVD, GFR<60, BMI

- Potential adjuncts: hsCRP, ApoB, microalbuminuria, cardiorespiratory fitness, CAC score, CIMT, ABI (Not enough data yet)
Primary Prevention: Assess ASCVD Risk in Each Age Group
Emphasize Adherence to Healthy Lifestyle

Age 0-19 y
Lifestyle to prevent or reduce ASCVD risk
Diagnosis of Familial Hypercholesterolemia → statin

Age 20-39 y
Estimate lifetime risk to encourage lifestyle to reduce ASCVD risk
Consider statin if family history, premature ASCVD, and LDL-C ≥160 mg/dL (≥4.1 mmol/L)

Age 40-75 y and
LDL-C ≥70 to <190 mg/dL (≥1.8 - <4.9 mmol/L) without diabetes mellitus
10-year ASCVD risk percent begins risk discussion

Risk Discussion:
Emphasize lifestyle to reduce risk factors
Class (I)

Risk Discussion:
If Risk enhancers present then risk discussion regarding moderate-intensity statin therapy
Class (IIb)

Risk Discussion:
If risk estimate + risk enhancers favor statin, initiate moderate-intensity statin to reduce LDL-C by 30% - 49%
Class (I)

Risk Discussion:
If risk decision is uncertain:
Consider measuring CAC in selected adults:
CAC = zero (lowers risk; consider no statin, unless diabetes, family history of premature CHD, or cigarette smoking are present)
CAC = 1-99 favors statin (especially after age 55)
CAC = 100+ and/or ≥75th percentile, initiate statin therapy
COST-EFFECTIVENESS OF STATINS FOR BORDERLINE RISK

- Standard: treat $AR_{10} > 7.5\%$, DM, LDL $> 190$  
  - Add treatment to $AR_{10} 5-7.4\%$ and LDL $160-190$  
  - Add treatment for $AR_{10} 5-7.4$ and LDL $130-159$  
  - Add treatment for $AR_{10} > 5.0$ regardless of LDL

- 35 Million
- 2 Million
- 4 Million
- 5 Million
### LIPIDS

#### Assessment

<table>
<thead>
<tr>
<th>ICER (Cost per QALY gained)</th>
<th>LDL 10-Year Risk, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; $150,000 per QALY</td>
<td>Intermediate cost-effective</td>
</tr>
<tr>
<td>$50,000–$150,000 per QALY</td>
<td>Highly cost-effective</td>
</tr>
<tr>
<td>$0–$50,000 per QALY</td>
<td>Cost saving</td>
</tr>
</tbody>
</table>

#### Men aged 40 y

<table>
<thead>
<tr>
<th>Baseline LDL-C Level, mg/dL</th>
<th>&lt;100</th>
<th>100-129</th>
<th>130-159</th>
<th>160-189</th>
<th>130 LDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1.0</td>
<td>Dominated</td>
<td>151,325</td>
<td>51,759</td>
<td>29,677</td>
<td></td>
</tr>
<tr>
<td>1.0-2.4</td>
<td>Dominated</td>
<td>60,493</td>
<td>17,471</td>
<td>Cost saving</td>
<td></td>
</tr>
<tr>
<td>2.5-4.9</td>
<td>Dominated</td>
<td>44,715</td>
<td>8,219</td>
<td>Cost saving</td>
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<tr>
<td>5.0-7.4</td>
<td>71,038</td>
<td>6,410</td>
<td>Cost saving</td>
<td>Cost saving</td>
<td></td>
</tr>
<tr>
<td>≥7.5</td>
<td>Cost saving</td>
<td>Cost saving</td>
<td>Cost saving</td>
<td>Cost saving</td>
<td></td>
</tr>
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</table>

#### Men aged 50 y

<table>
<thead>
<tr>
<th>Baseline LDL-C Level, mg/dL</th>
<th>&lt;100</th>
<th>100-129</th>
<th>130-159</th>
<th>160-189</th>
<th>130 LDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1.0</td>
<td>Dominated</td>
<td>156,204</td>
<td>43,592</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0-2.4</td>
<td>Dominated</td>
<td>156,204</td>
<td>43,592</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5-4.9</td>
<td>Dominated</td>
<td>33,230</td>
<td>7,039</td>
<td>Cost saving</td>
<td></td>
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<tr>
<td>5.0-7.4</td>
<td>157,413</td>
<td>14,408</td>
<td>3,727</td>
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<tr>
<td>≥7.5</td>
<td>122,524</td>
<td>6,437</td>
<td>Cost saving</td>
<td>Cost saving</td>
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</tbody>
</table>

#### Men aged 60 y

<table>
<thead>
<tr>
<th>Baseline LDL-C Level, mg/dL</th>
<th>&lt;100</th>
<th>100-129</th>
<th>130-159</th>
<th>160-189</th>
<th>130 LDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1.0</td>
<td>Dominated</td>
<td>146,320</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0-2.4</td>
<td>Dominated</td>
<td>146,320</td>
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<tr>
<td>2.5-4.9</td>
<td>Dominated</td>
<td>124,853</td>
<td>29,804</td>
<td>6,029</td>
<td></td>
</tr>
<tr>
<td>5.0-7.4</td>
<td>Dominated</td>
<td>69,893</td>
<td>466</td>
<td>Cost saving</td>
<td></td>
</tr>
<tr>
<td>≥7.5</td>
<td>188,836</td>
<td>20,576</td>
<td>Cost saving</td>
<td>Cost saving</td>
<td></td>
</tr>
</tbody>
</table>

#### Women aged 40 y

<table>
<thead>
<tr>
<th>Baseline LDL-C Level, mg/dL</th>
<th>&lt;100</th>
<th>100-129</th>
<th>130-159</th>
<th>160-189</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1.0</td>
<td>Dominated</td>
<td>7,885,907</td>
<td>103,222</td>
<td>45,493</td>
</tr>
<tr>
<td>1.0-2.4</td>
<td>Dominated</td>
<td>381,475</td>
<td>85,107</td>
<td>16,989</td>
</tr>
<tr>
<td>2.5-4.9</td>
<td>766,768</td>
<td>138,336</td>
<td>28,087</td>
<td>Cost saving</td>
</tr>
<tr>
<td>5.0-7.4</td>
<td>≥7.5</td>
<td>Cost saving</td>
<td>Cost saving</td>
<td>Cost saving</td>
</tr>
</tbody>
</table>

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</tr>
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<tbody>
<tr>
<td>&lt;1.0</td>
<td>Dominated</td>
<td>Dominated</td>
<td>214,360</td>
<td>61,128</td>
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<tr>
<td>1.0-2.4</td>
<td>Dominated</td>
<td>140,001</td>
<td>51,773</td>
<td>17,147</td>
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<tr>
<td>2.5-4.9</td>
<td>123,694</td>
<td>29,306</td>
<td>7,840</td>
<td>Cost saving</td>
</tr>
<tr>
<td>5.0-7.4</td>
<td>29,364</td>
<td>2,185</td>
<td>Cost saving</td>
<td>Cost saving</td>
</tr>
<tr>
<td>≥7.5</td>
<td>Cost saving</td>
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<tbody>
<tr>
<td>&lt;1.0</td>
<td>Dominated</td>
<td>Dominated</td>
<td>142,111</td>
<td>40,226</td>
</tr>
<tr>
<td>1.0-2.4</td>
<td>Dominated</td>
<td>Dominated</td>
<td>124,853</td>
<td>29,804</td>
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Data are presented as incremental cost-effectiveness ratios (ICER). A negative ICER indicates cost saving.
COST-EFFECTIVENESS OF STATINS FOR BORDERLINE RISK

- Standard: treat $\text{AR}_{10} > 7.5\%$, DM, LDL $> 190$
- Add treatment to $\text{AR}_{10}$ 5-7.4% and LDL 160-190
- Add treatment for $\text{AR}_{10}$ 5-7.4 and LDL 130-159
- Add treatment for $\text{AR}_{10} > 5.0$ regardless of LDL

More Aggressive treatment would save: 1200-5400 events/million, 1200-3200 QALY/million each year AND COST SAVINGS
Primary Prevention

Assess ASCVD Risk in Each Age Group
Emphasize Adherence to Healthy Lifestyle

Age 0-19 y
Lifestyle to prevent or reduce ASCVD risk
Diagnosis of Familial Hypercholesterolemia → statin

Age 20-39 y
Estimate lifetime risk to encourage lifestyle to reduce ASCVD risk
Consider statin if family history, premature ASCVD and LDL-C ≥160 mg/dL (≥4.1 mmol/L)

Age 40-75 y
LDL-C ≥190 mg/dL (≥4.9 mmol/L)
No risk assessment; High-intensity statin (Class I)

Diabetes mellitus and age 40-75 y
Moderate-intensity statin (Class I)

Diabetes mellitus and age 40-75 y
Risk assessment to consider high-intensity statin (Class IIa)

Age >75 y
Clinical assessment, Risk discussion

ASCVD Risk Enhancers:
- Family history of premature ASCVD
- Persistently elevated LDL-C ≥160 mg/dL (≥4.1 mmol/L)
- Chronic kidney disease
- Metabolic syndrome
- Conditions specific to women (e.g., preeclampsia, premature menopause)
- Inflammatory diseases (especially rheumatoid arthritis, psoriasis, HIV)
- Ethnicity factors (e.g., South Asian ancestry)

Lipid/Biomarkers:
- Persistently elevated triglycerides (≥175 mg/mL)

In selected individuals if measured:
- hs-CRP ≥2.0 mg/L
- Lp(a) levels >50 mg/dL or >125 nmol/L
- apoB ≥130 mg/dL
- Ankle-brachial index (ABI) <0.9

Risk Discussion:
- Emphasize lifestyle to reduce risk factors Class (I)
- If risk enhancers present then risk discussion regarding moderate-intensity statin therapy Class (IIb)
- If risk estimate + risk enhancers favor statin, initiate moderate-intensity statin to reduce LDL-C by 30% - 49% Class (I)
- Risk Discussion: initiate statin to reduce LDL-C ≥50% Class (I)

If risk decision is uncertain:
Consider measuring CAC in selected adults:
- CAC = zero (lowers risk; consider no statin, unless diabetes, family history of premature CHD, or cigarette smoking are present)
- CAC = 1-99 favors statin (especially after age 55)
- CAC = 100+ and/or ≥75th percentile, initiate statin therapy
6. In intermediate-risk or selected borderline-risk adults, if the decision about statin use remains uncertain, it is reasonable to use a CAC score in the decision to withhold, postpone or initiate statin therapy (S4.4.2-15, S4.4.2-17, S4.4.2-23).

7. In intermediate-risk adults or selected borderline-risk adults in whom a CAC score is measured for the purpose of making a treatment decision, AND

- If the coronary calcium score is zero, it is reasonable to withhold statin therapy and reassess in 5 to 10 years, as long as higher risk conditions are absent (diabetes mellitus, family history of premature CHD, cigarette smoking);
- If CAC score is 1 to 99, it is reasonable to initiate statin therapy for patients ≥55 years of age;
- If CAC score is 100 or higher or in the 75th percentile or higher, it is reasonable to initiate statin therapy (S4.4.2-17, S4.4.2-23).

***CENTRAL ILLUSTRATION:*** Cumulative Incidence of MACE Stratified by Statin Treatment and CAC Severity

- **CAC 0**: Statin vs. No Statin
  - aSHR 1.00, 95% CI 0.79-1.27
  - p = 0.99

- **CAC 1-100**: Statin vs. No Statin
  - aSHR 0.83, 95% CI 0.60-1.16
  - p = 0.29

- **CAC 101-400**: Statin vs. No Statin
  - aSHR 0.32, 95% CI 0.21-0.48
  - p < 0.0001

- **CAC 401+**: Statin vs. No Statin
  - aSHR 0.56, 95% CI 0.34-0.90
  - p = 0.017

---

COST-EFFECTIVENESS OF STATINS FOR BORDERLINE RISK

- Treatment for borderline AR$_{10}$ and LDL 160-189 is cost-saving.
- Adding treatment for AR$_{10}$ borderline and LDL >130 is cost-saving in men and highly cost-effective in women.
- Further extending treatment to all AR10 >5.0% would prevent the greatest number of ASCVD events AND be highly cost-effective.
- Patients with high LDL gain the greatest statin benefit.
- Patients with 0 Coronary Calcium Score gain little statin benefit.
- Personalized treatment can save lives and reduce costs.
Systolic BP During Follow-up

**Year 1**

*Mean SBP 136.2 mm Hg*

*Standard*

*Mean SBP 121.4 mm Hg*

*Intensive*

Average SBP (During Follow-up)

**Standard:** 134.6 mm Hg

**Intensive:** 121.5 mm Hg

Average number of antihypertensive medications

Number of participants
LEVEL 1: BASIC HYPERTENSION GUIDELINES

ACC/AHA Guideline Management of High Blood Pressure in Adults (2017)

Blood Pressure (BP) Thresholds and Recommendations for Treatment and Follow-Up
(For non-institutionalized, ambulatory, community-living adults)

Normal BP (BP <120/80 mm Hg)
Elevated BP (BP 120-129/80-89 mm Hg)
Stage 1 Hypertension (BP 130-139/80-89 mm Hg)
Stage 2 Hypertension (BP ≥140/90 mm Hg)

BP goal met
Assess and optimize adherence to therapy
Consider intensification of therapy

Clinical ASCVD or estimated 10-y CVD risk ≥10%
Promote optimal lifestyle habits

No
Yes

Nonpharmacologic therapy (Class I)
Nonpharmacologic therapy and BP-lowering medication (Class I)
Nonpharmacologic therapy and BP-lowering medication (Class I) ¶

Reassess in 1 year (Class IIa)
Reassess in 3-6 mo (Class I)
Reassess in 3-6 mo (Class I)

Oral Antihypertensive Drugs

<table>
<thead>
<tr>
<th>Class</th>
<th>Drug</th>
<th>Usual Dose, Range (mg per day)</th>
<th>Daily Frequency</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Agents</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thiazide or thiazide-type diuretics</td>
<td>Chlorothalidone</td>
<td>12.5-25</td>
<td>1</td>
<td>• Chlorothalidone preferred based on prolonged half-life and proven trial reduction of CVD</td>
</tr>
<tr>
<td></td>
<td>Hydrochlorothiazide</td>
<td>25-50</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indapamide</td>
<td>1.25-2.5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Metolazone</td>
<td>2.5-10</td>
<td>1</td>
<td>• Monitor for hyponatremia and hypokalemia, uric acid and calcium levels.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Use with caution in patients with history of acute gout unless patient is on uric acid-lowering therapy.</td>
</tr>
<tr>
<td>ACE Inhibitors</td>
<td>Benazepril</td>
<td>10-40</td>
<td>1 or 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Captopril</td>
<td>12.5-150</td>
<td>2 or 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Enalapril</td>
<td>5-40</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
| | Lisinopril | 10-40 | 1 | | • Do not use if history of angioedema with ACE inhibitors.
| | | | | • Avoid in pregnancy | |
| | | | | | |
| ARBs | Azilsartan | 40-80 | 1 | | • Do not use in combination with ACE inhibitors or direct renin inhibitor |
| | Canrenone | 8-32 | 1 | | • Increased risk of hyperkalemia in CKD or in those on K+ supplements or K+-sparing drugs |
| | Eprosartan | 600-900 | 1 or 2 | | • May cause acute renal failure in patients with severe bilateral renal artery stenosis |
| | Irbesartan | 150-300 | 1 | | • Do not use if history of angioedema with ARBs. Patients with a history of angioedema with an ACEI can receive an ARB beginning 6 weeks after ACEI discontinued. |
| | Losartan | 50-100 | 1 or 2 | | • Avoid in pregnancy |
| | | | | | |
| CCB—diltiazepines | Amlodipine | 2.5-10 | 1 | | • Avoid use in patients with HFE/FE; amlodipine or felodipine may be used if required |
| | Felodipine | 5-10 | 1 | | • Associated with dose-related pedal edema, which is more common in women than men |
| | Isradipine | 5-10 | 2 | | | |
| | Nifedipine SR | 5-20 | 1 | | | |
| | Nifedipine LA | 60-120 | 1 | | | |
| | Nisoldipine | 30-60 | 1 | | | |
| CCB—non-diltiazepines | Diltiazem SR | 180-300 | 2 | | • Avoid routine use with beta blockers due to increased risk of bradycardia and heart block |
| | Diltiazem ER | 120-480 | 1 | | • Do not use in patients with HFE/FE |
| | Verapamil IR | 40-80 | 3 | | • Drug interactions with diltiazem and verapamil (CYP3A4 major substrate and moderate inhibitor) |
| | Verapamil SR | 120-480 | 1 or 2 | | | |
| | Verapamil-Delayed release ER (various forms) | 100-480 | 1 (in the evening) | | | |

Nonpharmacologic interventions to reduce BP include: weight loss for overweight or obese patients with a Heart healthy diet, sodium restriction, and potassium supplementation within the diet; and increased physical activity with a structured exercise program. Men should be limited to no more than 2 and women no more than 1 standard alcohol drinks per day. The usual impact of each lifestyle change is a 4-5 mmHg decrease in SBP and 2-4 mmHg in DBP; but diet low in sodium; saturated fat, and total fat and increase in fruits; vegetables, and grains may decrease SBP by approximately 11 mmHg.


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1 Using the ACC/AHA Pooled Cohort Equations (http://tools.acc.org/ASCVD-Risk-Estimator-Plus). Note that patients with DM or CKD are automatically placed in the high-risk category. For initiation of renin-angiotensin system (RAS) inhibitor or diuretic therapy, assess blood tests for electrolytes and renal function 2 to 4 weeks after initiating therapy.

2 Consider initiation of pharmacological therapy for stage 2 hypertension with 2 antihypertensive agents of different classes. Patients with stage 2 hypertension and BP ≥150/100 mm Hg should be promptly treated, carefully monitored, and subject to upward titration 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.

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Footnotes:

1 BP threshold goals and specific comorbidities can be found in 2017 Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults.

¶ Using the ACC/AHA Pooled Cohort Equations (http://tools.acc.org/ASCVD-Risk-Estimator-Plus). Note that patients with DM or CKD are automatically placed in the high-risk category. For initiation of renin-angiotensin system (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 ≥150/100 mm Hg should be promptly treated, carefully monitored, and subject to upward titration 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.
Hazard Ratio = 0.75 (95% CI: 0.64 to 0.89)

During Trial (median follow-up = 3.26 years)
Number Needed to Treat (NNT) to prevent a primary outcome = 61
### SPRINT Primary Outcome and its Components

**Event Rates and Hazard Ratios**

<table>
<thead>
<tr>
<th></th>
<th>Intensive</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No. of Events</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary Outcome</td>
<td>243</td>
<td>319</td>
</tr>
<tr>
<td>All MI</td>
<td>97</td>
<td>116</td>
</tr>
<tr>
<td>Non-MI ACS</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>All Stroke</td>
<td>62</td>
<td>70</td>
</tr>
<tr>
<td>All HF</td>
<td>62</td>
<td>100</td>
</tr>
<tr>
<td>CVD Death</td>
<td>37</td>
<td>65</td>
</tr>
</tbody>
</table>

| **Rate, %/year**         |            |          |
| Primary Outcome          | 1.65       | 2.19     |
| All MI                   | 0.65       | 0.78     |
| Non-MI ACS               | 0.27       | 0.27     |
| All Stroke               | 0.41       | 0.47     |
| All HF                   | 0.41       | 0.67     |
| CVD Death                | 0.25       | 0.43     |

| **HR (95% CI)**          |            |          |
| Primary Outcome          | 0.75 (0.64, 0.89) | <0.001  |
| All MI                   | 0.83 (0.64, 1.09) | 0.19    |
| Non-MI ACS               | 1.00 (0.64, 1.55) | 0.99    |
| All Stroke               | 0.89 (0.63, 1.25) | 0.50    |
| All HF                   | 0.62 (0.45, 0.84) | 0.002   |
| CVD Death                | 0.57 (0.38, 0.85) | 0.005   |

\[
0.54 \text{absd}iff = 5 \text{events/year/1000 patients}
\]
Increasing coverage of antihypertensive medications to 70% alone would delay 39.4 million deaths (35.9–43.0)/25 years.
<130
LDL
BP

Heart Protection Symbol
An improved diet and 30-40 minutes of exercise/day lead to improved fitness and less obesity in California Public Schools.

Today 6.3 million children had healthy lunches and exercised 30-40 minutes.
IS IT TIME TO OPEN UP THE GATES FOR THE BLUE ZONE COMMUNITY
CENTRAL ILLUSTRATION: Shift in Pre- to Post-Test Risk for Coronary Heart Disease and Cardiovascular Disease in the Presence of Each Negative Risk Marker

COST-EFFECTIVENESS OF STATINS FOR BORDERLINE RISK

- Standard: treat $AR_{10} > 7.5\%$, DM, LDL > 190
- Add treatment to $AR_{10} \ 5-7.4\%$ and LDL 160-190
- Add treatment for $AR_{10} \ 5-7.4$ and LDL 130-159
- Add treatment for $AR_{10} > 5.0$ regardless of LDL
**All-cause Mortality**

**Cumulative Hazard**

\[ \text{Hazard Ratio} = 0.73 \ (95\% \ CI: 0.60 \text{ to } 0.90) \]

During Trial (median follow-up = 3.26 years)

Number Needed to Treat (NNT) to Prevent a death = 90

<table>
<thead>
<tr>
<th>Std</th>
<th>Int</th>
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</thead>
<tbody>
<tr>
<td>4583</td>
<td>4678</td>
</tr>
<tr>
<td>4528</td>
<td>4516</td>
</tr>
<tr>
<td>4383</td>
<td>4390</td>
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<tr>
<td>2998</td>
<td>3016</td>
</tr>
<tr>
<td>789</td>
<td>807</td>
</tr>
</tbody>
</table>
Summary and Conclusions

- SPRINT examined effects of more intensive antihypertensive therapy than currently recommended

- Participants were US adults ≥50 years with hypertension and additional risk for CVD

- Rapid and sustained difference in SBP achieved between the two treatment arms

- Trial stopped early, due to benefit, after median follow-up of 3.26 years

- Incidence of primary outcome (composite of CVD events) 25% lower in Intensive compared to Standard Group and all-cause mortality reduced by 27%.

- Treatment effect similar in all six pre-specified groups of interest.
Summary and Conclusions

- In participants with CKD at baseline, no differences in renal outcomes

- In participants without CKD at baseline, incidence of eGFR reduction ≥ 30% more common in Intensive Group

- No overall difference in serious adverse events (SAEs) between treatment groups

- SAEs associated with hypotension, syncope, electrolyte abnormalities, and hospital discharge reports of acute kidney injury or acute renal failure more common in Intensive Group

...overall, benefits of more intensive BP lowering exceeded the potential for
### CAC IN 2018 GUIDELINES

<table>
<thead>
<tr>
<th>IIa</th>
<th>B-NR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

6. In intermediate-risk or selected borderline-risk adults, if the decision about statin use remains uncertain, it is reasonable to use a CAC score in the decision to withhold, postpone or initiate statin therapy (S4.4.2-15, S4.4.2-17, S4.4.2-23).

7. In intermediate-risk adults or selected borderline-risk adults in whom a CAC score is measured for the purpose of making a treatment decision, AND
   - If the coronary calcium score is zero, it is reasonable to withhold statin therapy and reassess in 5 to 10 years, as long as higher risk conditions are absent (diabetes mellitus, family history of premature CHD, cigarette smoking);
   - If CAC score is 1 to 99, it is reasonable to initiate statin therapy for patients ≥55 years of age;
   - If CAC score is 100 or higher or in the 75th percentile or higher, it is reasonable to initiate statin therapy (S4.4.2-17, S4.4.2-23).