GETTING TO ZERO: PREVENTION – EQUATIONS

- Inter-heart $\text{OR}(\text{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{abdominal 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 $= 1 - S_0 e^{(\ln X'B - \text{Mean} X'B)}$ with $\ln (\text{age, total cholesterol, HDL-C, systolic BP})$ 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, Lp$_a$, ABI (Not enough data yet)
CLINICAL PRACTICE GUIDELINE

2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease

A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines

Endorsed by the American Association of Cardiovascular and Pulmonary Rehabilitation, the American Geriatrics Society, the American Society of Preventive Cardiology, and the Preventive Cardiovascular Nurses Association

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Primary Prevention

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

- **Age 40-75 y and LDL-C ≥190 mg/dL (≥4.9 mmol/L)**
  - No risk assessment; High-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)

**Lipids/Biomarkers:**
- Persistently elevated triglycerides ≥175 mg/dL/mL

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

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

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

**Risk Decision:**
- 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
LEVEL 1: BASIC HYPERTENSION GUIDELINES

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)1

<table>
<thead>
<tr>
<th>Class</th>
<th>BP Threshold and/or Estimated 10-Year Cardiovascular Disease Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BP 130/80 or estimated 10-year CVD risk ≥10%</td>
</tr>
<tr>
<td>2</td>
<td>BP 130/80 or estimated 10-year CVD risk 5-10%</td>
</tr>
<tr>
<td>3</td>
<td>BP 130/80 or estimated 10-year CVD risk 1-5%</td>
</tr>
</tbody>
</table>

BP Thresholds and Goals of Pharmacologic Therapy in Patients with Hypertension According to Clinical Conditions

- Consider initial pharmacological therapy for stage 2 hypertension with 2 antihypertensive agents of different classes.
- Patients with stage 2 hypertension and BP ≥140/90 mm Hg should be promptly treated carefully monitored, and subject to upward titration dose adjustment as necessary to control BP. (Assessment includes BP measurement, detection of orthostatic hypotension in selected patients (e.g., older or with postural symptoms), identification of white coat hypertension or 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 adherence to treatment to achieve BP target.)

Oral Antihypertensive Drugs

<table>
<thead>
<tr>
<th>Class</th>
<th>Drug</th>
<th>Usual Dose Range (mg per day)</th>
<th>Daily Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Agents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thiazide or thiazide-like diuretics</td>
<td>Indapamide</td>
<td>1.25-2.5</td>
<td>1</td>
</tr>
<tr>
<td>ACE inhibitors</td>
<td>Captopril</td>
<td>10-40</td>
<td>1 or 2</td>
</tr>
<tr>
<td>ARBs</td>
<td>Losartan</td>
<td>50-150</td>
<td>1 or 2</td>
</tr>
<tr>
<td></td>
<td>Telmisartan</td>
<td>10-40</td>
<td>1 or 2</td>
</tr>
<tr>
<td></td>
<td>Aliskiren</td>
<td>50-150</td>
<td>1 or 2</td>
</tr>
</tbody>
</table>

Nonpharmacologic Interventions

- To reduce BP include weight loss for overweight or obese patients with a history of heart disease, 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 4-6 mmHg decrease in SBP and 2-4 mmHg in DBP; but diet is for sodium, saturated fat, and food for fiber and increased in “vitals,” vegetables, and grains may decrease SBP by approximately 11 mmHg.

Footnotes:
1 Using the ACC/AHA Pocket Cohort Equations (http://tools.acc.org/AHA-Risk-Assessment.html). Note that patients with DM or CVD are automatically placed in the high-risk category. For initiation of nonvasodilator system (RAS) inhibitor or clonidine therapy, assess blood tests for electrolytes and renal function to 2 to 4 weeks after initiating therapy.
40 million lives

Increasing coverage of antihypertensive medications to 70% alone would delay 39.4 million deaths (35.9–43.0)/25 years
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 (54.4.2-15, 54.4.2-17, 54.4.2-23).

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 (54.4.2-17, 54.4.2-23).

- **CAC 0**
  - Statin vs. No Statin
  - Hazard Ratio: 1.03, 95% CI: 0.79-1.37
  - p = 0.99

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

- **CAC 101-400**
  - Statin vs. No Statin
  - Hazard Ratio: 0.32, 95% CI: 0.21-0.48
  - p = 0.0001

- **CAC 401+**
  - Statin vs. No Statin
  - Hazard Ratio: 0.36, 95% CI: 0.34-0.90
  - p = 0.017

---

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

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The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of adding the ankle-brachial index (ABI), high-sensitivity C-reactive protein (hsCRP) level, or coronary artery calcium (CAC) score to traditional risk assessment for cardiovascular disease (CVD) in asymptomatic adults to prevent CVD events.

A recent analysis from the community-based Coronary Artery Risk Development in Young Adults (CARDIA) prospective cohort study found that approximately 10% of the 3043 CARDIA participants aged 32 to 45 years (mean age, 40.3 years) had any CAC and that those individuals had a subsequent 5-fold higher risk for incident CHD events and a 3-fold higher risk for incident CVD events during 12.5 years of follow-up.14
Prevention of CVD

Cholesterol
Assess ASCVD Risk, personalize with risk enhancers, reclassify with CAC as needed

High Blood Pressure
Maintain blood pressure below 130/80 mm Hg

Physical Activity
Perform ≥150 mins/week of moderate or ≥75 mins/week of vigorous physical activity

Tobacco
Pharmacotherapy + behavior interventions recommended to maximize quit rates

Diet
Emphasis on intake of vegetables, fruits, nuts, legumes, fish and whole grains

Type II Diabetes
Control through diet and exercise. Metformin (primary therapy), SGLT-2 inhibitor or GLP-1 receptor agonist (secondary)

Aspirin Use
Low-dose aspirin for primary prevention now reserved for select high-risk patients
Healthy For Good™

- **Reduce Blood Sugar**
  About 21 million American adults have diagnosed diabetes. That's almost 9% of the adult population.

- **Control Cholesterol**
  More than 40% of American adults have total cholesterol levels higher than 200 mg/dL.

- **Eat Right**
  When you eat a heart-healthy diet you improve your chances for feeling good and staying healthy!

- **Lose Weight**
  Most Americans older than 20 are overweight or obese. About 32% of children are overweight or obese.

- **Manage Blood Pressure**
  About 80 million U.S. adults have high blood pressure. That's about 33%.

- **Get Moving**
  About one in every three U.S. adults, 30% - reports participating in no leisure time physical activity.

- **Stop Smoking**
  6% of adolescents aged 12 to 17 report being current smokers. Among adults, 19% of men and 15% of women are smokers.

Get your My Life Check® Assessment now at heart.org/mylifecom.
GETTING TO ZERO: CALIFORNIA INTERVENTIONS

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

2. Evidence Generation
   - Pragmatic Trials
   - Implementation Science
   - NCDR

3. Outcomes Measures
   - Clinical Endpoints
   - Patient Reported Outcomes
   - Cost and Cost Effectiveness
   - NCDR

4. Guidelines
   - Levels of Evidence
   - Real World Evidence
   - NCDR

5. Performance Measures
   - Scalability
   - Patient and Provider Usability
   - Implementation Factors
   - NCDR

6. Adoption and Engagement
   - Real World Adherence
   - Registrars
   - Technology Transfer
   - NCDR

SENATE BILL 891
SENATE BILL 357
SENATE BILL 906

California Elective Offsite PCI
California Transcatheter Aortic Valve Replacement - California Ambulatory Surgery Center Information
Death Rates for California
Heart Disease, 2014 - 2018
All Races (includes Hispanic/Latino), Both Sexes, All Ages

Age-Adjusted
Annual Death Rate
(Deaths per 100,000)

<table>
<thead>
<tr>
<th>Quantile Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>70.8 to 123.8</td>
</tr>
<tr>
<td>&gt; 123.8 to 136.6</td>
</tr>
<tr>
<td>&gt; 136.6 to 163.6</td>
</tr>
<tr>
<td>&gt; 163.6 to 175.8</td>
</tr>
<tr>
<td>&gt; 175.8 to 283.5</td>
</tr>
</tbody>
</table>

United States
Rate (95% C.I.)
166.0 (165.8 - 166.1)

California
Rate (95% C.I.)
143.1 (142.6 - 143.6)
Death Rates for California
Cerebrovascular Diseases, 2014 - 2018
All Races (includes Hispanic/Latino), Both Sexes, All Ages

Age-Adjusted
Annual Death Rate
(Deaths per 100,000)
Quantile Interval

United States
Rate (95% C.I.)
37.3 (37.2 - 37.4)

California
Rate (95% C.I.)
36.5 (36.2 - 36.8)
Figure 6: Deaths attributed to 19 leading risk factors, by country income level, 2004.

To calculate the difference in population health under the counterfactual scenarios, the PAF is first calculated. PAF is defined as:

$$PAF = \frac{\int RR(x)P(x)dx - \int RR(x)P(0)x}{\int RR(x)P(0)dx}$$  \hspace{1cm} (1)$$

where $RR(x)$ = relative risk at each exposure level, $P(0)$ = proportion of population at each exposure level, $P(x) = counterfactual proportion of population at each exposure level, and $x = maximum$ exposure level (34).
Figure 1: The causal chain. Major causes of ischaemic heart disease are shown. Arrows indicate some (but not all) of the pathways by which these causes interact.

The combined (joint) PAF that avoids double counting the overlap of multiple risk factors is given by equation 3 (33):

$$PAF = 1 - \prod_{i=1}^{n}(1 - PAF_i)$$  \hspace{1cm} (3)

where $PAF_i = PAF$ for individual risk factor $i$, and $n = \text{total number of risk factors that affect the same disease outcome.}$
### ADDRESSING SOCIAL DETERMINANTS

#### TABLE 2  
Example Considerations for Addressing Social Determinants of Health to Help Prevent ASCVD Events

| Topic/Domain            | Example Considerations                                                                                                                                                                                                 |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| **Cardiovascular risk** | - Adults should be routinely assessed for psychosocial stressors and provided with appropriate counseling *(S2.1-31).*  
  - Health literacy should be assessed every 4 to 6 y to maximize recommendation effectiveness *(S2.1-36).*                                                                 |---|
| **Diet**                | - In addition to the prescription of diet modifications, body size perception, as well as social and cultural influences, should be assessed *(S2.1-37, S2.1-38).*  
  - Potential barriers to adhering to a heart-healthy diet should be assessed, including food access and economic factors; these factors may be particularly relevant to persons from vulnerable populations, such as individuals residing in either inner-city or rural environments, those at socioeconomic disadvantage, and those of advanced age* *(S2.1-39).* |---|
| **Exercise and physical activity** | - In addition to the prescription of exercise, neighborhood environment and access to facilities for physical activity should be assessed *(S2.1-30, S2.1-40, S2.1-41).* |---|
| **Obesity and weight loss** | - Lifestyle counseling for weight loss should include assessment of and interventional recommendations for psychosocial stressors, sleep hygiene, and other individualized barriers *(S2.1-42-S2.1-44).*  
  - Weight maintenance should be promoted in patients with overweight/obesity who are unable to achieve recommended weight loss.                                                                 |---|
| **Diabetes mellitus**   | - In addition to the prescription of type 2 diabetes mellitus interventions, environmental and psychosocial factors, including depression, stress, self-efficacy, and social support, should be assessed to improve achievement of glycemic control and adherence to treatment *(S2.1-45-S2.1-48).* |---|
| **High blood pressure** |                                                                                                                                                                                                                       |---|
GETTING TO ZERO: REDUCING CARDIOVASCULAR DISEASE

- Cardiovascular Risk varies across California
- Cardiovascular Risk is Multifactorial
- Cardiovascular Risk can be reduced
- Regional, Countywide, Locality, Community, Neighborhood, and Individual Personalized-Healthcare will be needed to effectively Lower Risk
- We must start today