California Right Care Initiative Data and Briefs Packet
Cardiovascular, Hypertension, and Diabetes Management and Prevention
Quality Indicators, Metrics and Promising Interventions

Right Care Initiative

Updated July 1, 2021
# Table of Contents

1. Right Care Overview Project Brief.................................................................1-2
2. Right Care Demonstration Project Results: San Diego County............................3-4
3. Heart Attack and Stroke Prevention: Coronary Calcium Brief........................5-10
4. Top 10 Takeaways from the Lipid Guidelines.............................................11
5. Promising Intervention: Pharmacist on the Care Team................................12-13
6. Effectiveness of Community Health Workers for Chronic Disease Care Brief.................................14-18
8. Key Quality Data for Cardiovascular Prevention Among CA Medical Groups and Health Plans..........................21-26
9. Statistical Brief: Sacramento County................................................................27-33
10. Statistical Brief: Santa Clara County.............................................................34-36
11. Special Populations: South Asian Heart Disease Brief....................................37-40
California Right Care Initiative  Clinical Quality Improvement Leadership Collaborative

**Right Care Initiative Goals:** Drive Toward Zero Preventable Heart Attacks, Strokes, Diabetic Complications, and COVID Deaths & Disabilities Through Best Available Science Combined with Proactive Screening and Outreach

- Achieve 80% of patients in good control for these diabetic biometrics for preventing and better managing Cardiovascular and Cerebrovascular Diseases, as well as diabetes:
  - 80% of hypertensive patients with blood pressure (BP) controlled: <140/90 mm Hg (HEDIS National Standard) (Optimally <130/80 mm Hg endorsed by AACC/AHA/ASA/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA)
  - 80% of patients with diabetes and/or cardiovascular conditions on appropriate cholesterol therapy (proxy, LDL controlled: LDLc<100mg/dL)
  - 80% of diabetic patients with blood sugar controlled: Hemoglobin A1c<B
- Proactive Community Outreach to Screen & Identify Vulnerable Patients to Connect to Treatment & Support

**Activities:**
- University of Best Practices (UBPs) collaborative gatherings of health care leaders have been built in four metropolitan areas to share learning and encourage adoption of evidence-based interventions for preventing and better managing heart attacks, strokes, diabetes, and COVID-19.
- Practical presentations from benchmark performers are geared toward medical, pharmacy and quality improvement directors to spur achievement of national "A-grade" performance and better disease management.
- Promote adoption of strategies used by top performers, and regularly highlight and recognize progress on performance (based on HEDIS, P4P, hospitalization and mortality data).
- Foster “cooperation” among competing health systems. At all Right Care gatherings, we follow the Warren Barnes’ Principle: *We compete against disease and not each other* (Warren Barnes, J.D., M.Div., Former Chief Health Lawyer, State of California and Co-Founder, Right Care Initiative).

**Contact:** Hattie Rees Hanley, MPP, Right Care Initiative Director, hattiehanley@berkeley.edu, hattiehanley@post.harvard.edu

For Research & Logistics, please contact Senior Pre-Med Student Research Assistant Jenny Woo (510-549-6157) jennywoo@berkeley.edu, rightcare@berkeley.edu, and Pre-Med Student Research Assistant Albert Yeam albert1030@berkeley.edu

**Key Partners:** This collaborative, expert-based, data-driven project has been supported by volunteers, resources, and leadership from:

- The NIH National Heart, Lung & Blood Institute
- American Medical Group Assoc. Foundation
- American College of Cardiology, CA Chapter
- Med. groups, clinics, health plans & systems
- UC Berkeley School of Public Health
- University of California Schools of Public Health, Medicine, and Pharmacy
- Stanford School of Medicine & Clinical Excellence Research Center
- USC Schools of Med., Pharmacy and Policy
- RAND Corporation
- CDC Million Hearts Initiative
- Blue Shield of California
- Health Trust / Community Health Partnership
- Sierra Health Foundation
- California Chronic Care Coalition
- Stroke Awareness Foundation
- No More Broken Hearts Foundation
- American Heart/Stroke Association
- American Diabetes Association
- Local Military and Veteran's Health
- Integrated Healthcare Assoc. (P4P)
- California Department of Public Health
- Los Angeles County Dept. of Public Health
- CA Department of Managed Health Care
- CA Office of the Patient Advocate
- Statewide Health Planning & Development
- Amarin
- Boehringer-Ingelheim
- Genentech
- Johnson & Johnson
- Novo Nordisk

**Primary Objective:** Reduce preventable death, disability and suffering from the high leverage areas of cardiovascular and cerebrovascular disease, as well as diabetes, through implementation of the best medical science to improve patient outcomes. Since 2007, The California Right Care Initiative public-private collaboration has been working to catalyze the adoption of best practices deployed by top performers where metrics indicate that evidence-based practices are not fully deployed, with particular emphasis on control of blood pressure, cholesterol and blood sugar. For a synthesis of critically important strategies, see Right Care Initiative Goals and Objectives.

**Progress:** The results of our first demonstration project, funded by the National Heart, Lung and Blood Institute, were published in two articles as being associated with significant declines in heart attack hospitalizations. The first analysis estimated that during the first four years of our NIH-funded pilot project there were 2,735 fewer heart attack hospitalizations than would have been anticipated based on secular trend (Fulton et al. American Journal of Managed Care, Oct. 2017). The second analysis included another two years of data. That analysis estimated a sustained 22% reduction in acute myocardial infarction hospitalizations associated with our work and an estimated 3,826 fewer heart attack hospitalizations than anticipated based on secular trend over six years (Fremont et al. Health Affairs, Sept. 2018). The Health Affairs analysis further estimated that if our initial pilot results were spread statewide, $935 million would have been saved between 2011 and 2016 and over 42,000 acute myocardial infarction hospitalizations would have been prevented.

**Challenge:** Data from the California Office of Statewide Health Planning and Development indicate that annually approximately 298,000 Californians were hospitalized for heart attacks and strokes, approximately 100,000 of them younger than age 65 (2017). According to the US Centers for Disease Control, in 2017, 94,343 California deaths were caused by heart disease, stroke, diabetes, and hypertension (62,797; 16,355; 9,595; 5,596 respectively). These conditions are strongly linked to one another, and many of the deaths are preventable. A decade ago, NCQA conservatively estimated that improving California’s cardiovascular disease and diabetes measures to the national HEDIS 90th percentile could save 1,694 to 2,818 CA lives each year, while avoiding $118 million in yearly hospital costs, 766,401 sick days and $125.56 million in lost productivity. Heart disease, hypertension and diabetes are increasingly well understood scientifically, and ripe for best practices collaboration. The foundation of our work is publicly available data from the US Centers for Disease Control, the California Department of Public Health, the CA Office of the Patient Advocate, the CA Office of Statewide Health Planning and Development, the Integrated Health Care Association, the National Committee For Quality Assurance, the Agency for Health Care Quality and Research, and the Commonwealth Foundation, among others. Over the course of this project, California has outpaced the nation in improving health system performance on control of blood pressure, cholesterol and blood sugar, building on the “100,000 Lives” campaign for reducing medical errors and the Million Hearts™ national initiative that was launched in 2011.
Promising Interventions to Reach Right Care Control Targets for Heart Attack, Stroke, and Diabetes Prevention and High Quality Management

**Patient Activation**
- Stress reduction, medication adherence, healthy sleep, nutrition & physical activity, smoking cessation
- Evidence-based patient education (e.g., Project DULCI; Stanford Patient Self-Management)
- Motivational interviewing and evidence-based media messaging

**Patient Centered Practice Redesign**
- Team-based medical home
- Un-biased performance feedback
- Web supported high-tech enabled
- Biometrics screening (BP, LDL, HbA1c, Coronary Calcium, CT Scan Score)
- Optimized Clinical Connectivity for Rapid Treatment
- Timely Continuous Care—Not Episodic

**Intensive Ambulatory Care**

**Clinical Pharmacists on Care Team**
- CA Dept, Public Health
- White Paper
- HRSA.gov/patientsafety
- Surgeon General’s Rpt

**Protocols**
- Nationally Endorsed Guidelines (ACC, AHA)
- NICE UK (eg, chest pain)
- Bundled Medication Therapy (Apoptin, Statin, Hypertension Agents)

---

**Implementation Action:**

The Right Care Initiative, operated by the UC Berkeley School of Public Health, was publicly launched with encouragement from the Department of Managed Health Care, NCQA and the Deans of UC Berkeley and UCLA Schools of Public Health in March 2008 at the 1st annual Clinical Quality Improvement Leadership Summit. Since then, more than a dozen Right Care summits have been held around the state, along with over 200 monthly University of Best Practices. Each Right Care gathering is a collaborative effort to close the gap between science and practice to improve patient outcomes working with medical directors, pharmacy and quality improvement directors, as well as thought leaders in evidence-based medicine.

**State-wide Right Care Technical Expert Group:**

- **Stephen Shortell, PhD, MPH, MBA,** Technical Expert Group Chair, Dean Emeritus and Prof., School of Public Health, UC Berkeley; **Robert M. Kaplan, PhD,** Research Director, Stanford University Clinical Excellence Research Center;
- **Hector Rodriguez, PhD, MPH,** Prof., Health Policy and Management, School of Public Health, UC Berkeley; Director, Center for Healthcare Organizational and Innovation Research; **William J. Bommer, MD, FACP, FACC,** Statewide Chairman, Right Care Initiative; Specialty Delegate, California American College of Cardiology and California Medical Association; Director, California ePCC Program; Director, Prevention Forward Program and Professor, Division of Cardiovascular Medicine, University of California, Davis; **Steve Chen, PharmD,** FASHP, FCSHP, FCSMM, Co-Director for Clinical Affairs, USC School Pharmacy; **Keith Emmons, MD,** Medical Director, CenCal Health of Santa Barbara (Medi-Cal plan); **Scott Flinn, MD,** UC Berkeley, University of Best Practices Co-Founder; Medical Director, Blue Shield of California; Former Navy Undersea Medical Officer with the Navy SEALs; **Cindy Glambrone, PharmD,** Co-chair, Right Care Initiative Heart Failure & Stroke Work Group; Director, Performance Improvement and ACO Pharmacy Risk, MemorialCare Foundation and Medical Group; **Jan D. Hirsch, RPh, PhD,** Founding Dean, UC Irvine School of Pharmacy; **David Maron, MD, C.F.** Rehrn Professor of Medicine; Chief, Stanford Prevention Research Center; **Barton Health.**

**University of Best Practices**

The Right Care Initiative, operated by the UC Berkeley School of Public Health, was publicly launched with encouragement from the Department of Managed Health Care, NCQA and the Deans of UC Berkeley and UCLA Schools of Public Health in March 2008 at the 1st annual Clinical Quality Improvement Leadership Summit. Since then, more than a dozen Right Care summits have been held around the state, along with over 200 monthly University of Best Practices. Each Right Care gathering is a collaborative effort to close the gap between science and practice to improve patient outcomes working with medical directors, pharmacy and quality improvement directors, as well as thought leaders in evidence-based medicine.

**State-wide Right Care Technical Expert Group:**

- **Stephen Shortell, PhD, MPH, MBA,** Technical Expert Group Chair, Dean Emeritus and Prof., School of Public Health, UC Berkeley; **Robert M. Kaplan, PhD,** Research Director, Stanford University Clinical Excellence Research Center;
- **Hector Rodriguez, PhD, MPH,** Prof., Health Policy and Management, School of Public Health, UC Berkeley; Director, Center for Healthcare Organizational and Innovation Research; **William J. Bommer, MD, FACP, FACC,** Statewide Chairman, Right Care Initiative; Specialty Delegate, California American College of Cardiology and California Medical Association; Director, California ePCC Program; Director, Prevention Forward Program and Professor, Division of Cardiovascular Medicine, University of California, Davis; **Steve Chen, PharmD,** FASHP, FCSHP, FCSMM, Co-Director for Clinical Affairs, USC School Pharmacy; **Keith Emmons, MD,** Medical Director, CenCal Health of Santa Barbara (Medi-Cal plan); **Scott Flinn, MD,** UC Berkeley, University of Best Practices Co-Founder; Medical Director, Blue Shield of California; Former Navy Undersea Medical Officer with the Navy SEALs; **Cindy Glambrone, PharmD,** Co-chair, Right Care Initiative Heart Failure & Stroke Work Group; Director, Performance Improvement and ACO Pharmacy Risk, MemorialCare Foundation and Medical Group; **Jan D. Hirsch, RPh, PhD,** Founding Dean, UC Irvine School of Pharmacy; **David Maron, MD, C.F.** Rehrn Professor of Medicine; Chief, Stanford Prevention Research Center; **Barton Health.**

**San Diego University of Best Practices**

- **Carol Zaher, MD, MPH, MBA,** Los Angeles Right Care University of Best Practices Co-Founder; Medical Director, Blue Shield of California; Former Navy Undersea Medical Officer with the Navy SEALs; **Cindy Glambrone, PharmD,** Co-chair, Right Care Initiative Heart Failure & Stroke Work Group; Director, Performance Improvement and ACO Pharmacy Risk, MemorialCare Foundation and Medical Group; **Jan D. Hirsch, RPh, PhD,** Founding Dean, UC Irvine School of Pharmacy; **David Maron, MD, C.F.** Rehrn Professor of Medicine; Chief, Stanford Prevention Research Center; **Barton Health.**

**Early Co-founding Experts:**

- **Arnie Milstein, MD, MPH,** Professor of Medicine and Director, Clinical Excellence Research Center, Stanford University; Medical Director, Pacific Business Group on Health; **Los Angeles Right Care Technical Expert Group:**

- **Allen Fremont, MD, PhD,** Right Care Technical Expert Group Chair, Dean Emeritus and Prof., School of Public Health, UC Berkeley; **Robert M. Kaplan, PhD,** Research Director, Stanford University Clinical Excellence Research Center;
- **Hector Rodriguez, PhD, MPH,** Prof., Health Policy and Management, School of Public Health, UC Berkeley; Director, Center for Healthcare Organizational and Innovation Research; **William J. Bommer, MD, FACP, FACC,** Statewide Chairman, Right Care Initiative; Specialty Delegate, California American College of Cardiology and California Medical Association; Director, California ePCC Program; Director, Prevention Forward Program and Professor, Division of Cardiovascular Medicine, University of California, Davis; **Steve Chen, PharmD,** FASHP, FCSHP, FCSMM, Co-Director for Clinical Affairs, USC School Pharmacy; **Keith Emmons, MD,** Medical Director, CenCal Health of Santa Barbara (Medi-Cal plan); **Scott Flinn, MD,** UC Berkeley, University of Best Practices Co-Founder; Medical Director, Blue Shield of California; Former Navy Undersea Medical Officer with the Navy SEALs; **Cindy Glambrone, PharmD,** Co-chair, Right Care Initiative Heart Failure & Stroke Work Group; Director, Performance Improvement and ACO Pharmacy Risk, MemorialCare Foundation and Medical Group; **Jan D. Hirsch, RPh, PhD,** Founding Dean, UC Irvine School of Pharmacy; **David Maron, MD, C.F.** Rehrn Professor of Medicine; Chief, Stanford Prevention Research Center; **Barton Health.**

- **Arnie Milstein, MD, MPH,** Founder; Medical Director, Blue Shield of California; Former Navy Undersea Medical Officer with the Navy SEALs; **Cindy Glambrone, PharmD,** Co-chair, Right Care Initiative Heart Failure & Stroke Work Group; Director, Performance Improvement and ACO Pharmacy Risk, MemorialCare Foundation and Medical Group; **Jan D. Hirsch, RPh, PhD,** Founding Dean, UC Irvine School of Pharmacy; **David Maron, MD, C.F.** Rehrn Professor of Medicine; Chief, Stanford Prevention Research Center; **Barton Health.**

**San Diego University of Best Practices**

- **Carol Zaher, MD, MPH, MBA,** Los Angeles Right Care University of Best Practices Co-Founder; Medical Director, Blue Shield of California; Former Navy Undersea Medical Officer with the Navy SEALs; **Cindy Glambrone, PharmD,** Co-chair, Right Care Initiative Heart Failure & Stroke Work Group; Director, Performance Improvement and ACO Pharmacy Risk, MemorialCare Foundation and Medical Group; **Jan D. Hirsch, RPh, PhD,** Founding Dean, UC Irvine School of Pharmacy; **David Maron, MD, C.F.** Rehrn Professor of Medicine; Chief, Stanford Prevention Research Center; **Barton Health.**

**Resources:**

- We wish to thank the Right Care Initiative supporters: The Sierra Health Foundation, RAND Corporation, Stanford University, The California Department of Public Health, Blue Shield, Stroke Awareness Foundation, No More Broken Hearts Foundation, Atnrin, Atnrin, Boehringer-Ingelheim, Genentech, Johnson & Johnson, and Novo Nordisk for enabling the research and logistical support at the University of California, Berkeley School of Public Health for the Right Care Initiative University of Best Practices and our clinical quality improvement leadership summits. A very special thank you to the National Institutes of Health / National Heart, Lung, and Blood Institute, and the Judith and John White Family Foundation for initial seed funding for the University of Best Practices!

**Right Care Website:** [http://rightcare.berkeley.edu](http://rightcare.berkeley.edu)

View medical group scores by county via the [CA Office of the Patient Advocate](http://reportcard.opa.ca.gov/rc/medicalgroupcounty.aspx)
Assessing Effectiveness of University of Best Practices: 
Right Care Pilot Demonstration Project in San Diego 
Shows Improvements in Acute Myocardial Infarction 
Hospitalization Rates Compared with Rest of California

The Right Care Initiative of UC Berkeley School of Public Health has worked since 2007 to improve clinical outcomes by catalyzing uptake of patient-centered, evidence-based best practices among medical groups, clinics, and health plans. This public-private partnership is led by UC Berkeley School of Public Health and was publicly launched collaboratively with UCLA School of Public Health and the CA Department of Managed Health Care in 2008. Our collaborative is comprised of physician and clinical quality improvement leaders, health systems, multiple UC campuses, USC, Stanford, RAND, public health officials, patients, and advocates such as the CA Chronic Care Coalition. With support from NIH for our first pilot, and with subsequent charitable funds, we built four regionally-focused University of Best Practices (UBP) starting in 2011: San Diego, Sacramento, Los Angeles and the Bay Area Silicon Valley. Our 4th UBP was launched in Bay Area Silicon Valley in 2018 to continue to spread best practices to prevent and better manage heart attacks, strokes, and diabetes by building on the sustained 22% reduction of heart attacks we have seen with our initial pilot. Our University of Best Practices focus on leaders from organizations with breakthrough clinical quality who share strategies to improve patient outcomes. Data from our first NIH funded pilot University of Best Practices is described here.

### University of Best Practices: Right Care’s Translational Model to Implement Evidence-Based Innovations

- Monthly 2+ hour convenings are held with leaders from major regional health care delivery systems and public health.
- Leaders from high-performing organizations and/or experts present “how they did it” along with lessons learned.
- A break-out session or discussion involving all participants follows to consider how to apply the speaker’s ideas in the local setting and to problem-solve overcoming barriers for improved patient outcomes.
- Trusted performance data is the bedrock of the UBP model.

### Lessons Learned in Implementing University of Best Practices

- A collaborative, “non-combat zone” spirit among local clinical leaders is the essential ingredient, following the Warren principle: **In this room we compete against disease, not against each other.**
- High performing medical directors, coupled with cardiology and endocrinology experts, co-lead the discussions and mentor others to achieve better outcomes.
- 75% or less of our gathering time is for presentations to allow for sufficient discussion on achievable, locally applicable action plans.
- Many hours of behind-the-scenes planning and organizing are needed for a successful collaborative.
- Enthusiastic participation is built on the quality of intellectual content.

### UBP Resources – A National Institutes of Health - Grand Opportunity (NIH-GO) grant, awarded in late 2009, supported the UC Berkeley, UCLA and RAND Right Care research teams to meet with individual San Diego delivery systems in 2010; supported hosting three separate day-long Right Care Initiative Scientific Summits in San Diego in 2010-2011; and launched the initial pilot University of Best Practices in San Diego in February 2011. When NIH-GO grant funds expired, Right Care Champions Judith and Jack White provided bridge funding to continue the San Diego UBP until new federal grant funds were obtained. Charitable contributions, grant funding, and membership contributions continue to support the regional University of Best Practices sites.

Since the introduction of the University of Best Practices in San Diego County in early 2011, there has been an observable decline in hospitalizations for adult heart attacks (myocardial infarction) when compared to the rest of California (see graphs below) (Fulton et al., 2017; Fremont et al., 2018). This is similar to trends seen in South Carolina where physician collaboratives across the state focused on fighting against heart disease. South Carolina efforts on better control of blood pressure and lipids moved the state from 51st on CVD deaths to 35th place nationally between 1995 and 2006 (Egan et al, 2011).

---

**Figure 1: Hospitalizations per 100,000 Adult Population for Heart Attacks Comparing San Diego County with the rest of California, 2007-2014**

Source: Fulton et al., 2015, analysis of California Office of Statewide Health Planning and Development’s 2007 to 2014 Patient Hospitalization Discharge Data

Notes: SD County = San Diego County; CA (ex. San Diego County) = California excluding San Diego County; Heart attacks (ICD-9-CM code 410.xx); UBP= University of Best Practices. UBP started in February 2011, just after the 2010 data points. Percentages are percent changes since 2010.

**Figure 2: Three-Year Average Age-Adjusted Death Rate for Coronary Heart Disease in San Diego County 2007-2016**

Source: California Department of Public Health County Health Report 2011-2018

Notes: Coronary Heart Disease (CHD): ICD-10 codes I20-I25 as underlying cause of death.
The Right Care Initiative started statewide convenings in 2008, and with NIH support began planning focused implementation in San Diego County (SD) in 2010. Starting in 2011, SD medical groups were supported by RAND to have regular data sharing meetings (in addition to the NIH supported Right Care University of Best Practices) to drive improved control of LDL cholesterol, blood pressure, and HbA1c. Two figures below illustrate individual medical group performance in SD in controlling LDL cholesterol and blood pressure. Results from recent state report cards appear below. LDL 100 cholesterol and BP control in SD delivery systems outperformed California.

![LDL Control <100 mg/dL for People with Heart Disease](image)

**Figure 3: LDL Cholesterol Control (<100 mg/dL) for People with Heart Disease. Note: LDL data were no longer recorded in San Diego County after 2013**

**Looking Forward**

Results and lessons learned from the University of Best Practices approach to prevention and better management of heart attacks, strokes and diabetic complications are being spread to UBPs in Los Angeles, Sacramento, Santa Clara County. Significant progress has been made toward the initial goal set by the steering committee of medical directors from the initial Right Care Initiative San Diego University of Best Practices (now renamed Be There San Diego) who came to consensus in 2011 that heart attacks could be reduced by 50% in 5 years by implementing the interventions on the Right Care Triangle (see triangle to right and Right Care Initiative Project Brief).

From 2011 to 2014, the hospitalization rate decrease in San Diego County was 16.5 percentage points more than the decrease in the rest of the state for heart attacks. If those results were achieved throughout the rest of California, there would have been approximately 5,000 fewer hospitalizations for heart attacks each year, saving over $100 million in annual payments to hospitals.

A September 2018 *Health Affairs* article indicated that if our initial pilot results were spread statewide, $935 million would be saved between 2011 and 2016 and over 42,000 acute myocardial infarction hospitalizations would have been prevented.

Please see Press Release of *Health Affairs* study (Fremont et al., 2018) indicating a sustained 22% reduction in acute heart attack hospitalizations over 6 years in our initial pilot community: [here](#).

![Blood Pressure Control <140/90 mm Hg among Diabetics](image)

**Figure 4: Blood Pressure Control (<140/90 mm Hg) for People with Diabetes. Note: Data were not available for this measure until 2010**

**Building on the Shoulders of Giants**

The Right Care Initiative launched the University of Best Practices pilot program in San Diego building on the conceptual learnings of collaboratives that had come before (Egan et al, 2011).

Note: In 2014, after NIH funding ran out, The San Diego UBP obtained independent funding and was renamed Be There San Diego University of Best Practices. Its goals and leadership by renowned cardiologist Anthony DeMaria, MD, remain unchanged.

Additional resources can be found at: [www.RightCare.Berkeley.edu](http://www.RightCare.Berkeley.edu) The Right Care Initiative is a charitably funded collaborative operated by UC Berkeley School of Public Health, and was originally launched in collaboration with UCLA and the CA Department of Managed Health Care.

Project Brief Updated: May 2019; Originally Produced: 2016 by UC Berkeley Right Care Research Team: Professor Susan L. Ivey, MD, MHSA, Professor Brent Fulton, PhD; and research assistants Amanda Lu and Bryan Vuong.
Cardiovascular Disease Indicator: Coronary Artery Calcium is an Effective & Personalized Predictor of Cardiovascular Events

Heart attacks and strokes, the leading cause of death in the United States, strike without warning in approximately 50% of cases. They are often caused by plaque buildup in the walls of the arteries. The plaque usually includes calcium, which makes it visible on a CT scan. For this reason, it is possible to identify if plaque is present in the heart (coronary) arteries long before a heart attack strikes. Therefore, a CT scan of the coronary arteries is a means of screening for patients without symptoms who may be at high risk for a heart attack, refining clinical risk prediction and informing treatment decision-making to obtain better health outcomes and reduce costs. The presence of coronary artery calcification (CAC) increases the likelihood of having deposits in other arteries, including those that supply the brain. Therefore, finding coronary artery calcium may indicate an increased risk of stroke as well as heart attack. The 2018 joint guidelines issued by the American Heart Association (AHA) with the American College of Cardiology (ACC); and UK National Health Service guidelines, endorse this test to improve cardiovascular disease (CVD) risk classification and identify a group of individuals who receive major benefit from statins. Conventional risk factors of vascular disease that guide early detection include: family history, diabetes, elevated LDL cholesterol, low HDL cholesterol, tobacco use, hypertension, obesity/physical inactivity and stress. Measuring coronary artery calcium is a specific indicator of an individual's mortality risk that has proven to be a very effective predictor of risk, highly motivating for patients to be adherent to preventive medications & lifestyle changes, while being also cost-effective. Higher CAC scores are associated with higher risk and need for more intensive preventive intervention.

![Leading Causes of Death](image1)

**Figure 1: Leading Causes of Death for All Males and Females in the United States (2016)**
Source: Health, United States, 2017. Centers for Disease Control and Prevention, National Center for Health Statistics. US Department of Health and Human Services

![Mortality Rate by Risk Factor Burden](image2)

**Figure 3: Mortality Rate by Risk Factor Burden and CAC Score**

![Reduction in Costs Associated with Coronary Artery Calcification Scan versus no Scan Group](image4)

**Figure 4: Reduction in Costs Associated with Coronary Artery Calcification Scan Versus No Scan Group**

Notes: p<0.005 for both measures
Coronary Artery Calcium is a Cost-Effective and Reliable Indicator of Cardiovascular Risk and Mortality

Table 1: Pharmacological Initiation and Continuation Improved by Coronary Artery Calcium Scanning

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspirin Initiation</td>
<td>2.61</td>
<td>[1.81,3.78]</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Lipid Lowering Medication Initiation</td>
<td>2.86</td>
<td>[1.85,4.41]</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Blood Pressure Lowering Medication Initiation</td>
<td>1.94</td>
<td>[1.61,2.33]</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Lipid Lowering Medication Continuation</td>
<td>2.26</td>
<td>[1.56,3.28]</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Increased Exercise</td>
<td>1.84</td>
<td>[1.41,2.41]</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Dietary Change</td>
<td>1.94</td>
<td>[1.52,2.49]</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Primary Prevention Patients with Coronary Artery Calcium Scores ≥1000 have CVD Mortality Rates that Exceed High-Risk Secondary Prevention Patients

Figure 5: All-Cause Mortality and Coronary Artery Calcification Scores: Long Term Prognosis in 25,253 patients

Notes: With greater CAC score, cumulative survival decreases. Relative risk calculation uses those with 0 CAC score to compare.

*Kaplan-Meier Survival Estimate shows 99.6% survival for people with CAC = 0 without family history of CHD and 99.3% survival for people with CAC = 0 and family history of CHD

Figure 6: Understanding Extensive CAC (CAC Score ≥1,000) in Primary Prevention Patients
Source: Results from the Coronary Artery Calcium Consortium; Peng et al. Journal of the American College of Cardiology: Cardiovascular Imaging, 2019
Coronary Artery Calcium’s Role in Predicting Mortality and Identifying Groups for Statin Medication

Figure 8: Cumulative Incidence of Major Adverse Cardiovascular Event (MACE) Stratified by Statin Treatment and CAC Presence
Source: Mitchell et al. Journal of the American College of Cardiology 2018
Notes: In a 10-year observational study of 13,644 Military Personnel at Walter Reed Medical Center (mean age 50 years), no statin benefit was found among those with CAC scores of zero.

Table 2: Direct Economic Cost for Selected Conditions, U.S., 2015
Source: Center for Financing, Access and Cost Trends, Agency for Healthcare Research and Quality, Medical Expenditure Panel Survey, 2015
Notes: CVD conditions are bolded

<table>
<thead>
<tr>
<th>Condition</th>
<th>Total Direct Cost (in Billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Disease</td>
<td>$113.4</td>
</tr>
<tr>
<td>COPD, Asthma</td>
<td>$78.5</td>
</tr>
<tr>
<td>Hypertension</td>
<td>$52.2</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>$35.2</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>$30.5</td>
</tr>
<tr>
<td>Stroke</td>
<td>$27.5</td>
</tr>
<tr>
<td>Other Circulatory Conditions</td>
<td>$25.1</td>
</tr>
<tr>
<td>Anemias</td>
<td>$4.8</td>
</tr>
</tbody>
</table>

Figure 7: Mortality Rate Per 1,000 Person-Years for CVD, CHD, Cancer, and All-Cause Mortality by CAC Score Group
Source: Results from the Coronary Artery Calcium Consortium; Peng et al. Journal of the American College of Cardiology: Cardiovascular Imaging, 2019
Notes: CAC = coronary artery calcium; CHD = coronary heart disease; CVD = cardiovascular disease

Changing the Trajectory of the Outsized Cost of CVD Through Targeted Preventive Therapy

Myocardial Infarction, Stroke or Death as Initial Presentation of Coronary Heart Disease

Table 2: Direct Economic Cost for Selected Conditions, U.S., 2015
Source: Center for Financing, Access and Cost Trends, Agency for Healthcare Research and Quality, Medical Expenditure Panel Survey, 2015
Notes: CVD conditions are bolded

<table>
<thead>
<tr>
<th>Condition</th>
<th>Total Direct Cost (in Billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Disease</td>
<td>$113.4</td>
</tr>
<tr>
<td>COPD, Asthma</td>
<td>$78.5</td>
</tr>
<tr>
<td>Hypertension</td>
<td>$52.2</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>$35.2</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>$30.5</td>
</tr>
<tr>
<td>Stroke</td>
<td>$27.5</td>
</tr>
<tr>
<td>Other Circulatory Conditions</td>
<td>$25.1</td>
</tr>
<tr>
<td>Anemias</td>
<td>$4.8</td>
</tr>
</tbody>
</table>
Coronary Artery Calcification CT Scan Priority Scanning Groups

**American College of Cardiology and American Heart Association Cholesterol Clinical Practice Guidelines, 2018 (Grundy SM, et al.)**

- In adults 40 to 75 years of age without diabetes mellitus and with LDL-C levels ≥70 mg/dl (≥1.8 mmol/L), at a 10-year ASCVD risk of ≥7.5%, start a moderate-intensity statin if a discussion of treatment options favors statin therapy. Risk-enhancing factors favor statin therapy. **If risk status is uncertain, consider using CAC to improve specificity.** If statins are indicated, reduce LDL-C levels by ≥30%, and if 10-year risk is ≥20%, reduce LDL-C levels by ≥50%.

- In adults 40 to 75 years of age without diabetes mellitus and with LDL-C levels ≥70 mg/dl-89 mg/dl (≥1.8-4.9 mmol/L), at a 10-year ASCVD risk of ≥7.5%-19.9%, if a decision about statin therapy is uncertain, consider measuring CAC. **If the CAC score is zero, treatment with statin therapy may be withheld or delayed, except in cigarette smokers, those with diabetes mellitus, and those with a strong family history of premature ASCVD. A CAC score of 1-99 favors statin therapy, especially in those >55 years of age. For any patient, if the CAC score is ≥100 Agatston units or ≥75th percentile, statin therapy is indicated unless otherwise deferred by the outcome of clinician–patient risk discussion.**

**United Kingdom’s National Health Service Guidelines for Chest Pain Recommend Heart CT Scan for Chest Pain**

- Updates to United Kingdom’s national guidelines for chest pain involve recommendations that “cardiac CT is the first-line investigation for patients presenting with new-onset chest pain due to suspected coronary artery disease because of the diagnostic accuracy and cost effectiveness.”

- “If a patient’s pre-test likelihood of significant cardiovascular disease was low (10–29%), a coronary artery calcium score was the recommended first-line investigation with subsequent CT coronary angiography if the calcium score was between 1 and 400 Agatston Units.”

**The Importance of Coronary Artery Calcification Screening: Case Study**

An asymptomatic 55-year-old white with unremarkable cardiovascular risk factors (no hypertension, no smoking, no diabetes, lipids: TC:222; TG:122; HDL:42; LDL:156, family history: father is alive at 78; had a myocardial infarction at 50 and 55; had CAB: athletic) presents a 10-year atherosclerotic cardiovascular disease (ASCVD) risk score of 6.6%. With this ASCVD risk score, providers may consider prescribing a statin or aspirin and discuss lifestyle management, however a coronary artery calcification scan shows a calcium score of 1153 (shown left). The risk factors described, taken with the calcium score, indicate that the patient is at high risk for cardiovascular disease and it is recommended that a statin and aspirin are prescribed along with intensifying lifestyle management.
**Take Action**

Stanford Health Care, LA BioMed in Los Angeles, UC Davis Health Preventive Cardiology and Gundersen Health System are lowering the barrier to receiving the coronary artery calcium scan as a preventive screening test by offering it to patients for a cash price of $150 to receive this precision prevention information for understanding patients’ actual risk profile.

---

**Occupational Use of Coronary Artery Calcification CT Scan**

This scan is used as a tool in determining fitness for duty by predicting cardiovascular risk and yielding actionable information to prevent heart attacks and strokes.

- **The President of the United States**
  - After President Clinton's heart attack, the Coronary Calcium CT Scan was added to presidential physicals to enable a more preventive approach to protecting the President's health. This test enables greater clarity on whether cardiovascular medications are needed, and at what dose, as well as needed lifestyle modifications.

- **Astronauts**
  - Astronauts' medical assessments include calculating a 10-year cardiovascular Framingham Risk Score, measuring high-sensitivity C-reactive protein levels and using coronary artery calcium scores to screen for cardiovascular disease and decrease the likelihood of a crewmember experiencing a cardiac event during spaceflight.17
  - The 2014 NASA Human Research Program Investigators' Workshop developed a tool using CAC scores along with other risk factors to calculate astronaut cardiovascular health and risk.18

- **Firefighters**
  - Cardiovascular disease contributes to 45% of on-duty fatalities and is the leading cause of on-duty death among firefighters.16
  - Forward leading fire departments across the country, such as Los Angeles, CA and Gwinnett County, GA have determined this scan to be useful for preventing cardiovascular events and are also cost saving.19,20

---

**Coronary Artery Calcification Screening Additional Materials**

1) **Precision Medicine for Early Detection and Treatment of Coronary Artery Disease for People without Symptoms – Preventive Cardiology Expert Panel**
   - Video: Part 1: [https://www.youtube.com/watch?v=Lx3w_kc7BNY](https://www.youtube.com/watch?v=Lx3w_kc7BNY)
     Part 2: [https://www.youtube.com/watch?v=_cjpYbADJ9c](https://www.youtube.com/watch?v=_cjpYbADJ9c)
     Part 3: [https://www.youtube.com/watch?v=znvbrFeWiYs](https://www.youtube.com/watch?v=znvbrFeWiYs)

2) **Studies Featured/ Further Readings**
   - The Multi-Ethnic Study of Atherosclerosis (MESA) (MESA is a medical research study involving more than 6,000 men and women from six communities in the United States. MESA is sponsored by the National Heart Lung and Blood Institute of the National Institutes of Health)
   - Coronary Artery Risk Development in Young Adults (CARDIA) (1985-Present) is a prospective community-based study examining the development and determinants of clinical and subclinical cardiovascular disease and their risk factors. CARDIA includes over 5,000 black and white participants aged 18 to 30 years from multiple national sites including Kaiser.
     - Association of Coronary Artery Calcium in Adults Aged 32 to 46 Years with Incident Coronary Heart Disease and Death (Jama Cardiology 2017) is one example of an article utilizing the CARDIA Study.
   - The St. Francis Heart Study (Treatment of Asymptomatic Adults with Elevated Coronary Calcium Scores with Atorvastatin, Vitamin C, and Vitamin E)
   - The EISNER Study (Early Identification of Subclinical Atherosclerosis by Noninvasive Imaging Research)
   - The COURAGE Trial (Optimal Medical Therapy with or without percutaneous coronary intervention (PCI) for Stable Coronary Disease)
   - 2018 ACC/AHA Guideline on the Management of Blood Cholesterol
   - 2010 ACCF/AHA Guideline for Assessment of Cardiovascular Risk in Asymptomatic Adults
   - 2013 European Society of Cardiology Guidelines on the Management of Stable Coronary Artery Disease

3) **Irish Heart Disease Awareness’ video Widowmaker** (discusses evidence-base for using the CAC scan for proactive screening similar to a mammogram for the heart, but with much less frequency): [Irish Heart Disease Awareness – Heart Attacks, The Facts](https://www.heartdisease.ie/publications/coronary-artery-calcium-score/)
About the Right Care Initiative

Since 2007 The Right Care Initiative’s goal has been to apply scientific evidence and outcomes improvement strategies to reduce cardiovascular and diabetes morbidity and mortality through a collaborative focus on achieving measurable quality goals where performance metrics indicate that evidence-based, life-saving practices are not fully deployed. 2017 data from the California Office of Statewide Health Planning and Development indicate that annually approximately 298,000 Californians are hospitalized for heart attacks and strokes, approximately 100,000 of them younger than age 65. Many of these could be prevented with evidence-based preventive patient management, clinical quality improvement and adoption of best practices to implement best medical knowledge. Our work is focused in these high-leverage areas of better management of cardiovascular disease and diabetes, with particular emphasis on control of blood pressure, cholesterol and blood sugar, and is informed by data from Integrated Health Care Association, the National Committee for Quality Assurance, the federal Agency for Health Care Quality and Research, the Commonwealth Foundation, CMS, and the US Centers for Disease Control and the NIH.

The Right Care Initiative, operated by the UC Berkeley School of Public Health, was publicly launched with the Department of Managed Health Care, NCQA and the Deans of UC Berkeley and UCLA Schools of Public Health in March 2008 at the 1st annual Clinical Quality Improvement Leadership Summit. Since the first leadership summit, more than a dozen Right Care summits have been held around the state, along with over 150 monthly University of Best Practices. Each Right Care gathering is a collaborative effort to close the gap between science and practice to improve patient outcomes working with medical directors, pharmacy and quality improvement directors, as well as thought leaders in evidence-based medicine.

More information on The Right Care Initiative can be found at: https://RightCare.Berkeley.edu/

References

1 Center for Disease Control and Prevention. Heart Disease Fact. Accessed: May 2019

Project Brief produced 2017 (Updated 2019) by Cardiologists: William J. Bommer, MD, FACC (UC Davis; California American College of Cardiology); David J. Maron, MD, FACC, FAHA (Stanford University, Director of Preventive Cardiology; Clinical Prof. of Cardiovascular Medicine); Matthew Budoff, MD (UCLA Medical Center, Endowed Chair of Preventive Medicine); Eveline O. Stock, MD (UCSF Preventive Cardiology); Joseph Sky, MD, FACP, FACC (Chief of Cardiology, US Air Force David Grant Medical Center*) and Right Care Initiative Team: Hattie Rees Hanley, MPP, Right Care Initiative Director; Warren Barnes, JD, Regulatory Consultant UC Berkeley School of Public Health, Former Chief Lawyer CA Department of Managed Health Care; and Bryan Vuong, BA, UC Berkeley Research Assistant

*Dr. Joseph Sky’s views do not reflect an official position of the military.
Top 10 Take-Home Messages to Reduce Risk of Atherosclerotic Cardiovascular Disease through Cholesterol Management
Grundy SM, et al. 2018 Cholesterol Clinical Practice Guidelines

1. In all individuals, emphasize a heart-healthy lifestyle across the life course. A healthy lifestyle reduces atherosclerotic cardiovascular disease (ASCVD) risk at all ages. In younger individuals, healthy lifestyle can reduce development of risk factors and is the foundation of ASCVD risk reduction. In young adults 20 to 39 years of age, an assessment of lifetime risk facilitates the clinician–patient risk discussion (see No. 6) and emphasizes intensive lifestyle efforts. In all age groups, lifestyle therapy is the primary intervention for metabolic syndrome.

2. In patients with clinical ASCVD, reduce low-density lipoprotein cholesterol (LDL-C) with high intensity statin therapy or maximally tolerated statin therapy. The more LDL-C is reduced on statin therapy, the greater will be subsequent risk reduction. Use a maximally tolerated statin to lower LDLC levels by ≥50%.

3. In very high-risk ASCVD, use a LDL-C threshold of 70 mg/dL (1.8 mmol/L) to consider addition of non-statin to statin therapy. Very high-risk includes a history of multiple major ASCVD events or 1 major ASCVD event and multiple high-risk conditions. In very high-risk ASCVD patients, it is reasonable to add ezetimibe to maximally tolerated statin therapy when the LDL-C level remains ≥70 mg/dL (≥1.8 mmol/L). In patients at very high risk whose LDL-C level remains ≥70 mg/dL (≥1.8 mmol/L) on maximally tolerated statin and ezetimibe therapy, adding a PCSK9 inhibitor is reasonable, although the long-term safety (>3 years) is uncertain and cost effectiveness is low at mid-2018 list prices.

4. In patients with severe primary hypercholesterolemia (LDL-C level ≥190 mg/dL [≥4.9 mmol/L]), without calculating 10-year ASCVD risk, begin high-intensity statin therapy without calculating 10-year ASCVD risk. If the LDL-C level remains ≥100 mg/dL (≥2.6 mmol/L), adding ezetimibe is reasonable. If the LDL-C level on statin plus ezetimibe remains ≥100 mg/dL (≥2.6 mmol/L) and the patient has multiple factors that increase subsequent risk of ASCVD events, a PCSK9 inhibitor may be considered, although the long-term safety (>3 years) is uncertain and economic value is low at mid-2018 list prices.

5. In patients 40 to 75 years of age with diabetes mellitus and LDL-C ≥70 mg/dL (≥1.8 mmol/L), start moderate-intensity statin therapy without calculating 10-year ASCVD risk. In patients with diabetes mellitus at higher risk, especially those with multiple risk factors or those 50 to 75 years of age, it is reasonable to use a high-intensity statin to reduce the LDL-C level by ≥50%.

6. In adults 40 to 75 years of age evaluated for primary ASCVD prevention, have a clinician–patient risk discussion before starting statin therapy. Risk discussion should include a review of major risk factors (e.g., cigarette smoking, elevated blood pressure, LDL-C, hemoglobin A1C [if indicated], and calculated 10-year risk of ASCVD); the presence of risk-enhancing factors (see No. 8); the potential benefits of lifestyle and statin therapies; the potential for adverse effects and drug–drug interactions; consideration of costs of statin therapy; and patient preferences and values in shared decision-making.

7. In adults 40 to 75 years of age without diabetes mellitus and with LDL-C levels ≥70 mg/dL (≥1.8 mmol/L), at a 10-year ASCVD risk of ≥7.5%, start a moderate-intensity statin if a discussion of treatment options favors statin therapy. Risk-enhancing factors favor statin therapy (see No. 8). If risk status is uncertain, consider using coronary artery calcium (CAC) to improve specificity (see No. 9). If statins are indicated, reduce LDL-C levels by ≥30%, and if 10-year risk is ≥20%, reduce LDL-C levels by ≥50%.

8. In adults 40 to 75 years of age without diabetes mellitus and 10-year risk of 7.5% to 19.9% (intermediate risk), risk-enhancing factors favor initiation of statin therapy (see No. 7). Risk-enhancing factors include family history of premature ASCVD; persistently elevated LDL-C levels ≥160 mg/dL (≥4.1 mmol/L); metabolic syndrome; chronic kidney disease; history of preeclampsia or premature menopause (age <40 years); chronic inflammatory disorders (e.g., rheumatoid arthritis, psoriasis, or chronic HIV); high-risk ethnic groups (e.g., South Asian); persistent elevations of triglycerides ≥175 mg/dL (≥1.97 mmol/L); and, if measured in selected individuals, apolipoprotein B ≥130 mg/dL, high-sensitivity C-reactive protein ≥2.0 mg/L, ankle-brachial index <0.9 and lipoprotein (a) ≥50 mg/dL or 125 mmol/L, especially at higher values of lipoprotein (a). Risk-enhancing factors may favor statin therapy in patients at 10-year risk of 5-7.5% (borderline risk).

9. In adults 40 to 75 years of age without diabetes mellitus and with LDL-C levels ≥70 mg/dL- 189 mg/dL (≥1.8-4.9 mmol/L), at a 10-year ASCVD risk of ≥7.5% to 19.9%, if a decision about statin therapy is uncertain, consider measuring CAC. If CAC is zero, treatment with statin therapy may be withheld or delayed, except in cigarette smokers, those with diabetes mellitus, and those with a strong family history of premature ASCVD. A CAC score of 1 to 99 favors statin therapy, especially in those ≥55 years of age. For any patient, if the CAC score is ≥100 Agatston units or ≥75th percentile, statin therapy is indicated unless otherwise deferred by the outcome of clinician–patient risk discussion.

10. Assess adherence and percentage response to LDL-C–lowering medications and lifestyle changes with repeat lipid measurement 4 to 12 weeks after statin initiation or dose adjustment, repeated every 3 to 12 months as needed. Define responses to lifestyle and statin therapy by percentage reductions in LDL-C levels compared with baseline. In ASCVD patients at very high-risk, triggers for adding non-statin drug therapy are defined by threshold LDL-C levels ≥70 mg/dL (≥1.8 mmol/L) on maximal statin therapy (see No. 3).
The role of the pharmacist has evolved beyond dispensing medication into active participation in disease management and prevention. By including pharmacists on the care team, published evidence and health system experience consistently demonstrate that mortality is reduced, disease outcomes improve, healthcare costs are reduced for high-risk patients, hospital readmission rates are reduced and patients are more satisfied with their healthcare. This evidence has been demonstrated in a broad range of conditions including cardiovascular diseases, diabetes management, asthma/COPD, oncology, and psychiatry.

### A Need for Improved Medication Management

The cost of illness and death resulting from nonoptimized medication therapy reached $528.4 billion, equivalent to 16% of total U.S. health care expenditure, in 2016. A pharmacist on the care team can help to optimize medication therapy outcomes and reduce cost.

### Five Recent Studies Bolster Evidence for Clinical and Economic Benefits of Adding Pharmacist on the Care Team

**Pharmacists Working in Los Angeles Barbershops Improved Hypertension (HTN) Control** (Cedars-Sinai, California, 2018) In a 2018 published NIH-funded study, a much larger percentage of patients who had their medications managed by a pharmacist in their barbershop achieved HTN control compared to those for whom the barber encouraged lifestyle modifications and regular doctor appointments. The difference in systolic blood pressure between pharmacist-managed patients and usual care was 21mmHg. (New England Journal of Medicine, 2018) *p < 0.001*

**Home Blood Pressure (BP) Telemonitoring and Pharmacist Management** (HealthPartners Medical Group of Minnesota, 2013) Home BP telemonitorers wirelessly transmitted patient measurements to clinic-based pharmacists, who then adjusted hypertensive therapy under a collaborative care agreement with physicians. This modern model of making hypertension management accessible and convenient was touted by a JAMA editorial board in 2013 as “something patients, clinicians, and policy makers can take to the bank”, like ATMs are for banking.

<table>
<thead>
<tr>
<th>Patients with Uncontrolled Hypertension</th>
<th>Intervention Group</th>
<th>Control Group*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension Controlled at 6 months</td>
<td>118 (89.4%)</td>
<td>55 (32.2%)</td>
</tr>
</tbody>
</table>

**Mortality Rate Declined Dramatically for Recently Hospitalized Coronary Artery Disease Patients** (Kaiser Permanente, Colorado, 2007) CAD patients receiving comprehensive cardiac care from a collaborative practice of pharmacists and nurses soon after hospital discharge were less likely to die as compared to patients not enrolled in the program.

<table>
<thead>
<tr>
<th>Unadjusted Mortality by Comprehensive Cardiac Care Cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac Care Cohort</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Early Comprehensive Cardiac Care</td>
</tr>
<tr>
<td>No Comprehensive Cardiac Care</td>
</tr>
</tbody>
</table>

*(Pharmacotherapy, 2007)*

**Statewide Program Reduced Hospitalizations and Avoided Millions in Cost for Older Adults** (Center for Medicare & Medicaid Innovation [CMMI] Project in Hawaii, 2016) Medication management services provided by specially trained hospital and community pharmacists were associated with:

- 36% reduction in the medication-related hospitalization rate
- $6.6 million of avoided costs compared to the $1.8 million of program cost: a $2.61:1 return on investment.

**Insurer Based Transition of Care Program Reduced Hospital Readmissions for High Risk Patients** (CVS Health, 2016) Recently hospitalized patients participating in a post-discharge pharmacist medication reconciliation program had a 50% relative risk reduction (11% absolute risk reduction) for hospital readmission within 30 days of discharge. The program more than paid for itself with savings of $2 for every $1 spent.

---

### Right Care Initiative Pharmacy Collaboration— University of California NIH Demonstration Project:

**Improved BP Control and Fewer PCP Visits in a Pharmacist-Primary Care Physician (PCP) Collaborative Practice**

Drug therapy problem identified for almost 50% of patients at first pharmacist visit. Larger percentage of patients receiving care in the pharmacist-PCP collaborative practice had their BP controlled and on average had two fewer PCP visits. (UCLA School of Medicine, UCSD School of Pharmacy)

---

*These data are for patients continuing to see the pharmacist through 9 months.*
California Right Care Initiative Project Brief: Pharmacists on the Clinical Care Team

Additional Evidence Supporting Pharmacy Care

Cardiovascular and Diabetes Outcomes Improve for High Risk Patients – University of Southern California (CMMI Project)

Pharmacists providing Comprehensive Medication Management (CMM) for ~6,000 high-risk patients improved blood pressure, cholesterol management, and A1c significantly more than a propensity score-matched usual care cohort. Patient and physician satisfaction were extremely high (manuscript in preparation, 2018)

Large Employer Cardiovascular and Diabetes Program Improved Patient Health and Reduced Costs: The Asheville Project (City of Asheville, NC)

The Asheville quasi-experimental, longitudinal cohort studies provided early evidence of pharmacist on care team benefits.

### Asheville Cardiovascular (CV) Events and Costs:

<table>
<thead>
<tr>
<th>Category</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of CV events</td>
<td>77 per 1,000</td>
<td>38 per 1,000</td>
</tr>
<tr>
<td>CV-related medical costs</td>
<td>$1,362 PIPPY</td>
<td>$734 PIPPY</td>
</tr>
</tbody>
</table>

### Outcomes for Cardiovascular Pharmacy Management from Asheville Project

- Percent of Patients at Baseline
  - At Goal BP: 42.0%
  - At Goal LDL: 49.9%
  - Stage 1 HTN: 36.5%
  - Stage 2 HTN: 20.0%

- Percent of Patients at Follow-up
  - At Goal BP: 64.2%
  - At Goal LDL: 74.6%
  - Stage 1 HTN: 20.0%
  - Stage 2 HTN: 16.0%

### Outcomes for Diabetes Pharmacy Management from Asheville Project

- A1c Measurement in Past 6 Months
  - Before: 12%
  - After: 8%

- Self-Test Blood Sugar
  - Before: 80%
  - After: 40%

### Typical “Pharmacist on the Care Team” Services

- 60-minute initial patient interview and counseling session (in-person or telephone) and 20-30 minute follow up sessions
- Comprehensive review of lab results and medications (including over-the-counter medications, supplements and herbal remedies)
- Point of care testing (e.g., blood sugar, blood pressure, blood thinner monitoring), vital sign measurement, depression screening
- Assessment of patients to monitor medication efficacy and safety
- Determination of drug interactions, how to improve medication therapy, and cost savings alternatives
- Interactive communication with physician and other members of the healthcare team (optimally through the electronic medical record)

### Questions for a Pharmacist

- Is the medication selection and dose appropriate given the patient’s age or other conditions and medications?
- Should medication therapy changes be considered that might improve patient adherence or address side effects?
- What time of day should patients take medications?
- Are all prescribed medications necessary and at optimum dosage?
- Are there additional medications that the patient should be taking?
- With what should (or should not) a medication be taken?
- Are less expensive, equivalent medications available?

### References


This program description was written by the California Right Care Initiative team at the University of California, Berkeley. For more information: RightCare@Berkeley.edu; (510) 642-4937. Last updated May 23, 2018.
Effectiveness of Community Health Workers for Chronic Disease Care

Community health workers (CHW), as defined by the American Public Health Association, are “frontline public health workers who are trusted members of and/or have an unusually close understanding of the community served.” Accordingly, CHWs serve as intermediaries between healthcare services and communities, especially for underserved or minority populations, increasing quality of and access to relevant services.¹ These workers are variably referred to as health navigators, health coaches, or community outreach workers. Promotores (or promotoras) traditionally are CHWs serving Spanish-speaking communities.²

There is considerable discussion as to effectiveness of CHW interventions in the healthcare system, especially as key stakeholders continue to search for cost-effective strategies to improve patient outcomes. In an assessment conducted by the Centers for Disease Control and Prevention, authorizing CHWs to provide chronic disease care services, including blood pressure screening and education initiatives, was the policy component with the strongest evidence base.³ This issue brief explores the evidence for contributions of CHWs in chronic disease care and for support of patients and healthcare organizations.

HYPERTENSION MANAGEMENT

A 2017 randomized controlled trial (RCT) conducted at two Community Health Centers (CHCs) in Massachusetts examined hypertension management in English- and Spanish-speaking communities. Hypertension affects about half of adults in the United States, with profound disparities in hypertension awareness, treatment, and control especially among people of color (e.g., non-Hispanic Black men). CHWs worked directly with patients using multiple approaches to empower patients and encourage patient self-management. The 2017 study found that this intervention was effective in chronic disease management, and that use of culturally appropriate tools, such as patient narratives (video format), were particularly helpful and cost-effective.⁴

In a 2018 cluster-randomized trial, known as the Barbershop Project, researchers studied blood pressure (BP) reduction through Black-owned barbershops (Figure 1). A cohort of 319 Black male patrons with systolic BPs of 140 mm Hg or more from 52 Black-owned barbershops were assigned to either a pharmacist-led intervention group, in which barbershops with specialty-trained pharmacists would prescribe drug therapy under a collaborative practice agreement with the participants’ doctors, or an active control group, in which trained barbers verbally encouraged lifestyle modification and medical appointments.⁵

The study demonstrated a clear reduction in systolic blood pressure at 6 months (Figure 2). At baseline, the mean systolic BP was 152.8 mm Hg in the intervention group and 154.6 mm Hg in the control group. At 6 months, the mean systolic BP decreased by 27.0 mm Hg to 125.8 mm Hg in the intervention group, and by 9.3 mm Hg to 145.4 mm Hg in the control group. With the intervention, mean reduction was 21.6 mm Hg (95% CIs 14.7 - 28.4; P<0.001). Furthermore, 63.6% of participants who enrolled in the intervention group achieved a BP of less than 130/80 mm Hg, in contrast to just 11.7% of participants in the control group (Victor et al., 2018; 95% CIs 2.5 - 12.8; P<0.001).

---

Figure 1. Percentage of Barbershop Project Participants Achieved with Blood Pressure Level < 130/80 mm Hg after study period in control and CHW intervention groups (Victor et al., 2018)
The DIABLEST (Diabetes Among Latinos Best Practices Trial) study enrolled a total of 211 adult Latinos with type 2 diabetes (T2D) who lacked access to healthcare and disease management services. The primary objective was to evaluate the impact of CHW-led structured programs for blood glucose control. Study participants were randomly assigned to either a standard healthcare group or to a CHW intervention group. The CHW intervention consisted of 17 individual at-home sessions led by CHWs over a course of 12 months. These sessions served to promote healthy lifestyles, educate participants on nutrition and healthy food choices for diabetes, assist with use of blood glucose self-monitoring, and encourage medication adherence. There was a sustained impact (Figure 4) for the 12-month long intervention at 6 months post-intervention (p = 0.009). There was also a statistically significant overall repeated-measures group effect, with a mean difference of -0.51% [-5.57 mmol/mol], and 95% CI -0.83, -0.19% [-9.11, -2.03 mmol/mol].

**Mean Systolic Blood Pressure at Baseline and 6 months**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Intervention Group (N = 132)</th>
<th>Control Group (N = 171)</th>
<th>Intervention Effect</th>
<th>P Value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic blood pressure — mm Hg‡</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At baseline</td>
<td>152.8±10.3</td>
<td>154.6±12.0</td>
<td>-1.8 (95% CI -5.57 mmol/mol)</td>
<td>0.009</td>
</tr>
<tr>
<td>At 6 mo</td>
<td>125.8±11.0</td>
<td>145.4±15.2</td>
<td>-21.6 (-28.4 to -14.7)§</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Change</td>
<td>-27.0±13.7</td>
<td>-9.3±16.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diastolic blood pressure — mm Hg</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At baseline</td>
<td>92.2±11.5</td>
<td>89.8±11.2</td>
<td>-2.4 (95% CI -4.3 mmol/mol)</td>
<td>0.001</td>
</tr>
<tr>
<td>At 6 mo</td>
<td>74.7±8.3</td>
<td>85.5±12.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change</td>
<td>-17.5±11.0</td>
<td>-4.3±11.8</td>
<td>-14.9 (-19.6 to -10.3)§</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hypertension control at 6 mo — no. [%]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood pressure &lt;140/90 mm Hg</td>
<td>118 (89.4)</td>
<td>55 (32.2)</td>
<td>63 (47.8) (95% CI 35.8, 85.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Blood pressure &lt;135/85 mm Hg</td>
<td>109 (82.6)</td>
<td>32 (18.7)</td>
<td>77 (58.6) (95% CI 39.6, 75.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Blood pressure &lt;110/80 mm Hg</td>
<td>84 (63.6)</td>
<td>20 (11.7)</td>
<td>64 (48.4) (95% CI 30.4, 70.4)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

† Plus–minus values are means ±SD.
‡ For systolic blood pressure and diastolic blood pressure, P values were calculated from linear mixed-effects models with random intercepts for clusters. The estimated intervention effect was controlled for baseline systolic or diastolic blood pressure, routine doctor, and high cholesterol level. For hypertension control at 6 months, P values were calculated from generalized estimating equations with a compound symmetry working correlation to account for cluster effects. The estimated intervention effect was controlled for baseline systolic blood pressure, routine doctor, and high cholesterol level.
§ The prespecified primary outcome was the change in systolic blood pressure from baseline to 6 months. The intraclass correlation coefficient from the linear mixed-effects model for change in systolic blood pressure was 0.05. Degrees of freedom for the estimated intervention effect = 276.

**Figure 2. Barbershop Project Primary and Secondary Blood Pressure Outcomes (Victor et al., 2018)**

**Figure 3. Barbershop Project Systolic Blood Pressure Outcomes at Baseline and 6 months (Victor et al., 2018)**
A 2017 systematic review of RCTs assessed outcomes for CHWs in diabetes care. Managing Type 2 diabetes is difficult for many patients for a multitude of reasons, including financial insecurity, emotional distress, and low access to care. Data were extracted from a total of 17 peer-reviewed articles published between 1997 and 2016; CHW interventions were extensively reviewed with respect to theory integration, intervention design, outcome variables, and findings. Included studies were CHW specific interventions and excluded team-based interventions to isolate CHW effects. A majority of the included studies were conducted in the United States, and several studies targeted rural populations and/or minority communities. Implementation of interventions occurred in primary care clinics, outpatient settings in clinical research centers, grocery stores, and via telephone.

The review found that one third of included articles explicitly integrated theory into the research design. Furthermore, there was considerable variation in intervention specifics, including attrition rates and CHW training methods, however there was substantial overlap especially with respect to four types of service: patient education, patient care and management, care coordination, and providing support regarding patients’ mental, emotional, and social health, and patient well-being. Overall, findings from this review (Figure 5) suggest that CHW interventions have significant positive impacts on physical health outcomes, diabetes knowledge, and self-care behaviors, and also promote emotional well-being.7

A PRISMA-style systematic review (2021) of CHWs as patient navigators showed that interventions improved aspects of chronic disease management such as adherence to cancer screening and increased usage of primary care. A literature search was conducted between January 1990 and March 2020 in databases including PubMed, Medline, CINAHL, etc., in which 29 articles were identified for assessment.8

Figure 4. Primary HbA1c (Biomarker) results at baseline; at 3, 6, 12 months, during the intervention, and at 18 months (6 months post-intervention/maintenance period). Groups were equivalent at baseline. (Pérez-Escamilla et al., 2015)

![DIABLEST Study HbA1c Results](chart.png)

Figure 5. Positive Impacts demonstrated by CHW interventions (Adapted from Trump et al., 2017)

<table>
<thead>
<tr>
<th>Theme</th>
<th>Articles Supporting Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant impact on physical health</td>
<td>Corkery et al., 1997; Gary et al., 2003; Heisler et al., 2014; Kenya et al., 2014; McDermott et al., 2015; Perez-Escamilla et al., 2015; Prozio et al., 2013; Rothschild et al., 2014; Spencer et al., 2011; Tang et al., 2014; &amp; Wagner et al., 2016</td>
</tr>
<tr>
<td>Significant impact on diabetes management</td>
<td>Babamoto et al., 2009; Corkery et al., 1997; Kenya et al., 2014; &amp; Wagner et al., 2015</td>
</tr>
<tr>
<td>Significant impact on self-care behaviors</td>
<td>Babamoto et al., 2009; Batts et al., 2001; Corkery et al., 1997; Gary et al., 2003; Heisler et al., 2014; Kolannoor-Samuels et al., 2016; Rothschild et al., 2014; &amp; Spencer et al., 2011</td>
</tr>
<tr>
<td>Significant impact on mental health and well-being</td>
<td>Heisler et al., 2014; Rothschild et al., 2014; Spencer et al., 2013; Tang et al., 2014; &amp; Wagner et al., 2016</td>
</tr>
</tbody>
</table>
INTERDISCIPLINARY COLLABORATIVE CARE

Beyond CHW interventions, collaborative or team-based care has been identified as another potential way to improve patient outcomes. Interprofessional collaborative practices (ICP), as defined by the WHO, is when "multiple health workers from different professional backgrounds work together with patients, families, caregivers, and communities to deliver the highest quality of care." A meta-analysis and systematic review published in February of 2021 assessed ICP and outcomes in adults with respect to diabetes and hypertension in primary care. The team utilized standardized mean differences (SMD) as the primary metric to analyze the impact of ICP on study outcomes. Researchers found that ICP was associated with reductions in HbA1c regardless of baseline levels, especially in patients with the highest HbA1c levels at baseline. There was also strong evidence showcasing reduced systolic and diastolic blood pressures. In addition to data depicting such a strong case for ICP, ICP is also practical given global increases in prevalence of chronic diseases such as hypertension and diabetes; expanding elderly populations could potentially leave physicians overwhelmed and overworked.

PHARMACISTS WITH CHWs: HIGHLY SUCCESSFUL AT OVERCOMING BARRIERS RELATED TO MEDICATION ADHERENCE

A 2020 study looked at collaborative care specifically between pharmacists and CHWs to address medication adherence barriers, a major component of chronic disease care. In this study, CHWs received training in medication therapy management support, and worked with pharmacists from the Center for Quality Medication Management at the University of Florida to help predominantly Native American and Black hypertensive patients. By the final pharmacist-CHW visits at 6 months, 75.6% and 63.9% of the barriers related to antihypertensive and antidiabetic medications respectively were resolved. Furthermore, a paired t-test indicated a significant difference in the mean systolic (-5.9 mm Hg, p = 0.006) and diastolic (-4.5 mm Hg, p = 0.008) blood pressure over the course of the intervention. The positive findings from this study support the collaboration between pharmacists and CHWs as a model to improve medication adherence and overall patient outcomes.

<table>
<thead>
<tr>
<th>Barrier type</th>
<th>Antihypertensive medications</th>
<th>Antidiabetic medications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. barriers (initial encounter)</td>
<td>No. barriers (final encounter)</td>
</tr>
<tr>
<td>Forgetfulness</td>
<td>35</td>
<td>10</td>
</tr>
<tr>
<td>Running out of refills</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Knowledge</td>
<td>27</td>
<td>3</td>
</tr>
<tr>
<td>Adverse effects</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>Cost</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>90</td>
<td>22</td>
</tr>
</tbody>
</table>

Figure 6. Identified Medication Adherence Barriers (Wheat et al., 2020)

Figure 7. Percentage of barriers related to antihypertensive and antidiabetic medications resolved at 6 months (Wheat et al., 2020)

% of Barriers Resolved at 6 months

Figure 8. Paired t-test results for mean systolic blood pressure recorded at the initial (SD = 8.3) and 6 months/final visit (SD = 12.1). Tests indicated a clinically and statistically significance in mean systolic blood pressure values (p = 0.006)
COST-EFFECTIVENESS OF CHWs

Growing interest in CHWs has also stemmed from discussions regarding cost-effectiveness and expected cost savings. A return-on-investment analysis conducted in February 2020 found that every dollar invested in a CHW intervention would return $2.47 to an average Medicaid payer within the fiscal year. This analysis was based on a randomized controlled trial of Individualized Management for Patient-Centered Targets (IMPaCT), which is a standardized community health worker intervention that addresses socioeconomic and behavioral barriers to health in low-income populations. 302 patients were enrolled, with 150 randomly assigned to the intervention arm and 152 to the control arm.

After analysis, the study found that at baseline, there were no significant differences between the study arms in hospitalizations prior to enrollment in the study. At one year after enrollment, 31.6% of patients in the control arm had been hospitalized, in contrast to 23.3% of those in the intervention arm (p=0.11). During the one-year follow-up period, there were 98 admissions in the control arm (0.64 admissions per patient-year), and 68 admissions in the intervention arm (0.45 admissions per patient-year), showcasing a 30% relative reduction (p = 0.17).

Furthermore, the intervention group also had fewer and lower-cost admissions, with total calculated inpatient costs of $2,267,900.10. On the other hand, total inpatient costs in the control arm totaled $3,681,206.88. Factoring in outpatient costs, the total cost of care was $2,450,881.80 for the intervention group and $3,852,189.78 for the control group, which indicates a 38% reduction in care cost for the intervention versus control group.12

CONCLUSION

This issue brief reviews the evidence on efficacy of CHW interventions in improving medical outcomes for people with chronic conditions. The presented studies demonstrate the evidence for a clear benefit of CHW involvement in care of hypertension, diabetes, and cardiovascular risks. We recommend increased inclusion of CHWs in chronic disease care in the future. Primary roles and/or characteristics of CHWs include health education, promoting medication adherence, helping patients to navigate complex health systems, and exhibiting cultural competency for marginalized communities. CHWs can directly address various barriers to care that prevent patients, particularly those from communities of color, from receiving the best possible treatment to manage their chronic health conditions. We especially need additional research to further assess cost-effectiveness and address critical policy components (such as insurance coverage for expanded CHW care). Research and evaluation should continue to critically examine patient outcomes across multiple chronic disease conditions that may benefit from CHW interventions.

REFERENCES


Project Brief updated 06/04/2021 by Right Care Initiative Team: Susan L. Ivey, MD, MHS, Director of Research, Health Research for Action, Adjunct Professor, UC Berkeley School of Public Health; Hattie Hanley, MPP, Director & Co-Founder, Right Care Initiative, UC Berkeley School of Public Health; Emily Gu, UC Berkeley Student Research Assistant; and Jenny Woo, Senior Student Research Assistant. We also acknowledge the work of Margae Knox for the earlier version of Right Care Initiative’s CHW evidence brief.
“Home blood pressure monitoring should become a routine component of blood pressure measurement in the majority of patients with known or suspected hypertension…. [It] has the potential to improve the quality of care while reducing costs…."

Joint call to action by the American Heart Association, the American Society of Hypertension, and the Preventive Cardiovascular Nurses Association

More than 7 million California adults (about 27%) have hypertension. Approximately 69% of people who had a first heart attack, 77% who had a first stroke, and 74% of those with congestive heart failure had blood pressure greater than 140/90 mmHg. Home blood pressure monitoring is a readily accessible, evidence-based and cost-effective strategy for improving hypertension treatment and control.

Improved Health and Cost Outcomes with Home Blood Pressure Monitoring

- Home monitoring in one study reduced the medication needed for blood pressure control, saving $1198 per 100 patients per month.
- A meta-analysis of 18 randomized controlled trials found that hypertensive people using home monitoring had blood pressure 4.2/2.4 mmHg lower than those with standard office monitoring. Risk of blood pressure above target was also lower in people with home monitoring.
- Home monitoring identifies whether blood pressure is different outside the doctor’s office, which is common for as many as 20% of Americans. These patients are at higher risk for developing sustained high blood pressure (Harvard Newsletter).
- 95% of physicians agreed that home blood pressure measurements were useful in making treatment decisions to manage hypertension patients’ condition.

Home Monitoring Benefits

- Promotes better blood pressure control by engaging patients and motivating proactive behaviors—healthy eating, physical activity, proper medication use.
- Cuts healthcare costs—may reduce medications, the total number of doctor or clinic visits, and patients’ travel expenses and lost wages.
- Tracks treatment effects between doctor visits.
- Helps doctors confirm hypertension diagnosis earlier.

Blood Pressure Control among Critical Right Care Goals

- The Right Care goal for all California health plans and medical groups is to achieve the national “A grade” of performance on cardiovascular disease and diabetes prevention and treatment measures, particularly for blood pressure and cholesterol control.
- The National Committee for Quality Assurance (NCQA) estimates that controlling high blood pressure alone is estimated to save 619-1,057 lives annually and avoid $4.5 million in hospitalization costs.

Blood Pressure Control Trends: Most California Health Plans are Making Progress

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>90%</td>
<td>85%</td>
<td>70%</td>
<td>60%</td>
<td>75%</td>
<td>80%</td>
<td>75%</td>
<td>65%</td>
<td>70%</td>
<td>72%</td>
<td>75%</td>
</tr>
<tr>
<td>2007</td>
<td>92%</td>
<td>87%</td>
<td>72%</td>
<td>65%</td>
<td>78%</td>
<td>82%</td>
<td>78%</td>
<td>68%</td>
<td>72%</td>
<td>74%</td>
<td>78%</td>
</tr>
<tr>
<td>2008</td>
<td>94%</td>
<td>90%</td>
<td>74%</td>
<td>68%</td>
<td>80%</td>
<td>85%</td>
<td>80%</td>
<td>70%</td>
<td>75%</td>
<td>76%</td>
<td>80%</td>
</tr>
<tr>
<td>2009</td>
<td>96%</td>
<td>92%</td>
<td>76%</td>
<td>70%</td>
<td>82%</td>
<td>88%</td>
<td>82%</td>
<td>72%</td>
<td>76%</td>
<td>78%</td>
<td>82%</td>
</tr>
<tr>
<td>2010</td>
<td>98%</td>
<td>95%</td>
<td>78%</td>
<td>72%</td>
<td>84%</td>
<td>90%</td>
<td>84%</td>
<td>74%</td>
<td>78%</td>
<td>80%</td>
<td>84%</td>
</tr>
<tr>
<td>2011</td>
<td>99%</td>
<td>97%</td>
<td>80%</td>
<td>74%</td>
<td>86%</td>
<td>91%</td>
<td>86%</td>
<td>76%</td>
<td>80%</td>
<td>82%</td>
<td>86%</td>
</tr>
<tr>
<td>2012</td>
<td>100%</td>
<td>98%</td>
<td>82%</td>
<td>76%</td>
<td>88%</td>
<td>92%</td>
<td>88%</td>
<td>78%</td>
<td>82%</td>
<td>84%</td>
<td>88%</td>
</tr>
</tbody>
</table>

Home Monitors Increasingly Accurate and Affordable

- Machines can be purchased over-the-counter at most drugstores and pharmacies.
- Prices range from less than $50 to about $100.
- Validated machines are listed at [http://www.dableducational.org/](http://www.dableducational.org/)
- New technology is continually improving the ease and convenience of home monitoring.
**Patient-Directed Blood Pressure Control with Home Monitoring** Featured in the American Medical Group Association’s *Best Practices in Hypertension Compendium*\(^1\)

This demonstration project showed that patient participation in the control of blood pressure through home monitoring is *feasible, effective*, requires few extra clinic resources, and leads to better goal achievement.

**Target Population**
- Patients with high blood pressure and high risk for adverse cardiovascular outcomes

**Intervention**
- Each patient was given a blood pressure goal, a 30-60 minute educational session about blood pressure control importance, information about treatment options, and a home blood pressure monitor.
- Patients measured and recorded their blood pressure and pulse two times per day until blood pressure was at goal or after changes in treatment. Blood pressure readings were phoned/faxed/e-mailed to a clinic nurse. (Wireless versions now available make reporting even easier).
- Patients also evaluated blood pressure personally and, if not at goal, contacted clinic for instructions to improve blood pressure control.

**Outcomes**
- 31% of patients in the patient-directed care (home monitoring) group achieved goal in 6 months compared to 13% of patients in the usual care group.

**Lessons Learned**
- Physicians committed as a group to implement home monitoring when the project plan was presented at unit meetings.
- Questionnaires, blood pressure tracking sheets and educational materials helped patients better understand their blood pressure goal.

---

**U.S. & International Guidelines Support Home Blood Pressure Monitoring**

- Joint National Committee on Prevention Detection, Evaluation and Treatment of High Blood Pressure
- A Joint Call to Action by the American Heart Association, American Society of Hypertension and Preventive Cardiovascular Nurses Association
- European Society of Hypertension/European Society of Cardiology
- Canadian Hypertension Education Program
- Japanese Society of Hypertension
- British Hypertension Society

---

**Blood Pressure Categories**

<table>
<thead>
<tr>
<th>BLOOD PRESSURE CATEGORY</th>
<th>SYSTOLIC mm Hg (upper number)</th>
<th>DIASTOLIC mm Hg (lower number)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORMAL</td>
<td>LESS THAN 120</td>
<td>and</td>
</tr>
<tr>
<td>ELEVATED</td>
<td>120 – 120</td>
<td>and</td>
</tr>
<tr>
<td>HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1</td>
<td>130 – 139</td>
<td>or</td>
</tr>
<tr>
<td>HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2</td>
<td>140 OR HIGHER</td>
<td>or</td>
</tr>
<tr>
<td>HYPERTENSIVE CRISIS (consult your doctor immediately)</td>
<td>HIGHER THAN 180</td>
<td>and/or</td>
</tr>
</tbody>
</table>

---

**Works Cited**


This promising intervention brief was written by the Right Care Initiative team at the University of California, Berkeley with support from the California Office of the Patient Advocate—Last Updated August 2019. For questions or comments, please visit [RightCare.Berkeley.edu](http://RightCare.Berkeley.edu)
Office of the Patient Advocate Gold Bar Performance Report Cards
(Right Care Target Measures for Medical Groups in Sacramento, Los Angeles, San Diego and Santa Clara County)

Performance in Right Care CA Counties for Blood Pressure (BP) Control at <140/90 mmHg (Performance Year 2019)

<table>
<thead>
<tr>
<th></th>
<th>Sacramento County</th>
<th>Los Angeles County</th>
<th>San Diego County</th>
<th>Santa Clara County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>Performance Data for Managed Care Patients. CA Office of the Patient Advocate Report 2020-2021 Edition</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Performance in Right Care CA Counties for BP Control at <140/90 mmHg for people with Diabetes (Performance Year 2019)

<table>
<thead>
<tr>
<th></th>
<th>Sacramento County</th>
<th>Los Angeles County</th>
<th>San Diego County</th>
<th>Santa Clara County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>Performance Data for Managed Care Patients. CA Office of the Patient Advocate Report 2020-2021 Edition</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Performance in Right Care CA Counties for Blood Sugar Control at HbA1c < 8 for people with Diabetes (Performance Year 2019)

Sacramento County  Los Angeles County  San Diego County  Santa Clara County

Source: Performance Data for Managed Care Patients. CA Office of the Patient Advocate Report 2020-2021 Edition

Performance in Right Care CA Counties for Prescribing Statins to people with Heart Disease (Performance Year 2019)

Sacramento County  Los Angeles County  San Diego County  Santa Clara County

Source: Performance Data for Managed Care Patients. CA Office of the Patient Advocate Report 2020-2021 Edition
Key Quality Indicators for Cardiovascular Prevention Among California Health Plans

Controlling High Blood Pressure (<140/90mmHg) Among California Health Plans

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Aetna Health of California (HMO/POS)</td>
<td>61.06</td>
<td>61.00</td>
<td>62.59</td>
<td>62.59</td>
<td>65.04</td>
<td>65.04</td>
<td>59.43</td>
<td>59.43</td>
<td>41.46</td>
<td>34.06</td>
<td>40.00</td>
<td>47.00</td>
<td>57.00</td>
<td>57.00</td>
<td>-4.06%</td>
</tr>
<tr>
<td>Blue Cross (HMO/POS)</td>
<td>60.04</td>
<td>61.00</td>
<td>71.16</td>
<td>71.16</td>
<td>71.00</td>
<td>63.02</td>
<td>60.16</td>
<td>64.56</td>
<td>60.00</td>
<td>61.27</td>
<td>66.00</td>
<td>72.00</td>
<td>62.00</td>
<td>62.00</td>
<td>1.96%</td>
</tr>
<tr>
<td>Blue Shield of California (HMO/POS)</td>
<td>58.60</td>
<td>65.00</td>
<td>63.55</td>
<td>64.73</td>
<td>64.79</td>
<td>66.33</td>
<td>60.50</td>
<td>60.50</td>
<td>65.20</td>
<td>61.70</td>
<td>58.00</td>
<td>53.00</td>
<td>50.00</td>
<td>53.00</td>
<td>3.00%</td>
</tr>
<tr>
<td>Cigna Health Care (HMO/POS)</td>
<td>64.23</td>
<td>64.00</td>
<td>62.11</td>
<td>62.11</td>
<td>68.04</td>
<td>68.04</td>
<td>52.22</td>
<td>57.80</td>
<td>59.80</td>
<td>46.23</td>
<td>48.00</td>
<td>51.00</td>
<td>55.00</td>
<td>65.00</td>
<td>0.77%</td>
</tr>
<tr>
<td>Health Net of California, Inc. (HMO/POS)</td>
<td>62.23</td>
<td>62.00</td>
<td>63.11</td>
<td>68.56</td>
<td>65.82</td>
<td>67.93</td>
<td>65.03</td>
<td>65.03</td>
<td>65.96</td>
<td>61.17</td>
<td>61.00</td>
<td>65.00</td>
<td>64.00</td>
<td>68.00</td>
<td>5.77%</td>
</tr>
<tr>
<td>Kaiser Permanente-North</td>
<td>73.31</td>
<td>74.00</td>
<td>80.37</td>
<td>80.37</td>
<td>83.70</td>
<td>87.08</td>
<td>85.71</td>
<td>90.41</td>
<td>87.44</td>
<td>88.13</td>
<td>87.00</td>
<td>84.00</td>
<td>82.00</td>
<td>80.00</td>
<td>2.00%</td>
</tr>
<tr>
<td>Kaiser Permanente-South</td>
<td>73.97</td>
<td>76.00</td>
<td>79.08</td>
<td>84.23</td>
<td>83.70</td>
<td>85.64</td>
<td>85.64</td>
<td>85.64</td>
<td>85.64</td>
<td>83.70</td>
<td>84.00</td>
<td>80.00</td>
<td>79.00</td>
<td>79.00</td>
<td>5.03%</td>
</tr>
<tr>
<td>Sharp Health Plan (HMO)</td>
<td>69.54</td>
<td>67.78</td>
<td>67.78</td>
<td>72.98</td>
<td>72.56</td>
<td>76.00</td>
<td>78.00</td>
<td>68.00</td>
<td>68.00</td>
<td>64.00</td>
<td>68.00</td>
<td>68.00</td>
<td>82.00</td>
<td>82.00</td>
<td>12.46%</td>
</tr>
<tr>
<td>United Healthcare (HMO)</td>
<td>53.81</td>
<td>63.00</td>
<td>66.75</td>
<td>66.75</td>
<td>68.83</td>
<td>66.83</td>
<td>64.10</td>
<td>64.10</td>
<td>65.63</td>
<td>55.80</td>
<td>55.00</td>
<td>64.00</td>
<td>68.00</td>
<td>68.00</td>
<td>14.19%</td>
</tr>
<tr>
<td>Western Health Advantage (HMO)</td>
<td>60.83</td>
<td>60.00</td>
<td>63.99</td>
<td>64.48</td>
<td>68.61</td>
<td>68.61</td>
<td>70.80</td>
<td>70.80</td>
<td>68.13</td>
<td>70.56</td>
<td>68.00</td>
<td>71.00</td>
<td>71.00</td>
<td>70.00</td>
<td>9.17%</td>
</tr>
<tr>
<td>National 90th Percentile</td>
<td>71.61</td>
<td>72.68</td>
<td>74.09</td>
<td>76.16</td>
<td>74.94</td>
<td>74.65</td>
<td>76.64</td>
<td>76.16</td>
<td>75.00</td>
<td>75.00</td>
<td>75.00</td>
<td>74.00</td>
<td>74.00</td>
<td>2.39%**</td>
<td></td>
</tr>
<tr>
<td>California Average</td>
<td>63.64</td>
<td>69.44</td>
<td>70.30</td>
<td>70.81</td>
<td>68.93</td>
<td>68.16</td>
<td>67.22</td>
<td>63.35</td>
<td>64.30</td>
<td>66.70</td>
<td>68.20</td>
<td>69.20</td>
<td>68.20</td>
<td>5.56%</td>
<td></td>
</tr>
<tr>
<td>National Average</td>
<td>63.37</td>
<td>64.09</td>
<td>63.43</td>
<td>65.30</td>
<td>63.04</td>
<td>63.30</td>
<td>63.98</td>
<td>60.51</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Data collected is from National Committee for Quality Assurance (NCQA)  ** Data collected is from Office of the Patient Advocate (OPA)  Δ Since 2011 for Sharp Health Plan  **Δ Since 2008 for National 90th Percentile
Controlling Blood Pressure (<140/90mmHg) for People with Diabetes Among California Health Plans

- **Aetna Health of California (HMO/POS)**
  - 2011: 61.76%
  - 2012: 61.76%
  - 2013: 57.92%
  - 2014: 57.92%
  - 2015: 45.74%
  - 2016: 52.00%
  - 2017: 54.00%
  - 2018: 62.00%
  - 2019: 68.00%
  - Change Since 2011: 6.24%

- **Blue Cross (HMO/POS)**
  - 2011: 72.33%
  - 2012: 72.33%
  - 2013: 73.48%
  - 2014: 73.48%
  - 2015: 67.64%
  - 2016: 72.00%
  - 2017: 65.00%
  - 2018: 66.00%
  - 2019: 66.00%
  - Change Since 2011: 3.33%

- **Blue Shield of California (HMO/POS)**
  - 2011: 64.97%
  - 2012: 68.73%
  - 2013: 56.20%
  - 2014: 71.09%
  - 2015: 66.61%
  - 2016: 67.00%
  - 2017: 64.00%
  - 2018: 64.00%
  - 2019: 64.00%
  - Change Since 2011: 1.03%

- **Cigna Health Care (HMO/POS)**
  - 2011: 63.96%
  - 2012: 67.64%
  - 2013: 66.67%
  - 2014: 67.40%
  - 2015: 58.97%
  - 2016: 52.00%
  - 2017: 64.00%
  - 2018: 64.00%
  - 2019: 65.00%
  - Change Since 2011: 1.04%

- **Health Net of California, Inc. (HMO/POS)**
  - 2011: 67.41%
  - 2012: 67.41%
  - 2013: 62.77%
  - 2014: 63.75%
  - 2015: 64.48%
  - 2016: 69.00%
  - 2017: 69.00%
  - 2018: 69.00%
  - 2019: 69.00%
  - Change Since 2011: 1.59%

- **Kaiser Permanente-North**
  - 2011: 80.47%
  - 2012: 82.85%
  - 2013: 82.18%
  - 2014: 83.76%
  - 2015: 82.55%
  - 2016: 82.00%
  - 2017: 81.00%
  - 2018: 80.00%
  - 2019: 80.00%
  - Change Since 2011: -0.47%

- **Kaiser Permanente-South**
  - 2011: 83.72%
  - 2012: 84.60%
  - 2013: 85.07%
  - 2014: 84.50%
  - 2015: 82.96%
  - 2016: 83.00%
  - 2017: 82.00%
  - 2018: 82.00%
  - 2019: 81.00%
  - Change Since 2011: -2.72%

- **Sharp Health Plan (HMO)**
  - 2011: 68.86%
  - 2012: 68.86%
  - 2013: 76.21%
  - 2014: 76.21%
  - 2015: 76.17%
  - 2016: 80.00%
  - 2017: 81.00%
  - 2018: 83.00%
  - 2019: 83.00%
  - Change Since 2011: 14.14%

- **United Healthcare (HMO)**
  - 2011: 70.22%
  - 2012: 70.22%
  - 2013: 64.68%
  - 2014: 66.11%
  - 2015: 63.51%
  - 2016: 67.00%
  - 2017: 70.00%
  - 2018: 70.00%
  - 2019: 69.00%
  - Change Since 2011: -1.22%

- **Western Health Advantage (HMO)**
  - 2011: 75.36%
  - 2012: 75.36%
  - 2013: 73.97%
  - 2014: 73.97%
  - 2015: 70.07%
  - 2016: 70.00%
  - 2017: 74.00%
  - 2018: 69.00%
  - 2019: 77.00%
  - Change Since 2011: 1.64%

- **National 90th Percentile**
  - 2011: 79.68%
  - 2012: 79.60%
  - 2013: 78.68%
  - 2014: 79.02%
  - 2015: 78.83%
  - 2016: 76.00%
  - 2017: 76.00%
  - 2018: 77.00%
  - 2019: 77.00%
  - Change Since 2011: -2.68%

- **California Average**
  - 2011: 67.16%
  - 2012: 72.86%
  - 2013: 63.62%
  - 2014: 72.01%
  - 2015: 67.62%
  - 2016: 69.40%
  - 2017: 70.40%
  - 2018: 71.40%
  - 2019: 72.70%
  - Change Since 2011: 5.54%

- **National Average**

*Data collected is from National Committee for Quality Assurance (NCQA) * Data collected is from Office of the Patient Advocate (OPA)
### Key Quality Indicators for Cardiovascular Prevention Among California Health Plans

#### 2012-2019

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Aetna Health of California (HMO/POS)</td>
<td>52.13%</td>
<td>49.65%</td>
<td>48.18%</td>
<td>41.85%</td>
<td>46.00%</td>
<td>54.00%</td>
<td>58.00%</td>
<td>62.00%</td>
<td>9.87%</td>
</tr>
<tr>
<td>Blue Cross (HMO/POS)</td>
<td>62.33%</td>
<td>63.50%</td>
<td>63.50%</td>
<td>64.92%</td>
<td>59.00%</td>
<td>64.00%</td>
<td>61.00%</td>
<td>61.00%</td>
<td>-0.45%</td>
</tr>
<tr>
<td>Blue Shield of California (HMO/POS)</td>
<td>61.45%</td>
<td>63.14%</td>
<td>61.56%</td>
<td>64.92%</td>
<td>59.00%</td>
<td>64.00%</td>
<td>57.00%</td>
<td>62.00%</td>
<td>-1.26%</td>
</tr>
<tr>
<td>Cigna Health Care (HMO/POS)</td>
<td>63.26%</td>
<td>55.72%</td>
<td>55.72%</td>
<td>60.20%</td>
<td>54.00%</td>
<td>64.00%</td>
<td>67.00%</td>
<td>66.00%</td>
<td>3.56%</td>
</tr>
<tr>
<td>Health Net of California, Inc. (HMO/POS)</td>
<td>62.44%</td>
<td>60.83%</td>
<td>59.37%</td>
<td>64.96%</td>
<td>62.00%</td>
<td>64.00%</td>
<td>66.00%</td>
<td>66.00%</td>
<td>3.56%</td>
</tr>
<tr>
<td>Kaiser Permanente-North</td>
<td>63.14%</td>
<td>69.89%</td>
<td>69.89%</td>
<td>69.89%</td>
<td>69.00%</td>
<td>68.00%</td>
<td>67.00%</td>
<td>66.00%</td>
<td>2.86%</td>
</tr>
<tr>
<td>Kaiser Permanente-South</td>
<td>66.59%</td>
<td>66.69%</td>
<td>61.64%</td>
<td>63.35%</td>
<td>62.00%</td>
<td>67.00%</td>
<td>69.00%</td>
<td>69.00%</td>
<td>-2.59%</td>
</tr>
<tr>
<td>Sharp Health Plan (HMO)</td>
<td>73.48%</td>
<td>66.75%</td>
<td>66.75%</td>
<td>72.73%</td>
<td>69.00%</td>
<td>67.00%</td>
<td>64.00%</td>
<td>69.00%</td>
<td>4.56%</td>
</tr>
<tr>
<td>United Healthcare (HMO)</td>
<td>64.44%</td>
<td>59.67%</td>
<td>63.74%</td>
<td>62.56%</td>
<td>62.00%</td>
<td>67.00%</td>
<td>64.00%</td>
<td>69.00%</td>
<td>-4.48%</td>
</tr>
<tr>
<td>Western Health Advantage (HMO)</td>
<td>68.07%</td>
<td>65.21%</td>
<td>65.21%</td>
<td>64.72%</td>
<td>63.00%</td>
<td>64.00%</td>
<td>66.00%</td>
<td>65.00%</td>
<td>-3.07%</td>
</tr>
<tr>
<td>National 90th Percentile</td>
<td>71.43%</td>
<td>69.33%</td>
<td>68.98%</td>
<td>67.22%</td>
<td>65.00%</td>
<td>66.00%</td>
<td>66.00%</td>
<td>66.00%</td>
<td>-5.43%</td>
</tr>
<tr>
<td>California Average</td>
<td>64.69%</td>
<td>59.56%</td>
<td>63.03%</td>
<td>62.75%</td>
<td>60.60%</td>
<td>64.30%</td>
<td>63.90%</td>
<td>65.00%</td>
<td>0.31%</td>
</tr>
<tr>
<td>National Average</td>
<td>61.32%</td>
<td>58.90%</td>
<td>57.47%</td>
<td>55.34%</td>
<td>55.34%</td>
<td>55.34%</td>
<td>55.34%</td>
<td>55.34%</td>
<td>55.34%</td>
</tr>
</tbody>
</table>

* Data collected is from National Committee for Quality Assurance (NCQA) *Data collected is from Office of the Patient Advocate (OPA)
Right Care Initiative: Key Quality Indicators for Cardiovascular Prevention Among California Health Plans

Trend analysis provided by the UC Berkeley School of Public Health Right Care Research Team, November 2019

Controlling LDL-Cholesterol<100 & Prescribing Statins for People with Heart Disease Among California Health Plans

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>61.16%</td>
<td>65.74%</td>
<td>62.58%</td>
<td>64.48%</td>
<td>62.84%</td>
<td>66.04%</td>
<td>62.53%</td>
<td>59.62%</td>
<td>56.84%</td>
<td>59.87%</td>
<td>69.04%</td>
</tr>
<tr>
<td>2007</td>
<td>64.00%</td>
<td>69.00%</td>
<td>66.00%</td>
<td>57.00%</td>
<td>65.00%</td>
<td>71.00%</td>
<td>70.00%</td>
<td>65.23%</td>
<td>63.00%</td>
<td>60.00%</td>
<td>69.63%</td>
</tr>
<tr>
<td>2008</td>
<td>60.53%</td>
<td>69.00%</td>
<td>62.16%</td>
<td>60.55%</td>
<td>70.98%</td>
<td>72.84%</td>
<td>69.13%</td>
<td>67.30%</td>
<td>66.01%</td>
<td>60.44%</td>
<td>71.97%</td>
</tr>
<tr>
<td>2009</td>
<td>56.27%</td>
<td>70.56%</td>
<td>59.58%</td>
<td>60.51%</td>
<td>69.87%</td>
<td>74.97%</td>
<td>69.13%</td>
<td>67.30%</td>
<td>66.01%</td>
<td>60.44%</td>
<td>73.06%</td>
</tr>
<tr>
<td>2010</td>
<td>58.62%</td>
<td>70.56%</td>
<td>59.56%</td>
<td>60.51%</td>
<td>69.87%</td>
<td>74.97%</td>
<td>74.41%</td>
<td>74.41%</td>
<td>66.01%</td>
<td>60.44%</td>
<td>73.06%</td>
</tr>
<tr>
<td>2011</td>
<td>47.30%</td>
<td>64.66%</td>
<td>59.62%</td>
<td>62.28%</td>
<td>64.70%</td>
<td>75.74%</td>
<td>78.94%</td>
<td>78.94%</td>
<td>66.01%</td>
<td>60.44%</td>
<td>69.59%</td>
</tr>
<tr>
<td>2012</td>
<td>62.26%</td>
<td>64.66%</td>
<td>59.95%</td>
<td>62.28%</td>
<td>64.70%</td>
<td>78.04%</td>
<td>76.72%</td>
<td>78.04%</td>
<td>66.01%</td>
<td>60.44%</td>
<td>N/A</td>
</tr>
<tr>
<td>2013</td>
<td>58.00%</td>
<td>69.47%</td>
<td>60.05%</td>
<td>62.28%</td>
<td>64.70%</td>
<td>79.42%</td>
<td>81.00%</td>
<td>79.42%</td>
<td>66.01%</td>
<td>60.44%</td>
<td>N/A</td>
</tr>
<tr>
<td>2014-2016</td>
<td></td>
<td>77.00%</td>
<td>80.00%</td>
<td>80.00%</td>
<td>81.00%</td>
<td>88.00%</td>
<td>85.00%</td>
<td>88.00%</td>
<td>84.00%</td>
<td>81.00%</td>
<td>N/A</td>
</tr>
<tr>
<td>2017</td>
<td>79.00%</td>
<td>77.00%</td>
<td>80.00%</td>
<td>80.00%</td>
<td>81.00%</td>
<td>88.00%</td>
<td>85.00%</td>
<td>88.00%</td>
<td>84.00%</td>
<td>81.00%</td>
<td>N/A</td>
</tr>
<tr>
<td>2018</td>
<td>80.00%</td>
<td>77.00%</td>
<td>82.00%</td>
<td>82.00%</td>
<td>81.00%</td>
<td>88.00%</td>
<td>85.00%</td>
<td>88.00%</td>
<td>84.00%</td>
<td>81.00%</td>
<td>N/A</td>
</tr>
<tr>
<td>2019</td>
<td>80.00%</td>
<td>78.00%</td>
<td>83.00%</td>
<td>83.00%</td>
<td>82.00%</td>
<td>88.00%</td>
<td>85.00%</td>
<td>88.00%</td>
<td>84.00%</td>
<td>82.00%</td>
<td>N/A</td>
</tr>
</tbody>
</table>

* Data directly from National Committee for Quality Assurance (NCQA)

*Data from NCQA, prepared by the CA Office of the Patient Advocate (OPA)
The Right Care Initiative (RCI) is dedicated to improving cardiovascular and diabetes outcomes by catalyzing uptake of patient-centered, evidence-based practices using performance data to drive improvement among health systems, medical groups, clinics, and health plans. Based at UC Berkeley School of Public Health, this public-private partnership was launched in 2008 by the UC Berkeley and UCLA Schools of Public Health with encouragement from the CA Department of Managed Health Care. RCI includes health system leaders, patient groups, the University of California (multiple campuses), USC, Stanford, Health Services Advisory Group (CMS QIO), CA Chronic Care Coalition, and RAND. We collaborate intensively with local leaders in 4 major metro areas: San Diego, Sacramento, Los Angeles and Silicon Valley. Right Care’s first University of Best Practices (UBP) launched in San Diego in February of 2011; the 2nd in Sacramento 2012. UBP gathers health leaders for top performers to teach proven strategies, practices, and breakthrough ideas to prevent heart attacks, strokes, and diabetic complications.

University of Best Practices: Right Care’s Translational Model to Implement Evidence-Based Innovations
• Monthly 2-hour convenings are held with leaders from the major regional health care delivery systems in each region.
• Leaders from successful organizations or experts present for 1 hour.
• A break-out session or discussion involving all participants follows in the second hour to consider how to apply the speaker’s ideas in the local setting and to problem-solve how to overcome barriers to better uptake of evidence-based protocols and practices.
• Trusted performance data are the bedrock of the UBP model.

Key Statistics
• Mortality rates in Sacramento County for diabetes, coronary heart disease, and stroke are higher compared to the state. Figure 1.
• Sacramento has higher hospitalization rates for acute myocardial infarction (MI) and stroke compared with California overall (OSHPD).
• Sacramento County has the 2nd worst rate of MIs in CA.
• There are large disparities by race for cardiovascular hospitalizations and risk factors. Figs. 5, 6 and 8.
• Many counties are leading Sacramento on lowering risks. Table 1.
Figure 7: Sacramento Myocardial Infarction Hospitalization Rates by Race, 2014
Source: California Office of Statewide Health Planning and Development's Patient Hospitalization Discharge Data

Figure 8: Sacramento Stroke (without TIA) Hospitalization Rates by Race, 2014
Source: California Office of Statewide Health Planning and Development's Patient Hospitalization Discharge Data

Figure 5: 2014 Age-adjusted MI Hospitalization rate in Sacramento stratified by race
Source: California Office of Statewide Health Planning and Development’s Patient Hospitalization Discharge Data

Figure 6: 2014 Age-adjusted Stroke Hospitalization rate in Sacramento stratified by race
Source: California Office of Statewide Health Planning and Development’s Patient Hospitalization Discharge Data


Figure 7: Self-reported Cardiovascular Risk Factors from 2014-2017 California Health Interview Survey
Source: Self-reported, publicly available telephone survey data, California Health Interview Survey (CHIS) UCLA Center for Health

Figure 8: Self-reported Cardiovascular Risk Factors by race from 2014-2017 California Health Interview Survey
Source: Self-reported, publicly available telephone survey data, California Health Interview Survey (CHIS) UCLA Center for Health

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>California</th>
<th>Sacramento</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>28.7</td>
<td>31.7</td>
</tr>
<tr>
<td>Obesity (BMI&gt;30)</td>
<td>27.3</td>
<td>28.3</td>
</tr>
<tr>
<td>Smoking</td>
<td>11.7</td>
<td>14.3</td>
</tr>
<tr>
<td>Diabetes</td>
<td>9.6</td>
<td>10.4</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>6.4</td>
<td>7.8</td>
</tr>
<tr>
<td>Heart Failure</td>
<td>2.5</td>
<td>1.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>African American only, non-Hispanic</th>
<th>Asian only</th>
<th>White, non-Hispanic</th>
<th>Hispanic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>38.9</td>
<td>34.3</td>
<td>30.2</td>
<td>25.3</td>
</tr>
<tr>
<td>Obesity (BMI&gt;30)</td>
<td>38.1</td>
<td>13.8</td>
<td>26.6</td>
<td>35.7</td>
</tr>
<tr>
<td>Smoking</td>
<td>17.3</td>
<td>11.8</td>
<td>10.7</td>
<td>11.6</td>
</tr>
<tr>
<td>Diabetes</td>
<td>12.6</td>
<td>8.8</td>
<td>9.1</td>
<td>11.6</td>
</tr>
</tbody>
</table>

Page 28 of 40
### Table 1: Age-Adjusted Prevalence of Self-Reported Cardiometabolic and Other Risk Factors for Adults in California Counties (Percent (rank)) 2014-2017

<table>
<thead>
<tr>
<th>County</th>
<th>Diabetes (% (rank))</th>
<th>Obesity (% (rank))</th>
<th>Hypertension (% (rank))</th>
<th>Heart Disease (% (rank))</th>
<th>Smoking Status (% (rank))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles</td>
<td>10.3 (36)</td>
<td>28.3 (27)</td>
<td>28.7 (20)</td>
<td>5.8 (10)</td>
<td>11.0 (15)</td>
</tr>
<tr>
<td>Sacramento</td>
<td>10.4 (41)</td>
<td>29.9 (32)</td>
<td>31.7 (28)</td>
<td>7.8 (27)</td>
<td>14.3 (25)</td>
</tr>
<tr>
<td>San Diego</td>
<td>8.5 (23)</td>
<td>24 (13)</td>
<td>27.1 (9)</td>
<td>6.2 (16)</td>
<td>10.8 (12)</td>
</tr>
<tr>
<td>Santa Clara</td>
<td>8.8 (27)</td>
<td>19.4 (4)</td>
<td>28.3 (15)</td>
<td>5.1 (4)</td>
<td>8.1 (3)</td>
</tr>
</tbody>
</table>

Table 1: Data are age adjusted from pooled CHIS 2014-2017. Ranks are from 1-44 with 1 having the lowest prevalence, and 44 having the highest; small counties were pooled to create stable estimates. All estimates reported are stable. Source: Dingbaum, Darsie, Ivey et al., CA Department of Public Health Analysis, 2017 (CHIS 2014-2017 Adult Public Use File).

### Table 2: Comparing Counties – Coronary Heart Disease
Three Year Averaged, Age-adjusted Mortality Rates (2014-2016)

<table>
<thead>
<tr>
<th>County</th>
<th>Age-adjusted Death Rate</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Santa Clara</td>
<td>58.2*</td>
<td>54.9</td>
</tr>
<tr>
<td>San Diego</td>
<td>81.2*</td>
<td>78.2</td>
</tr>
<tr>
<td>State Rate</td>
<td>89.1</td>
<td>88.2</td>
</tr>
<tr>
<td>Sacramento</td>
<td>103.9*</td>
<td>98.1</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>103.9*</td>
<td>102.0</td>
</tr>
</tbody>
</table>

*Statistically significant relative to the state mean

Table 2: Age-adjusted Mortality Rates for Coronary Heart Disease. Source: County Health Status Profiles 2018 Report, California Department of Public Health.

### Table 3: Comparing Counties – Stroke (without TIA)
Three Year Averaged, Age-adjusted Mortality Rates (2014-2016)

<table>
<thead>
<tr>
<th>County</th>
<th>Age-adjusted Death Rate</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Santa Clara</td>
<td>26.6*</td>
<td>24.3</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>33.2</td>
<td>32.1</td>
</tr>
<tr>
<td>San Diego</td>
<td>34.3</td>
<td>32.4</td>
</tr>
<tr>
<td>State Rate</td>
<td>34.7</td>
<td>34.2</td>
</tr>
<tr>
<td>Sacramento</td>
<td>41.7*</td>
<td>38.4</td>
</tr>
</tbody>
</table>

*Statistically significant relative to the state mean

Table 3: Age-adjusted Mortality Rates for Stroke. Source: County Health Status Profiles 2018 Report, California Department of Public Health.
Figure 9: Age-Adjusted Hospitalization Rate for Myocardial Infarction (2010-2014 Office of Statewide Health Planning and Development)

Figure 10: Age-Adjusted Hospitalization Rate for Stroke with TIA (2010-2014 Office of Statewide Health Planning and Development)

Figure 11: Age-Adjusted Hospitalization Rate for Stroke without TIA (2010-2014 Office of Statewide Health Planning and Development)
Sacramento County Mortality Hot Spots for Diabetes, Heart Disease, Hypertension, and Stroke (2007-2011)

Figure 12: Sacramento County Hot Spots for Diabetes, Heart Disease, Hypertension and Stroke Mortality Rates (2007-2011)

Source: California Department of Public Health, Map 3,4,5,6. Community Health Status Report 2014
Proposed Action Plan for Sacramento County

Sacramento County has:

- Higher rates of smoking than the state average
  - Encourage primary care physicians to ask about smoking as a vital sign during every visit.
  - Provide brief cessation counseling for smokers which also helps meet meaningful use.¹

- Higher rates of obesity than the state average
  - Encourage measurement of BMI regularly in primary care; ensure patients are aware of obesity-related health risks.²
  - Develop a plan with patients for addressing obesity; provide solid evidence to promote diet and physical activity changes.
  - Work to ensure all communities have access to safe, affordable options for healthy diets and physical activity in their neighborhoods.³

- Higher rates of hypertension than the state; high rates of uncontrolled hypertension, especially for African Americans
  - Improve community outreach about hypertension as a silent killer.
  - Improve medication adherence by utilizing health coaches to activate patients via motivational interviewing and evidence-based media messaging.
  - Provide information about best practices for treating hypertension to local primary care providers.
  - Ensure that physicians are made aware of the most recent medication protocols and guidelines for hypertension and guidelines are actively being upheld by all care team members.

- Disparities in self-reported hypertension, smoking, and obesity exist among different race/ethnicities in Sacramento County
  - Utilize health coaches for evidence-based patient education and motivational interviewing on nutrition and physical activity and for counseling on smoking cessation.
  - Use culturally aligned, linguistically appropriate health coaches to bridge the gaps.
  - Ask your patients about social determinants of health including whether medication costs are within budget.

Other Interventions may include:

- Clinical pharmacists on the care team to integrate comprehensive medication management to improve quality of health care.
- Community-based screenings, patient education, and referrals into care, such as in faith-based settings and barbershops to "meet patients where they are."
- Referring smokers to tobacco tax funded smoking cessation programs.
- Creating a public messaging campaign such as on bill-boards and on social media to encourage patients to adopt healthy lifestyles such as 30 minutes of walking a day, and moving to a plant-centric eating pattern.
- Adopting culturally appropriate messaging to enhance education for high risk populations.
- Deploy evidence-based, culturally appropriate video training materials for high risk patients and their families to be prescribed before an appointment of motivational interviewing. High risk patients & families need to learn the importance of home blood pressure monitoring, that time is of the essence when CVD symptoms strike, and to call 911 rather than self transport to ensure prompt treatment at a hospital with capacity to treat quickly.

Bibliography


Right Care Initiative Research Team – Last Revised: May 2019
Lifestyle Changes for Hypertension Control

<table>
<thead>
<tr>
<th>Modification</th>
<th>Recommendation</th>
<th>Approximate SBP Reduction (Range)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce Weight</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>Adopt DASH eating plan²</td>
<td>Consume a diet rich in fruits, vegetables, and low-fat dairy products with a reduced content of saturated and total fat</td>
<td>8–14 mm Hg</td>
</tr>
<tr>
<td>Lower sodium intake</td>
<td>a. Consume no more than 2,400 mg of sodium/day; b. Further reduction of sodium intake to 1,500 mg/day is desirable, since it is associated with even greater reduction in BP; and c. Reduce sodium intake by at least 1,000 mg/day since that will lower BP, even if the desired daily sodium intake is not achieved</td>
<td>2–8 mm Hg</td>
</tr>
<tr>
<td>Physical activity</td>
<td>Engage in regular aerobic physical activity such as brisk walking (at least 30 min per day, most days of the week)</td>
<td>4–9 mm Hg</td>
</tr>
<tr>
<td>Moderation of alcohol consumption</td>
<td>Limit consumption to no more than 2 drinks± (e.g., 24 oz beer, 10 oz wine, or 3 oz 80-proof whiskey) ** per day in most men, and to no more than 1 drink per day± (e.g., 12 oz beer, 4-5 oz wine, or 1.5 oz 80-proof whiskey) ** in women and lighter weight persons</td>
<td>2–4 mm Hg</td>
</tr>
<tr>
<td>Tobacco cessation</td>
<td>Use Motivational Interviewing (MI) techniques versus usual care for smoking cessation to demonstrate a significant increase in quitting. MI delivered by primary care physicians nearly 4 times more effective than usual care but delivery by counselors closer to 1.25 (still a significantly higher quit rate than usual care).</td>
<td>0–5 mm Hg</td>
</tr>
</tbody>
</table>

Components of the Dietary Approaches to Stop Hypertension Diet

<table>
<thead>
<tr>
<th>Dietary Component</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total fat</td>
<td>27% of calories</td>
</tr>
<tr>
<td>Saturated fat</td>
<td>6% of calories</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>150 mg</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>55% of calories</td>
</tr>
<tr>
<td>Fiber</td>
<td>30 g</td>
</tr>
<tr>
<td>Protein</td>
<td>18% of calories</td>
</tr>
<tr>
<td>Sodium</td>
<td>1,500 mg</td>
</tr>
<tr>
<td>Potassium</td>
<td>4,700 mg</td>
</tr>
<tr>
<td>Calcium</td>
<td>1,250 mg</td>
</tr>
<tr>
<td>Magnesium</td>
<td>500 mg</td>
</tr>
</tbody>
</table>

Heart disease and stroke still account for 26% of deaths among Santa Clara county residents, despite strong local progress in the past 15 years across the state and Santa Clara County, and remain the #1 and #5 killers nationally. Given Santa Clara County's substantially lower death rates than the rest of the state from Strokes and Heart Attacks, combined with a critical mass of resourceful innovators, Santa Clara County and the SF Bay Area region have the unique opportunity to show what is possible in pressing Towards Zero Preventable Heart Attacks, Strokes, and Diabetes Deaths & Disabilities. Focused, collaborative efforts to address clinical performance gaps among delivery systems and medical groups for the critical risk factors of control of cholesterol, blood pressure and blood sugar can reduce risk of death and disability from strokes, heart attacks and diabetes. In addition to managing these cardiovascular indicators among patients already engaged with the health care system, we must redouble our efforts to find and treat the vulnerable through proactive screening and outreach to help close the disparities in cardiovascular health that exist particularly for high risk racial and ethnic groups such as African Americans and those from India/South Asia.

Figure 1: Three-year average age-adjusted death rate due to coronary heart disease (1999-2016). Source: California Department of Public Health. County Health Status Profiles

Figure 2: Three-year average age-adjusted death rate due to stroke (1999-2016). Source: California Department of Public Health. County Health Status Profiles

Comparing Santa Clara County Deaths from Heart Disease and Stroke by Subgroup to the State and Nation

Figure 3: Age-Adjusted Death Rate in people over 35 from Heart Disease and Stroke per 100,000 people in Santa Clara County by subgroup, state and nation (2014-2016). Note: * Subgroup from Santa Clara County. Source: Centers for Disease Control and Prevention. National Center for Chronic Disease Prevention and Health Promotion, Interactive Atlas of Heart Disease and Stroke

Heart Attack Hospitalizations Among Persons Over 35

Figure 4: Age-adjusted heart attack hospitalization rate among persons 35 and over per 10,000 population, Santa Clara County compared to California (2000-2014). Source: Centers for Disease Control and Prevention. Environmental Public Health Tracking Network. Hospitalizations for Heart Attack.
Figure 5: Age-adjusted stroke hospitalization rate among Medicare beneficiaries 65 and over per 1,000 population, Santa Clara County compared to California and Nationally (2005-2015). Source: Centers for Disease Control and Prevention. National Center for Chronic Disease Prevention and Health Promotion, Interactive Atlas of Heart Disease and Stroke.

Life Expectancy at Birth by County Sub-Area

<table>
<thead>
<tr>
<th>Sub-Area</th>
<th>Life Expectancy at Birth (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNITED STATES</td>
<td>78.6</td>
</tr>
<tr>
<td>Midtown San Jose</td>
<td>79.5</td>
</tr>
<tr>
<td>CALIFORNIA</td>
<td>80.1</td>
</tr>
<tr>
<td>Downtown San Jose</td>
<td>80.7</td>
</tr>
<tr>
<td>Santa Clara</td>
<td>81.5</td>
</tr>
<tr>
<td>Campbell</td>
<td>81.9</td>
</tr>
<tr>
<td>North San Jose</td>
<td>82.5</td>
</tr>
<tr>
<td>Evergreen</td>
<td>82.7</td>
</tr>
<tr>
<td>Blossom Hill</td>
<td>82.8</td>
</tr>
<tr>
<td>Alum Rock</td>
<td>82.9</td>
</tr>
<tr>
<td>Sunnyvale</td>
<td>83.1</td>
</tr>
<tr>
<td>Eastern Foothills</td>
<td>83.4</td>
</tr>
<tr>
<td>Cupertino, Saratoga, &amp; Los Gatos</td>
<td>83.7</td>
</tr>
<tr>
<td>Almaden</td>
<td>84.1</td>
</tr>
<tr>
<td>Milpitas</td>
<td>84.8</td>
</tr>
<tr>
<td>Los Altos, Mt View, Palo Alto</td>
<td>86.7</td>
</tr>
</tbody>
</table>

Average Life Expectancy in Santa Clara County by Sex and Race/Ethnicity

<table>
<thead>
<tr>
<th>Sub-Area</th>
<th>Average Life Expectancy (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Santa Clara County (all races)</td>
<td>83.7</td>
</tr>
<tr>
<td>African American</td>
<td>81.9</td>
</tr>
<tr>
<td>Asian</td>
<td>80.7</td>
</tr>
<tr>
<td>Latino/Hispanic</td>
<td>87.9</td>
</tr>
<tr>
<td>White</td>
<td>86.6</td>
</tr>
</tbody>
</table>

Figure 6: Life Expectancy at Birth by County Sub-Area. Source: Santa Clara County Community Health Existing Conditions Report, 2013

Age-Adjusted Life Expectancy in Santa Clara County by Sex and Race/Ethnicity

Figure 7: Age-Adjusted Life Expectancy in Santa Clara County by Sex and Race/Ethnicity. Source: Santa Clara County 2010 Health Profile Report; 2010 Vital Statistics


<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>28.3</td>
</tr>
<tr>
<td>Obese (BMI&gt;30)</td>
<td>19.4</td>
</tr>
<tr>
<td>Smoking</td>
<td>8.1</td>
</tr>
<tr>
<td>Diabetes (type I and II)</td>
<td>8.8</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>5.1</td>
</tr>
</tbody>
</table>

Figure 8: Self-Reported Cardiovascular Risk Factors, 2014-2017
Source: Source: Self-reported, publicly available telephone survey data, California Health Interview Survey (CHIS) UCLA Center for Health Policy Research
References

2. Santa Clara County 2017 Asian and Pacific Islander Health Assessment.
7. Community Health Existing Conditions Report for the County of Santa Clara General Plan Health Element. Santa Clara County Public Health Department, 2013
9. UCLA Center for Health Policy Research. AskCHIS. Ever Diagnosed with High Blood Pressure, Obesity, Diabetes, Smoking and Heart Disease, compared by Race/Ethnicity (California, Santa Clara County). Available at http://www.chis.ucla.edu. Exported on January 20, 2019
10. California Office of Statewide Health Planning and Development "Trends in Cardiac Care in California 1988 to 2008"
Excess Risk for Early Heart Attacks & Cardiovascular Disease Among South Asians

Background:
The term South Asian denotes persons whose countries of origin include India, Pakistan, Nepal, Bangladesh, Sri Lanka, Bhutan, Maldives, and other countries in the South Asian region. This term also denotes persons from the South Asian diaspora, whose families have settled in other parts of the world, such as in Trinidad/Tobago, Guyana, Fiji, Tanzania, and Kenya, often generations ago. While native South Asians (who reside in the countries aforementioned) may share genetic and cultural risk factors with diasporic South Asians (individuals of South Asian descent residing outside of their native region) in the United States, diasporic South Asians can differ in socioeconomic status, education levels, healthcare behaviors, religious beliefs and attitudes, health insurance/access, and language proficiency, which can affect the risk, treatment, and outcomes for cardiovascular (CV) disease. South Asians have experienced significant population growth in the U.S., increasing 81% from 2000 to 2010 alone, and will make up part of the largest immigrant population in the United States by 2065. As a physician in the United States, it is likely that you will take care of South Asian patients, and it is important to understand the risk profile of these communities, and how the diverse range of ethnic, religious, and socioeconomic statuses of these groups intertwine with their CV health outcomes.

In the United States, South Asian Americans are four times more likely to develop cardiovascular conditions and diseases than the rest of the population. South Asians in America have an increased risk of cardiovascular disease (CVD) in comparison to non-Hispanic whites, are at high risk of coronary artery disease (CAD) and mortality compared to other ethnic groups, and exhibit higher rates of premature CAD. South Asians also experience a high prevalence of specific CVD risk factors, such as type 2 diabetes (T2DM), obesity, metabolic syndrome, hypertension, central distribution of weight/fat, and abnormal blood cholesterol and glucose levels. This risk profile can be attributed to upstream factors such as urbanization and globalization, and other interactions of genetic, environmental, and behavioral lifestyle factors.

Mediators of Atherosclerosis in South Asians Living in America (MASALA) Study:
The MASALA Study is the first longitudinal cohort study of South Asians in the U.S., seeking to understand unique factors leading to coronary artery disease (CAD) in South Asian Americans. Since 2010, South Asians have been recruited by investigators at UCSF and Northwestern University to further identify risk factors in this population and help guide future prevention efforts for heart disease in South Asians. The MASALA Study findings include high rates of diabetes, lipid disorders, and low physical activity among South Asians, and these data can be used to help prevent and treat cardiometabolic conditions among this U.S. population.

Figure 1: Ethnic differences in body composition [AD Shah et al., 2016]

Recently, the MASALA Study has found that South Asians in the study have higher levels of liver, visceral, and intermuscular fat and significantly less total lean abdominal and back muscle mass compared with four other racial/ethnic groups from the Multi-Ethnic Study of Atherosclerosis (MESA). This study also found significant differences in liver fat attenuation, which was significantly lower (and thus worse) in South Asians (Figure 1). These higher levels of ectopic adiposity are associated with insulin resistance, increased inflammatory markers, and decreased insulin sensitivity.
Leading causes of mortality in Asian Indians:

Research evaluating the leading causes of mortality in Asian Indians in California found cardiovascular diseases to be the leading cause of death for both males and females. Almost half of all deaths for Asian Indian males in this study were due to CVD disease. In this same study, the number of deaths due to diabetes, a major risk factor for heart disease, increased with age for both Asian Indian males and females. A 2014 study examined national mortality data comparing Asian sub-groups to non-Hispanic whites using U.S. death records from 2003–2010. NHW men and women had the highest overall age-adjusted mortality rates, but Asian Indian men and women had greater proportionate mortality burden from ischemic heart disease using proportional mortality ratios (PMR) for relative risk. Most recently, another study examined outcomes for mortality from ischemic heart disease (IHD) and cerebrovascular disease among the 6 largest Asian-American subgroups compared with non-Hispanic whites. The 2019 study demonstrated Asian Indians had more years of productive life lost (YPLL) to IHD than did non-Hispanic persons, and that disparity held for both men and women.

Risk factors for heart disease include:

Hypertension: One of the most common CVD risk factors among South Asian Americans is hypertension, with a prevalence of 43% in men and 35% in women in the MASALA cohort. Multiple studies show high prevalence of hypertension in South Asian Americans. UK studies demonstrated increased rates of hypertension in Gujarati Asian Indians living in UK compared to a non-migrant group from India.

Diabetes: One study found the prevalence of type 2 diabetes (T2DM) to be 24% among South Asians in India, with incidence continuing to rise. South Asians in the MASALA cohort had age-adjusted rates of T2DM of 23%, much higher than for other U.S. groups, and high levels of insulin resistance, a risk factor for T2DM. In general, South Asians are at higher risk of both T2DM and CVD compared with other populations. South Asians also develop T2DM and CVD at a significantly younger age, and tend to have more severe and extensive disease.

Tobacco use: Studies show that while the frequency of smoked tobacco among South Asians is relatively low, tobacco is traditionally a key modifiable risk factor for CVD. Men tend to have higher rates of smoking than women, although rates among women increase with acculturation to American culture. It is also important to note that cultural tobacco products such as hookahs, paan, beedis, and ghutka may be commonly used among South Asian Americans and can increase one’s risk of a heart attack. According to recent research, items such as hookahs and paan may not be overtly considered tobacco products within the South Asian community, and thus many people underestimate the associated health risks. Second-generation diasporic South Asians also report more frequent use of hookahs and alternative tobacco use methods compared with earlier generations, which can put them at greater risk of future CVD.

Low levels of physical activity: South Asians in America tend to have lower levels of physical activity than other groups. In general, diasporic South Asians exhibit a more sedentary lifestyle on immigration to Western countries. Insufficient physical activity is a significant risk factor for CVD, abnormal lipid and glucose profiles, and high blood pressure. Studies have shown that participating in 2.5 hours of exercise weekly reduces the risk of CVD, improves endothelial function, increases high density lipoprotein (HDL) levels, and decreases ambulatory blood pressure. Notably, low physical activity increases cardiovascular risk as much as high blood cholesterol, high blood pressure, or smoking cigarettes.

It is essential to recognize significant barriers to improving physical activity levels among South Asian communities, including certain cultural beliefs, practices, and accessibility issues. Individual participation in regular physical activity can sometimes be seen as being in opposition to South Asian cultural norms of putting family before self. There may also be lower physical activity levels among lower socioeconomic groups due to accessibility issues, including limited time, resources, and inadequate access to safe and walkable neighborhoods.

South Asian women may also participate in less leisure-time physical activity due to religious modesty, fear of going out alone, and even potential cultural stigma from the community. There is a need for culturally acceptable programs tailored for South Asian women. An example study demonstrated Bollywood dance was found to be as effective as other forms of moderate-vigorous physical activity, and that dance can significantly reduce BMI and total fat mass in South Asian women.

A reasonable walking goal is 10,000 steps a day. The CDC recommends about 150 minutes of moderate physical activity per week (30 minutes on 5 days of the week). There also needs to be more education and information on the preventive benefits of moderate physical activity for the South Asian community, as well as a need for neighborhood and community-level interventions.

Obesity: Obesity is a crucial precursor of T2DM and also a significant risk factor for CVD. With obesity on the rise, and prevalent in South Asians, it is essential to use Asian-specific BMI cutoffs given lower BMI cutoffs are associated with increased heart disease risk. BMI of >23 kg/m² is categorized as overweight, and >27.5 kg/m² as obese.
is categorized as obese. When these standards were applied to the MASALA cohort, 33% of South Asian Americans exceeded these lowered BMI cutoffs for obesity, putting them at higher risk for CVD. South Asians in several studies have been noted to be especially prone to developing central obesity, with fat primarily in the liver and around the abdominal visceral organs, which promotes insulin resistance and inflammation, and is metabolically much more harmful. This phenotype, 'metabolically obese-normal weight,' can be described as a higher propensity for liver and visceral fat deposition and is widely prevalent among South Asians.

Coronary artery calcium (CAC): Levels of CAC are a strong predictor of CAD and cardiovascular events. In the MASALA cohort, researchers found that CAC levels in South Asian men are similar to those of white men, and are overall higher compared to African Americans, Latinos, and Chinese Americans. This study also found that South Asian women tend to have similar CAC levels compared to other women, but those levels increase significantly in older age (>70). This high burden of subclinical coronary atherosclerosis, as indicated by higher CAC scores in South Asians starting at earlier ages (Figure 2), partly explains the higher rates of CVD in South Asians. A UK study demonstrated higher prevalence and severity of arterial calcification in Asian Indians compared to whites with angina, even with matching of age and risk factors for CVD.

Poor diet: South Asians who migrate to Western countries report increased consumption of fats and decreased consumption of fiber. Several studies have also noted alarmingly low fresh fruit and vegetable consumption among South Asian migrants. Emphasizing increased consumption of fresh fruits and vegetables and lowering sodium in the diet can help prevent dietary patterns that may increase hypertension in South Asians.

Stress: Anxiety and depression in South Asian men and stress in South Asian women were associated with thicker arterial walls (elevated carotid intima-media thickness), which is a marker for sub-clinical CVD.

Next Steps:

1. Educate physicians, healthcare providers, and health systems to proactively address the unique risks South Asian individuals have for heart disease, lipid disorders, and diabetes, through screening, education, and counseling of patients.
2. South Asian patients should have their blood pressure, cholesterol, and fasting glucose levels checked even if their BMI is normal (cardiometabolic risk begins at > 23 kg/m²). Consider ordering coronary CT scans to assess for CAC scores at younger ages.
3. Control cardiometabolic risk factors in those who have already developed them; poor control of risk factors results in greater cardiovascular mortality.
4. Incorporate race, ethnicity, and country of origin in electronic health record and research studies of lipids and on genetic markers for lipid abnormalities.
5. Continue adequately funding longitudinal studies and clinical trials among these high-risk groups who have often been harder to recruit into research studies.
6. Undertake culturally-tailored outreach in South Asian communities including creating culturally relevant educational materials in common South Asian languages, such as Hindi, Punjabi, Bangla, Urdu, Gujarati, Tamil, Telugu, etc. Develop interventions and evaluate them for effectiveness.
   A. Interventions can include incorporating more fresh fruits, vegetables, nuts, legumes, whole grains, and low-fat dairy products into the diet, and promotion of regular physical activity. In regards to diet, we need culturally appropriate ways to modify favorite foods, rather than eliminating beloved food items from the South Asian diet.

It is important to note that much of the research on CV risk factors in South Asian Americans focuses specifically on persons of Indian descent; those originating from other South Asian countries (Pakistan, Bangladesh, Sri Lanka, etc.) have been under-sampled in research on South Asian CV risks. There may be specific nuances in risk factors for each ethnic group not yet understood, and it is important to eventually generate more CV data for each of these subpopulations for a more representative picture of risk factors.
Acknowledgements:

The authors would like to thank Dr. Alka Kanaya, Professor-In-Residence, Department of Medicine, UCSF School of Medicine, for her careful review of the content of this brief; and Hattie Rees Hanley, MPP, Right Care Initiative Director, for her ongoing leadership to develop succinct project briefs with the goal of making complex information more readily available for taking action to improve patient outcomes.

References:


