SOUTH ASIAN HEART CENTER

Physician's Guide to the Coronary Artery Disease Pandemic in South Asians

DID YOU KNOW THAT 50% OF HEART ATTACKS IN SOUTH ASIANS OCCUR BEFORE THE AGE OF 55?

South Asian Heart Center
EL CAMINO HOSPITAL

Quick Reference for South Asian Patients

Seemingly healthy non-smoking, non-obese, mostly vegetarian South Asians originating from the Indian sub-continent countries of India, Pakistan, Bangladesh, Sri Lanka and Nepal, routinely show up at emergency rooms with acute myocardial infarction (MI). Traditional guidelines often underestimate the inherent risk of Coronary Artery Disease (CAD) in this vulnerable population. With the aim to reduce premature heart-attacks, the South Asian Heart Center recommends an early and comprehensive assessment and management approach in the primary prevention of CAD in your South Asian patients.

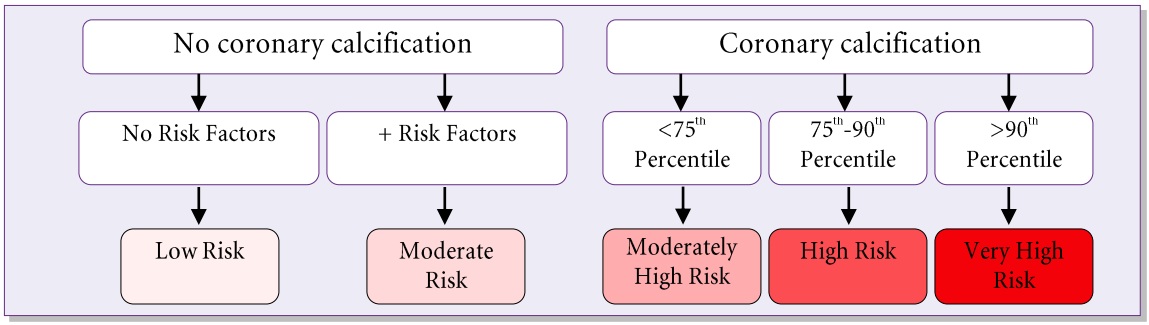
EDUCATE — Step 1: Educate patients on their increased risk for CAD.

South Asians are twice as likely to succumb to a heart-attack compared to people of other ethnicities. Impress upon the need to seek immediate help by calling 911 if they experience chest pain, feelings of indigestion, or any of the symptoms of a heart-attack. Note that women's heart-attack symptoms can be different from men's.

ASSESS — Step 2: Comprehensively assess risk at younger ages (18 years and above).

Traditional Factors	Behavioral/ Biometric Factors	Genetics/ Emerging Factors	Metabolic Factors	Inflammatory/ Thrombotic Factors	Presence of Arteriosclerosis
– HTN – DM – Lipids	– Exercise – Veg/fruits – Stress – Obesity (BMI, WC)	– Lp(a) – LDL IIIa+b – HDL2b	– Insulin – Glucose – Homocysteine	– CRP – Fibrinogen	– Calcium score

IDENTIFY — Step 3: Stratify risk based on severity of CAD and presence of risk factors.



MANAGE — Step 4: Aggressively manage risk factors through lifestyle and pharmacotherapy.

Educate patients on the benefits of Therapeutic Lifestyle Changes (TLC) and follow-up with them routinely to re-assess risk and efficacy of therapeutic management.

MEDICATIONS
- Start with TLC
- As indicated/tolerated

EXERCISE
- Daily aerobic activity
- Varied and vigorous

DIET
- Greens over grains
- Portion the plate

STRESS REDUCTION
- Daily meditation
- Adequate sleep

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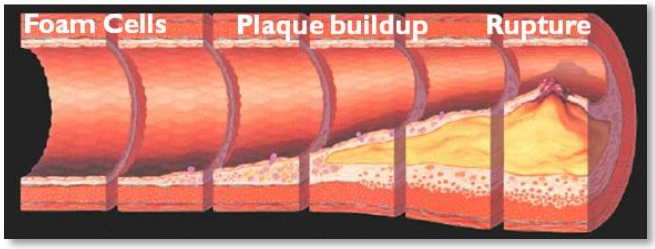
Coronary Artery Disease and South Asians

Coronary Artery Disease

CAD is a result of inflammatory processes within the coronary arterial wall leading to plaque deposition. It results from the interaction of many genes and the individual's behavior and environment.

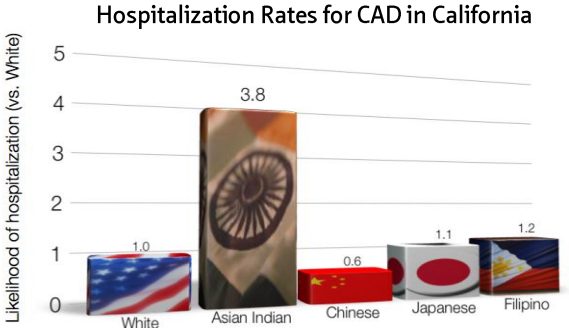


A heart-attack is the first manifestation of CAD in over 50% of individuals. It is usually a result of plaque rupture leading to the formation of an intra-luminal blood clot.

South Asians bear a disproportionate burden of CAD vs. other populations.

South Asia comprises of the Indian sub-continental countries of India, Pakistan, Bangladesh, Sri Lanka, and Nepal and covers a land mass of 2.4%. In particular, India comprises of only one-sixth of the world's population, yet carries three-fifths of the global burden of heart disease.

South Asia is in the middle of a CAD epidemic where seemingly healthy, non-smoking, non-obese, mostly vegetarian individuals are experiencing an unprecedented rate of MIs and mortality at significantly younger ages.



Traditional guidelines often under-estimate the risk of CAD and subsequent heart events such as heart-attacks. This highlights the unmet need for advanced comprehensive screening and aggressive management in the primary prevention of this rampant epidemic.

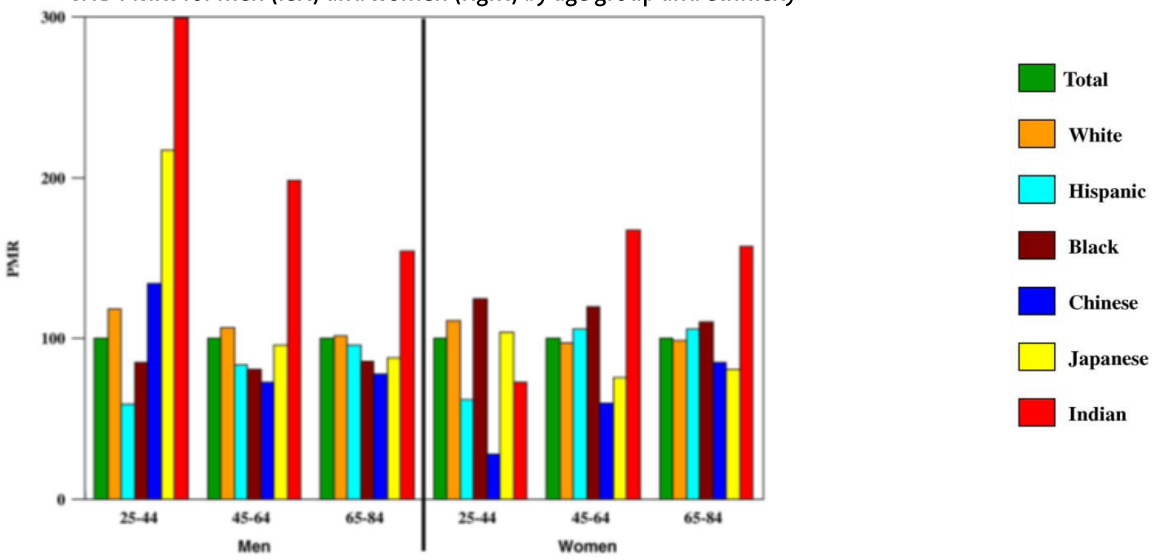
The South Asian CAD Pandemic

- CAD rates among urban and overseas Asian Indians are 50% to 400% higher than people of other ethnic origins irrespective of gender, religion, or social class.
- As compared to Chinese (2.4%), and Europeans (5.4%), 10.7% of South Asians are affected by CAD.
- In India, the average age at which MIs occur has decreased by 10-20 years. Among Asian Indian men, 50% of MIs occur before the age of 55.
- The six-month mortality after acute MI is two times higher in South Asians compared to Europeans, despite similar therapy.
- According to TIME Asia, a World Health Organization (WHO) study estimates that Indians (less than 17% of the world's population) will carry a disproportionate 60% of the global heart disease burden.

CHD IN SOUTH ASIAN WOMEN

Mortality rates due to Coronary Heart Disease (CHD) among South Asian women have increased over time. Standardized mortality ratios (SMRs) and Proportionate Mortality Rates (PMRs) for CHD are highest in Asian Indian men and women, reflective of the higher percentage of CHD deaths compared with all cause deaths in this group. Additionally, while all cause and CHD mortality are declining in all other ethnic groups, Asian Indian women show a 5% increase in CHD mortality.

CHD PMRs for men (left) and women (right) by age group and ethnicity



The 4 main risk factors which consistently show significant association with acute MI across all South Asian countries are: current and former smoking, high Apo B /Apo A-1 ratio, history of hypertension, and history of diabetes. Furthermore, the higher rates of CHD observed in South Asians is accentuated by the low daily consumption of fruits and vegetables and the lack of regular exercise compared to other populations.

	Risk Factors for Early Myocardial Infarction	Other populations	South Asians
Clinical	Elevated Apo B / Apo A-1 ratio	31.8%	43.8%
	Diabetes	7.2%	9.5%
	Hypertension	23.6%	12.7%
Lifestyle	Current and former smoking	49.4%	40.8%
	High Waist-to-Hip (WHR) ratio	34.0%	29.6%
	Moderate or high intensity exercise	21.6%	6.1%
	Daily intake of fruits and vegetables	45.2%	26.5%
	Alcohol ≥ per week	26.9%	10.7%
	Psychosocial stress	18.0%	14.0%

Why are South Asians at Higher Risk?

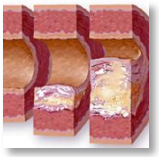
Conventional risk factors do not completely explain the increased risk for CAD in South Asians. It appears that at a given level of any single or combination of conventional risk factor(s), the CAD rate among South Asians is at least double that of non South Asians. Thus, the assessment of conventional risk factors alone is insufficient in identifying those individuals at increased risk.

The INTERHEART study demonstrates that traditional cardiovascular risk factors such as current and former tobacco use, cholesterol ratio, hypertension, and diabetes, play an important role in the prediction of MI in populations around the world. The study also establishes the early onset of traditional risk factors in South Asians, and highlights the factors that make South Asians more susceptible.

Numerous case-control studies documenting premature CAD in South Asians demonstrate similar or lower prevalence of traditional risk factors when compared with other populations. Recent evidence points to underlying emerging risk factors and genetic markers that are important for identifying the individual at risk for premature CAD.

	% of Subjects with Values Beyond Cut-Points	Other populations	South Asians	*p*
Traditional	Triglycerides > 200 mg/dl	29.7%	16.2%	0.0020
	LDL > 160 mg/dl	17.7%	15.0%	0.4600
	LDL > 130 mg/dl	42.6%	39.5%	0.5300
	HDL < 40 mg/dl, < 50 mg/dl	49.1%	36.9%	0.2700
Emerging	LDL IIIa+b > 20%	67.1%	61.8%	0.0200
	HDL 2b < 20%, <30%	75.7%	91.8%	0.0001
	Lp (a) > 20 mg/dl	25.5%	44.3%	0.0001
	Homocysteine > 14 mol/L	3.1%	7.7%	0.0500

Genetics and lifestyle play a significant role in increasing the risk in South Asians.



Early, excessive burden of conventional/metabolic risk factors in South Asians vs. others:
- Higher prevalence and risk of diabetes: 9.5% vs. 7%
- Elevated Apo B / Apo A-1 ratio: 44% vs. 32%
- Earlier onset of disease: lower median age of MI - 53 vs. 59 yrs

Shortage of protective behavioral risk factors in South Asians vs. others:
- Regular exercise routine: 6% vs. 21%
- Daily consumption of fruits and vegetables: 26% vs. 45%
- Consumption of alcohol more than once per week: 11% vs. 27%

Unrecognized (emerging/genetic) and under-utilized markers:
- Impaired reverse cholesterol transport: HDL2b subtype abnormalities
- Elevated Lp(a): the deadly cholesterol
- Potential role of inflammatory/thrombotic markers such as abnormal C-reactive protein (CRP) and fibrinogen
- Abnormalities of glucose/insulin metabolism, abdominal fat, elevated homocysteine
- Atherogenic Lipoprotein Profile (ALP): disorders of small dense LDL subtypes

Traditional Guidelines Underestimate Risks

NCEP ATP III guidelines miss 75% of MIs in young adults (before age 55).

- Standard lipid profile monitoring fails to identify those at risk for their first MI.
- Patients presenting with MIs have lipid panels that are normal as per ATP III guidelines; LDL is higher than normal in only 16% of the group.
- Physicians often underestimate CAD risk for various patient profiles, a 9-23% lower risk on average (compared to the calculated Framingham risk) according to the Swedish GP study.

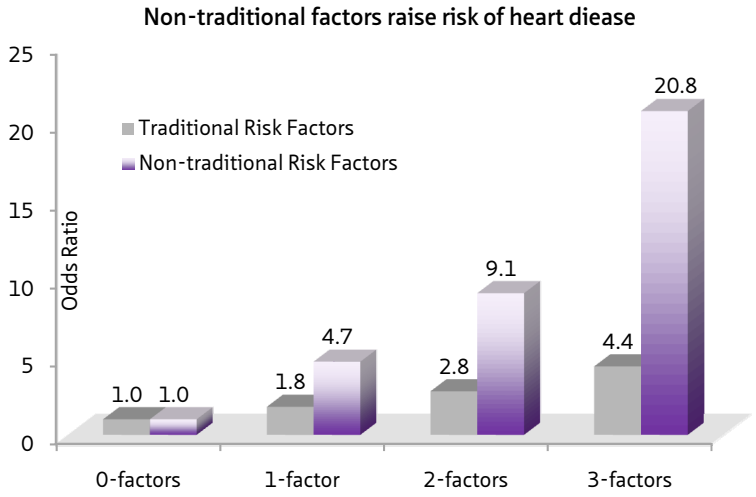
Key Findings

The most important aspect in the prevention of heart-attacks is to identify those at high risk of developing CAD at an early age.

Blood Cholesterol is NOT the best predictor of heart disease risk.

- Although high cholesterol is an important CAD risk factor, 80% of people who develop CAD have the same cholesterol values as those who do not develop CAD.
- Thus, while elevated blood cholesterol reflects increased CAD risk, normal cholesterol levels should not be interpreted to mean a lack of CAD risk.

Non-traditional abnormalities show increased risk over traditional factors.



According to the Québec Cardiovascular Study, combinations of multiple non-traditional abnormalities (hyperinsulinemia, elevated Apo B, small dense LDL particles) substantially increase the risk of ischemic heart disease over traditional factors alone (LDL, triglycerides, and HDL).

Evaluating South Asians for Cardiovascular Risk

With the large evidence of increased risk of CAD in South Asians, and since conventional approaches to testing and treatment have proven insufficient, it is recommended that all adult South Asians over the age of 18 be screened comprehensively and retested often for the following factors:

- Traditional metabolic and clinical factors such as lipids, hypertension, and diabetes.
- Behavioral factors including smoking status, sedentary lifestyles, lack of fruits and vegetables, alcohol consumption, psychosocial stress, and obesity.
- Genetic markers including Lp(a), LDL IIIa, b, LDL IVb, and HDL-2b subtypes.
- Metabolic disorders such as insulin resistance, glucose intolerance and homocysteine.
- Inflammatory markers such as CRP and thrombotic markers such as fibrinogen.
- Presence of silent arteriosclerosis with non-invasive calcium scoring CT heart scans.

Disorders of Lifestyle

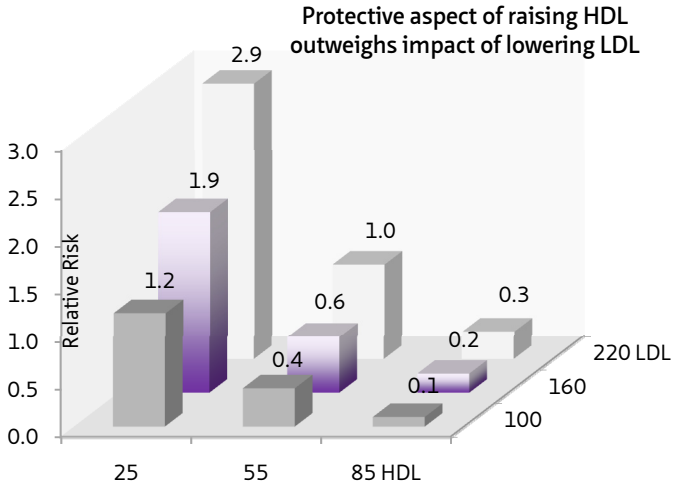
Disorders of lifestyle should be evaluated for risk of CAD.

Lifestyle disorders such as increased stress levels, smoking, irregular or sedentary daily routines, and grain- vs. green-based diets are all associated with increased risk and should be considered and evaluated. Individuals who incorporate four healthy habits (not smoking, eating ≥5 fruit/vegetable servings per day, maintaining recommended BMI, and exercising regularly) are likely to experience a 40% reduction in all-cause mortality risk and a 35% relative risk reduction of cardiovascular events over four years as compared to those who do not change their lifestyles.

Disorders of HDL
Reverse Cholesterol Transport

HDL abnormalities appear to be more prominent in South Asians.

The relative risk of CHD decreases rapidly with higher HDL vs. lower LDL. The prevalence of low HDL levels is 300% greater in men with premature CHD than those without. This is substantially higher than the 30% greater prevalence of high LDL levels in men with premature CHD. HDL2b is considered to be the active HDL particle in reverse cholesterol transport, and should be measured during lipid evaluation.

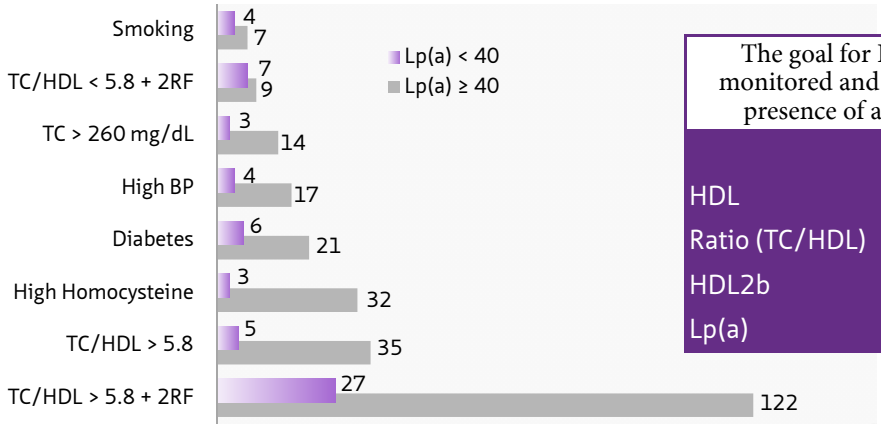


Disorders of Lp(a)
The Deadly Cholesterol

Lp(a) plays a crucial role in multiplying the risk for MI.

Lp(a) is a LDL lipoprotein with an attached protein chain. Approximately 30% of individuals with heart disease have elevated Lp(a) levels. The concentration of Lp(a) in plasma is genetically determined (chromosome 6). It is an independent risk factor for CAD and is one of the best predictors of heart-attacks in young men. The risk of premature CAD is 100 times more when there is high Lp(a) as well as high cholesterol ratio and two other risk factors.

Multiplicative risk of Lp(a) in the presence of other risk factors



The goal for HDL and cholesterol ratios should be monitored and aggressively managed, especially in the presence of arteriosclerosis and/or elevated Lp(a).

	Goal	At-risk
HDL	≥40 ♂ | ≥50 ♀	<40 ♂ | <50 ♀
Ratio (TC/HDL)	≤3.5	≥4.5
HDL2b	≥30%	<20%
Lp(a)	–	≥30

Glucose/insulin metabolism and related obesity disorders raise CHD risk.

ABNORMALITIES OF GLUCOSE AND INSULIN METABOLISM

In South Asians, the relative risk of CHD increases for BMI >23 and diabetes risk increases for BMI >22. Risk also significantly increases for weight gain after age 18 of five kg or more. Someone who is more than 30% overweight has 2.5 times the risk of dying of diabetes and 1.55 times the risk of dying of heart disease. INTERHEART provides robust evidence that among participants stratified on the basis of their BMI, those in the highest quintiles of waist-to-hip ratio (WHR) are at increased odds for MI. High fasting insulin, which is a surrogate marker for insulin resistance, predicts CHD. CHD risk is highest in men with elevations in both insulin and Apo B.

	Goal	Borderline	At-risk
BMI	≤23	23.1-26.9	≥27
Waist Circumference	<36 ♂ | <32 ♀	–	≥36 ♂ | ≥32 ♀
Pre-diabetic glucose levels	<100	–	100-124
Diabetic glucose levels	<100	–	≥125
Insulin	<10	10-24	≥25
Homocysteine	<10	10-13	≥14

The proportion of cholesterol in small, dense LDL particles predicts risk.

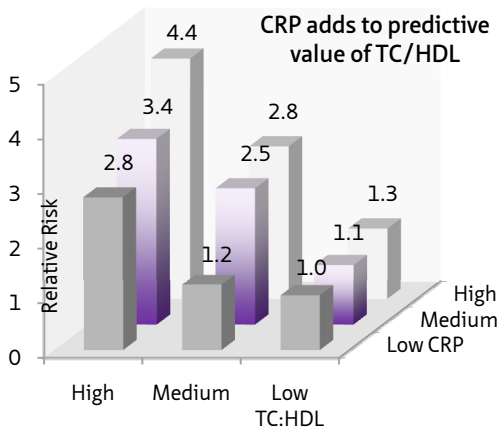
DISORDERS OF LDL
Artherogenic Lipoprotein Profile

Artherogenic Lipoprotien Profile (ALP) is the abundance of small dense LDL particles characterized by LDL IIIa+b >20%, IVb >10%. ALP increases cardiovascular disease risk 3-4 fold—independent of standard risk factors, and increases risk in Type II diabetic patients. Apo B concentration (particle number) is also significantly associated with risk. 50% of first degree relatives may express small dense subclasses (chromosome 19).

	Goal	Borderline	At-risk
LDL (w/ 0-1 risk factors)	<100	100-129	≥130
LDL (w/ 2+ risk factors)	<100	–	≥100
LDL (w/ CHD equivalent)	<70	–	≥70
Q-LDL IIIa+b	<32.1	–	≥32.1
Apo B	<60	–	≥120

CRP adds to predictive value of TC/HDL ratio in determining risk of first MI.

ELEVATED INFLAMMATORY MARKERS



The Physicians' Health Study shows the interaction between the CRP levels and TC/HDL ratio, indicating that using both these parameters appears to do a better job of predicting risk than using either one alone. The JUPITER trial demonstrates a 44% reduction in coronary events in men ≥50 years and women ≥60 with elevated CRP levels over 2 with the use of rosuvastatin over a period of 1.9 years.

Treatment Modalities

	Contributing Factors	Treatment Considerations
Low HDL	– Genetic predisposition – High triglycerides – High consumption of carbohydrates – Obesity – Sedentary lifestyle – Insulin resistance/diabetes mellitus – Smoking	– Low carbohydrate, cardio-protective diet – Regular aerobic exercise – Smoking cessation – Correct insulin resistance – Control diabetes mellitus – Nicotinic acid +/- statin – Thiazolidinediones – Omega-3 fish oil – Statins (minor effect)
Low HDL2b	– Genetic predisposition – High triglycerides – High consumption of carbohydrates and trans-fats – Obesity – Sedentary lifestyle – Insulin resistance/diabetes mellitus – Alcohol – Bile acid sequestrants – Estrogen therapy – Sleep apnea	– Low carbohydrate, cardio-protective diet – Regular aerobic exercise – Smoking cessation – Correct insulin resistance – Control diabetes mellitus – Nicotinic acid +/- statin
Elevated Triglycerides	– Genetic predisposition – High consumption of carbohydrates and trans- fats – Obesity – Sedentary lifestyle – Insulin resistance/diabetes mellitus – Pregnancy and lactation – Smoking	– Weight loss – Regular aerobic exercise – Avoid high glycemic foods – Low carbohydrate, cardio-protective diet – Limit alcohol consumption – Nicotinic acid +/- statin – Omega-3 fish oil – Thiazolidinediones – Statins (modest effect) – Treat levels >500 mg/dl to prevent pancreatitis
Elevated LDL/Apo B	– Genetic predisposition – High consumption of saturated fats – Obesity – Sedentary lifestyle – Trans fats	– Saturated fat restricted, cardio-protective diet – Weight loss – Regular exercise – Statins – Cholesterol absorption inhibitors (stanols and sterols) – Nicotinic acid – Bile acid sequestrants
Elevated small dense LDL particles	– Genetic predisposition – High consumption of simple carbohydrates – Obesity – Sedentary lifestyle – High triglycerides and low HDL – Insulin resistance/diabetes mellitus	– Low carbohydrate, cardio-protective diet – Weight loss – Regular exercise – Correct insulin resistance – Control diabetes mellitus – Nicotinic acid +/- statin – Statins (minor effect) – Thiazolidinediones – Omega-3 fish oil

Contributing Factors	Treatment Considerations	
– Genetic predisposition – Lp(a) levels can increase after a drop in estrogen – The size of the kringle chain may determine atherogenic potential	– Lifestyle has no predictable impact on Lp(a) – There is no specific guideline for treatment for elevated Lp(a) – If aspirin tolerant and responsive, consider aspirin therapy for primary prevention – In secondary prevention consider adding Nicotinic acid to Statin Rx	HIGH Lp(a)
– Any medical condition, lifestyle habit or drug that causes infection, inflammation, and/or tissue injury.	– Fat restricted, cardio-protective diet – Weight loss and regular exercise – Smoking cessation – Statins; nicotinic acid – If aspirin tolerant and responsive, consider aspirin therapy for primary prevention	ELEVATED CRP
– Genetic predisposition – Advancing age – Visceral adiposity; obesity – Sedentary lifestyle – High carbohydrate diet – Stress; sleep apnea	– Low carb, high fiber, cardio-protective diet – Weight loss and regular exercise – Recommended pharmacologic methods of meeting insulin requirements or regulating insulin sensitivity	ELEVATED INSULIN
– Genetic metabolic defects – Folic acid, B6 and B12 deficiency – Illness: renal insufficiency/failure, anemia, hypothyroidism, psoriasis – Excess alcohol, caffeine, nicotine – Diet low in greens, high in meats – Niacin therapy	– Diet high in green leafy vegetables – Identify and treat underlying abnormality such as renal insufficiency/pernicious anemia – Initiating treatment for this continues to be controversial in reducing CVD risk – When in combination with other risks, aggressively treat all other risk factors	ELEVATED HOMOCYSTEINE
– Genetic predisposition – Higher levels in South Asians, Blacks, Hispanics and females – High consumption of carbohydrates – Excess weight; sedentary lifestyle – Increasing age; tobacco use – Insulin resistance/diabetes mellitus – Stress; hypertension – Post-menopausal state – Acute/chronic inflammation	– Weight loss – Increase physical activity – Smoking cessation – Stress reduction – Nicotinic acid – Omega-3 fish oil – Anti-platelet therapy – HRT in post-menopausal women – Control hypertension – Control diabetes mellitus	ELEVATED FIBRINOGEN
– Abnormal observed calcium score	– Evaluate for ischemia – Determine functional capacity – Consider family screening – Move to secondary prevention – Aggressive lifestyle modifications – Consider combination pharmacotherapy – Aim for LDL ≤ 80; HDL > LDL – Follow 70–70–70 LDL–HDL–TRIG rule	PRESENCE OF ARTERIOSCLEROSIS

Therapeutic Lifestyle Changes

PHYSICAL ACTIVITY:
Exercise as Medicine

TLC involving diet, exercise and stress reduction have shown to improve longevity and reduce the risk for diabetes mellitus, cardiovascular disease, and cancer. These changes are the cornerstone of a complete prevention and treatment program. Educate patients and guide them to active lifestyles. Share with them the evidence on when, how much, and how to exercise.

Evidence behind the benefits of physical activity ...

Amount and regularity of exercise matters

- Amount, not intensity, is most important for weight loss and positive lipid effects.
- 35-40 mins/day of brisk walking is associated with a CAD risk reduction of >50%.
- Regular physical activity benefits both low and high-risk individuals.
- Being a weekend warrior (exercising 1-2 times/week) adds longevity for the low-risk, but not the high-risk individual.
- Individuals can achieve greater weight loss with short bouts of exercise.

Type of exercise programs

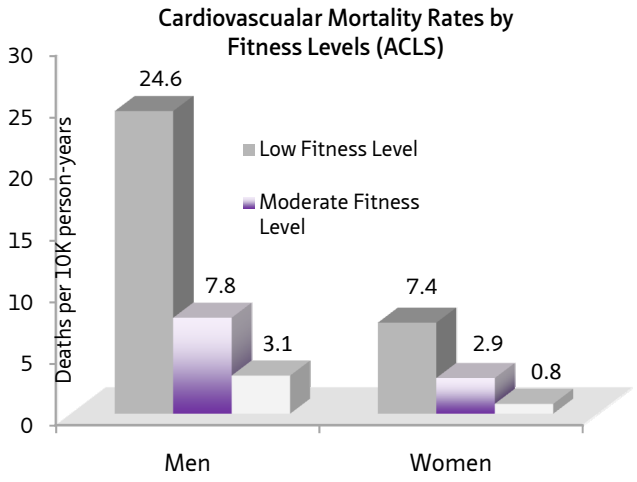
- Home-based exercise has greater adherence than gym-based programs (83.8% vs. 62.1%), weight loss at 12 months (12.1 kg vs. 8.1 kg), and weight maintenance at 15 months (11.7 kg vs. 7.0 kg).
- Aerobic and resistance exercise along with a weight reduction diet (compared to a calorie restricted diet alone), results in greater mobilization of abdominal fat, and improved functional capacity in obese men.

Exercise timing makes a difference

- Early morning exercise in the fasting state is more potent than an identical amount of exercise in the fed state and improves whole-body glucose tolerance.
- Exercise before a fat meal has a beneficial effect on the induced triglyceride and HDL response.

... versus the drawbacks of unfit and sedentary lifestyles

- Fitness is the most important predictor of longevity. For each minute improvement in the Bruce protocol treadmill test, longevity is enhanced by 8%.
- Sedentary lifestyles increase risk for CAD. Approximately 3.5 hours of television viewing per day is associated with an 88% elevation in CAD risk.



Therapeutic Lifestyle Changes

An essential part of heart disease prevention is integrating the evidence on the importance of nutrition on heart health. Educate patients on making sensible selections and substitutions and on choosing freshly prepared fresh foods. Suggest eating a variety of foods each day – two cups of vegetables, one and a half cups of fresh fruit, and at least three servings of low fat dairy. Make patients aware about:

- Minimizing drinking calories, for example eating whole fruit instead of drinking juice.
- Using lightly steamed or sautéed multi-colored vegetables, not overcooking them.
- Tracking the number of servings being consumed. 1 serving of cereal is about ¾ cup. 1 bowl of cereal can have up to 4 servings and 4 times the calories they may need.

The evidence behind healthy fats

- Trans-fats can detrimentally increase LDL while decreasing HDL.
- Consumption of saturated fats raises HDL, but also undesirably raises LDL.
- Omega-3 fatty acids add to the primary prevention effects of statin therapy.

- Choose meats such as white chicken, pork, lean red meat, turkey, and oily fish.

- Replace carbohydrates and oils with high quality protein, non-fat paneer, cottage cheese, and nuts.
- Use 1% or skim dairy products such as milk, yogurts, and cheese to lower saturated fats for desserts or paneer.
- Cook with a limited oil high in mono-unsaturated fats such as olive/canola.

- Replace whole eggs with egg whites, avoiding the high cholesterol egg yolks.

- Reduce oils high in saturated fat such as coconut milk. Instead, use less or lighter versions.
- Avoid products with trans-fats (foods that list hydrogenated shortening in the ingredients).
- Avoid hydrogenated ghee, cream, and tropical oils.

The evidence behind carbohydrates

- Consumption of ≥ soft drink/day increases the incidence of metabolic syndrome by 50%, obesity, waist circumference and blood pressure over 4 years.
- Cereal fiber intake is associated with a 61% reduced risk of type 2 diabetes between highest and lowest intake.
- Highest vs. lowest whole-grain consumption is associated with a 35% reduction in risk of type 2 diabetes.

- Choose complex carbohydrates high in dietary fiber; substitute brown rice for white rice.
- Instead of eating only rice, try grains such as cracked wheat, barley, quinoa (high in protein, low glycemic index).
- Choose whole-wheat pasta, and only thin crust over deep- or thick-crust pizzas.

- Avoid enriched flour, refined flour, white rice and starchy roots. Instead, check for whole-wheat flour (not just wheat flour) and a minimum of 3 grams of fiber per slice of bread.
- Avoid high fructose corn syrup, soda, artificial sweeteners and fruit juices.
- Avoid deep fried foods rich carbohydrates, such as Indian snacks.

Diet: Dinner vs. Diner

Meal Tips

Number of meals per day:

Eating ≥ meals/day versus ≤ meals/day is associated with a 45% lower risk of obesity.

When and where to eat:

Skipping breakfast is associated with a 450% increased risk of obesity, as is greater frequency of eating breakfast or dinner away from home.

STRESS REDUCTION: The Rx of Meditation

INTERHEART identifies psychological stress as one of the 9 risk factors that explain 90% of heart-attacks. Stress is defined as feeling irritable, filled with anxiety, or as having sleep difficulties as a result of conditions at work or at home. After adjusting for age, gender, geographic region, lipids, hypertension and smoking, chronic stress is associated with a 2.67-fold increase in risk for MI.

Physiological stress arises from the inability of an individual's physiology to maintain balance, a steady state and/or homeostasis. Psychological stress results from the absence of creativity when an individual or organization is challenged.

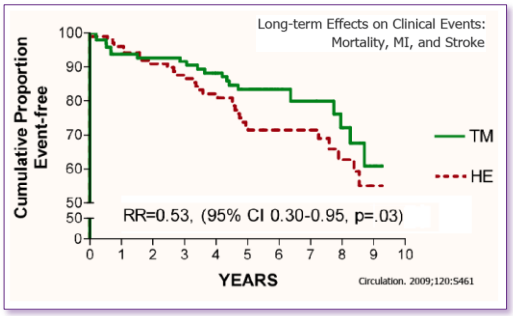
Several studies relate stress to diseases and events:

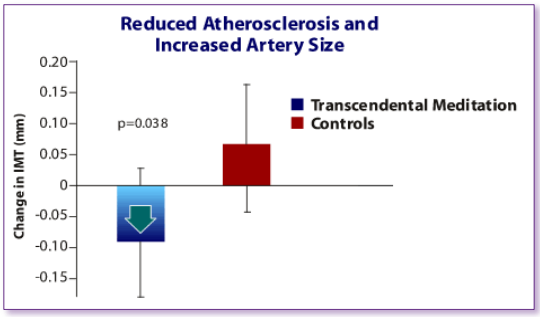
- **Mortality** with underlying neurotic hostility, CAD-prone and antisocial personality
- **Acute MI** with 32.5% of PAR explained by psychosocial factors
- **Cardiomyopathy** with stress causing severe left ventricular dysfunction
- **Dyslipidemia** with chronic work stress associated with elevated atherogenic lipids
- **Metabolic syndrome** where work stressors raise the risk of metabolic syndrome
- **Obesity** where stress exaggerates diet-induced obesity

Meditation is commonly used as a stress reduction technique. There are three popular meditation techniques: Concentrative, Contemplative, and Transcendental, and each vary in their concept and practice. Transcendental Meditation (TM) has been a widely researched technique, and its benefits in disease prevention and mangement are amply demonstrated.

Meditation Technique	Meditation Concept	Examples of Meditation Practices
Concentrative	Focus on object	Breathing, Pranayam, Third Eye, Raj Yoga
Contemplative	Observe the object	Zen, Imagery, Healing, Mindfulness
Transcendental	Object disappears	Transcendental Meditation (TM)

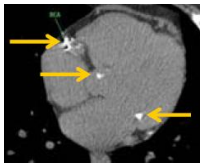
The practice of TM creates a wakeful hypo-metabolic physiologic state, where individuals experience decreased O_2 consumption, CO_2 elimination, respiratory rate and minute ventilation with no change in respiratory quotient. Stress reduction with the TM technique compared to health education is associated with a 47% reduction in risk for all cause mortality, MI and stroke in high-risk patients, and a 61% reduction in events in those who practice regularly.





CT Heart Scan

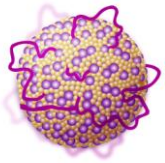
Coronary Calcium Scoring



- Determines the presence and extent of CAD in the absence of physical symptoms
- The amount of calcification as well as the percentile rank based on age group and gender should be considered in evaluating risk
- Patients visualizing coronary artery calcium may improve utilization and adherence to lipid-lowering therapy

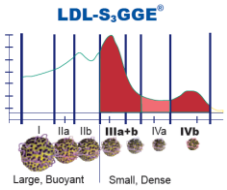
Advanced Blood Test

Apolipoprotein B – Apo B



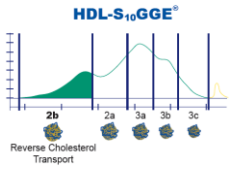
- Structural protein on LDL
- Indicates exactly how many LDLs are present in the blood
- Goal for secondary prevention: Less than 70 mg/dl

LDL Subclasses – 7 Particle size regions



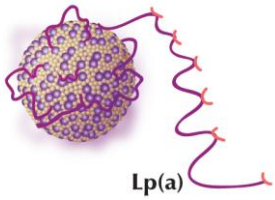
- 3 large (LDL I, IIa, IIb) and 4 small (IIIa, IIIb, IVa, IVb) subclasses of LDLs
- Small LDL particles enter endothelium 40% faster than large particles
- Goal: IIIa+IIIb less than 15%, IVb less than 5%

HDL2b



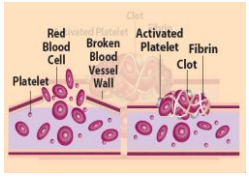
- One of five HDL subtypes (2a, 2Ib, 3a, 3b, 3c)
- Attributed with reverse cholesterol transport and contains natural antioxidant which protects arterial cell walls
- Goal: 20-35% in men & postmenopausal women; 30-45% in premenopausal women

Lipoprotein (a) – Lp (a)



- LDL particle with an attached abnormal protein (genetically determined)
- High levels may raise risk of CAD by 300% because of increased plaque formation, plaque rupture, and coagulation
- Goal: Less than 30 mg/dl; used to stratify risk; treat other risks aggressively

Fibrinogen



- Naturally occurring protein needed for the normal blood clotting process
- Elevated levels is associated with hyper-coagulability and coronary artery disease
- An acute phase reactant and may be increased by estrogen therapy
- Goal: Less than 350 - 400 mg/dl; may be used to stratify risk

Homocysteine

- Results from the metabolism of sulfur containing amino acids in the body
- Elevated as a result of nutritional deficiencies, genetic abnormalities, renal dysfunction, or generalized arteriosclerosis
- Pharmacologic treatment controversial
- Goal: Less than 10-15 µmol/L

Glossary

Angina	Chest discomfort that occurs when an area of the heart muscle does not get sufficient oxygen-rich blood. It is often the first symptom of CAD.
Apo B	The main structural component of all non-high density lipoproteins. Each non-HDL particle contains one Apo B.
Atherosclerosis	Process of plaque build-up in the coronary arteries, leading to their narrowing.
CAD	Coronary Artery Disease occurs when plaque builds up in the coronary arteries. CVD or Cardio Vascular Disease involves the blood vessels providing nutrition to the heart.
Calcium CT Scan	A CT scan that can detect calcification in coronary arteries and helps visualize the presence of CAD.
CHD	Coronary Heart Disease occurs when there is failure of the body's coronary circulation to supply adequate blood flow to cardiac muscle and surrounding tissue.
Cholesterol	An essential structural component of mammalian cell membranes, produced by the liver or intestines, and transported in the blood via lipoproteins. It is important and necessary for normal physiology but abnormal levels are associated with cardiovascular disease.
CRP	A plasma protein that responds to systemic inflammation. Elevated CRP levels correlate with the presence of metabolic syndrome, insulin resistance, endothelial dysfunction, and impaired fibrinolysis.
Fibrinogen	A glycoprotein that is made in the liver and involved in the coagulation cascade.
HDL	High Density Lipoprotein has many functions including reverse cholesterol transport. It transfers cholesterol to the liver from the peripheral circulation and is referred to as the "good cholesterol."
HDL2b	The defined subclass of HDLs that is most associated with efficacy of reverse cholesterol transport. Functionally, it is associated with an antioxidant that protects the arterial wall.
Homocysteine	A naturally occurring amino acid produced in the body. Excess amounts are associated with inflammation inside arterial walls, endothelial dysfunction and vascular injury.
Ischemia	Inadequate blood supply to an organ or part of the body, especially the heart muscles.
LDL	Low Density Lipoprotein; transports cholesterol from the liver to the body's tissues and organs. It is often referred to as the "bad cholesterol."
MI	Myocardial Infarction is also known as a heart-attack; occurs when plaque raptures, leading to a blood clot which occludes the coronary artery, causing the heart muscle to die.
Obesity	A condition in which excess body fat accumulates to the point that it may have an adverse effect on health (body mass index ≥ 30 kg/m^2).
South Asia	South Asia represents the countries of Indian subcontinent, including India, Pakistan, Bangladesh, Sri Lanka, and Nepal. India accounts for 60% of the world's burden of CAD.
TLC	Therapeutic Lifestyle Changes are the American Heart Association's recommendations to help prevent cardiovascular disease.
TM	Transcendental Meditation is a simple and effortless technique practiced 20 minutes twice each day while sitting comfortably with the eyes closed. It is the most widely practiced, most researched, and most effective method of stress reduction and self-development.

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About the South Asian Heart Center

South Asian Heart Center
EL CAMINO HOSPITAL

The South Asian Heart Center is the first major non-profit response to the growing epidemic of heart disease among South Asians. The Center was established in 2004 at El Camino Hospital in Mountain View, California with the mission to reduce the high incidence of coronary artery disease in South Asians through a comprehensive, culturally appropriate program that raises awareness through education, evaluates risk factors for heart disease with advanced screening, and facilitates lifestyle changes with supportive heart-health coaching.

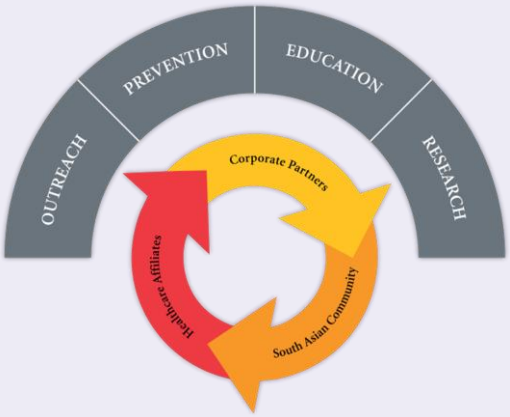
Collaborative risk reduction approach

The South Asian Heart Center program to reduce the incidence of heart disease in this high-risk population depends on a strong collaboration with healthcare providers who diagnose and treat patients in their clinical practices. Since its inception, the Center has engaged key physicians to outreach to their respective communities. The Center's approach with healthcare providers relies on collaboration, education, and affiliation. To maintain continuity of care and personalized pharmacological planning, the Center reports all assessments, findings, results, and recommendations to the participant's physicians and primary care providers.

The South Asian Heart Center envisions a strong 3-way partnership for improved outcomes and reduced premature heart-attacks between **individuals**, their **healthcare providers** for medical management and routine care, and **the Center** for screening and lifestyle coaching. The Center's operating guidelines are:

- Primordial and primary prevention NOT medical therapy
- Screening for risk-factors NOT medical management
- Minimize cost, reduce invasive tests and procedures
- Maintain continuity of medical care with participant's current physician
- Communicate results and plan with physicians, and encourage follow-up with them

The Center's Strategic Initiatives



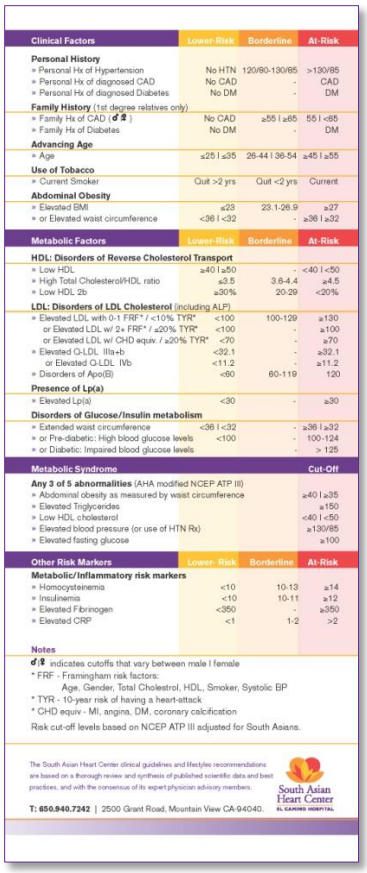
Outreach
Raise global understanding and awareness of the severity of the pandemic, and methods to combat it

Education
Promote early diagnosis, treatment, and lifestyle changes to prevent onset and disease progression

Prevention
Implement comprehensive disease management with advanced risk-stratification methodology

Research
Identify causative factors elevating risk, create risk prediction tools and assess program effectiveness

Brochure and Handout Order Form



Clinical Factors	Lower-Risk	Borderline	At-Risk
Personal History			
» Personal Hx of Hypertension	No HTN	120/80-130/85	>130/85
» Personal Hx of diagnosed CAD	No CAD	-	CAD
» Personal Hx of diagnosed Diabetes	No DM	-	DM
Family History (1st degree relatives only)			
» Family Hx of CAD (♂♀)	No CAD	≥55 I ≥65	55 I <65
» Family Hx of Diabetes	No DM	-	DM
Advancing Age			
» Age	≥25 I ≥35	26-44 I 36-54	≥45 I ≥55
Use of Tobacco			
» Current Smoker	Quit >2 yrs	Quit <2 yrs	Current
Abdominal Obesity			
» Elevated BMI	≤23	23.1-26.9	≥27
» or Elevated waist circumference	<36 I <32	-	≥36 I ≥32
Metabolic Factors	**Lower-Risk**	**Borderline**	**At-Risk**
HDL: Disorders of Reverse Cholesterol Transport			
» Low HDL	≥40 I ≥50	-	<40 I <50
» High Total Cholesterol/HDL ratio	≤3.5	3.6-4.4	≥4.5
» Low HDL 2b	≥30%	20-29	<20%
LDL: Disorders of LDL Cholesterol (including ALP)			
» Elevated LDL with 0-1 FRF* / <10% TYR*	<100	100-129	≥130
or Elevated LDL w/ 2+ FRF* / ≥20% TYR*	<100	-	≥100
or Elevated LDL w/ CHD equiv. / ≥20% TYR*	<70	-	≥70
» Elevated Q-LDL IIIa+b	<32.1	-	≥32.1
or Elevated Q-LDL IVb	<11.2	-	≥11.2
» Disorders of Apo(B)	<60	60-119	120
Presence of Lp(a)			
» Elevated Lp(a)	<30	-	≥30
Disorders of Glucose/Insulin metabolism			
» Extended waist circumference	<36 I <32	-	≥36 I ≥32
» or Pre-diabetic: High blood glucose levels	<100	-	100-124
» or Diabetic: Impaired blood glucose levels		-	> 125
Metabolic Syndrome			**Cut-Off**
Any 3 of 5 abnormalities (AHA modified NCEP ATP III)			
» Abdominal obesity as measured by waist circumference			≥40 I ≥35
» Elevated Triglycerides			≥150
» Low HDL cholesterol			<40 I <50
» Elevated blood pressure (or use of HTN Rx)			≥130/85
» Elevated fasting glucose			≥100
Other Risk Markers	**Lower-Risk**	**Borderline**	**At-Risk**
Metabolic/Inflammatory risk markers			
» Homocysteinemia	<10	10-13	≥14
» Insulinemia	<10	10-11	≥12
» Elevated Fibrinogen	<350	-	≥350
» Elevated CRP	<1	1-2	>2

Notes

♂♀ indicates cutoffs that vary between male I female

* FRF - Framingham risk factors:
Age, Gender, Total Cholestrol, HDL, Smoker, Systolic BP

* TYR - 10-year risk of having a heart-attack

* CHD equiv - MI, angina, DM, coronary calcification

Risk cut-off levels based on NCEP ATP III adjusted for South Asians.

The South Asian Heart Center clinical guidelines and lifestyles recommendations are based on a thorough review and synthesis of published scientific data and best practices, and with the consensus of its expert physician advisory members.

South Asian Heart Center EL CAMINO HOSPITAL

T: 650.940.7242 | 2500 Grant Road, Mountain View CA 94040.

Developed by the South Asian Heart Center at the El Camino Hospital, these brochures and patient handouts covering CAD in South Asians are culturally appropriate materials for your practice and for your South Asian patients.

Visit us at www.southasianheartcenter.org to view our full resource set. Order online, fax, or photocopy this order form and send to the following address:

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Handouts for Patients

_____ Patient Education Brochure
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_____ Stress Reduction Techniques
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_____ Calcium Scoring CT Heart Scan
_____ Get Moving

For Physicians

_____ Advanced Laboratory Requisition
_____ Physician Guide Pocket Reference Card
_____ Patient Referral Form
_____ Physicians Guide to the Coronary Artery Disease Pandemic in South Asians

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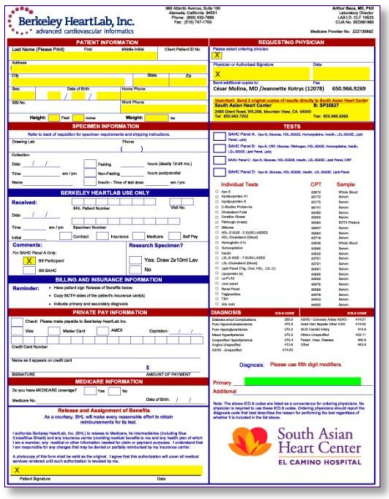

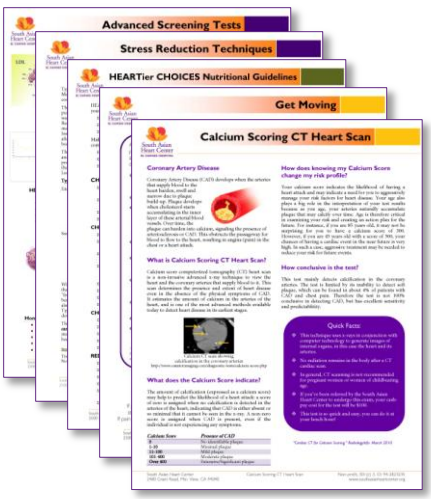

OUR MISSION

The mission of the South Asian Heart Center is to reduce the high incidence of coronary artery disease in South Asians through a comprehensive, culturally appropriate program that raises awareness through education, evaluates risk factors for heart disease with advanced screening, and facilitates lifestyle changes with supportive heart-health coaching.

People of South Asian descent have **4x** higher risk of heart disease.

Two campuses:

Willow Pavilion, 2480 Grant Road
Mountain View, CA 94040

815 Pollard Road
Los Gatos, CA 95032

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