CARDIOVASCULAR DISEASE: THE #1 KILLER

JOEL KAHN MD, FACC

CLINICAL PROFESSOR, WAYNE STATE UNIVERSITY SCHOOL OF MEDICINE

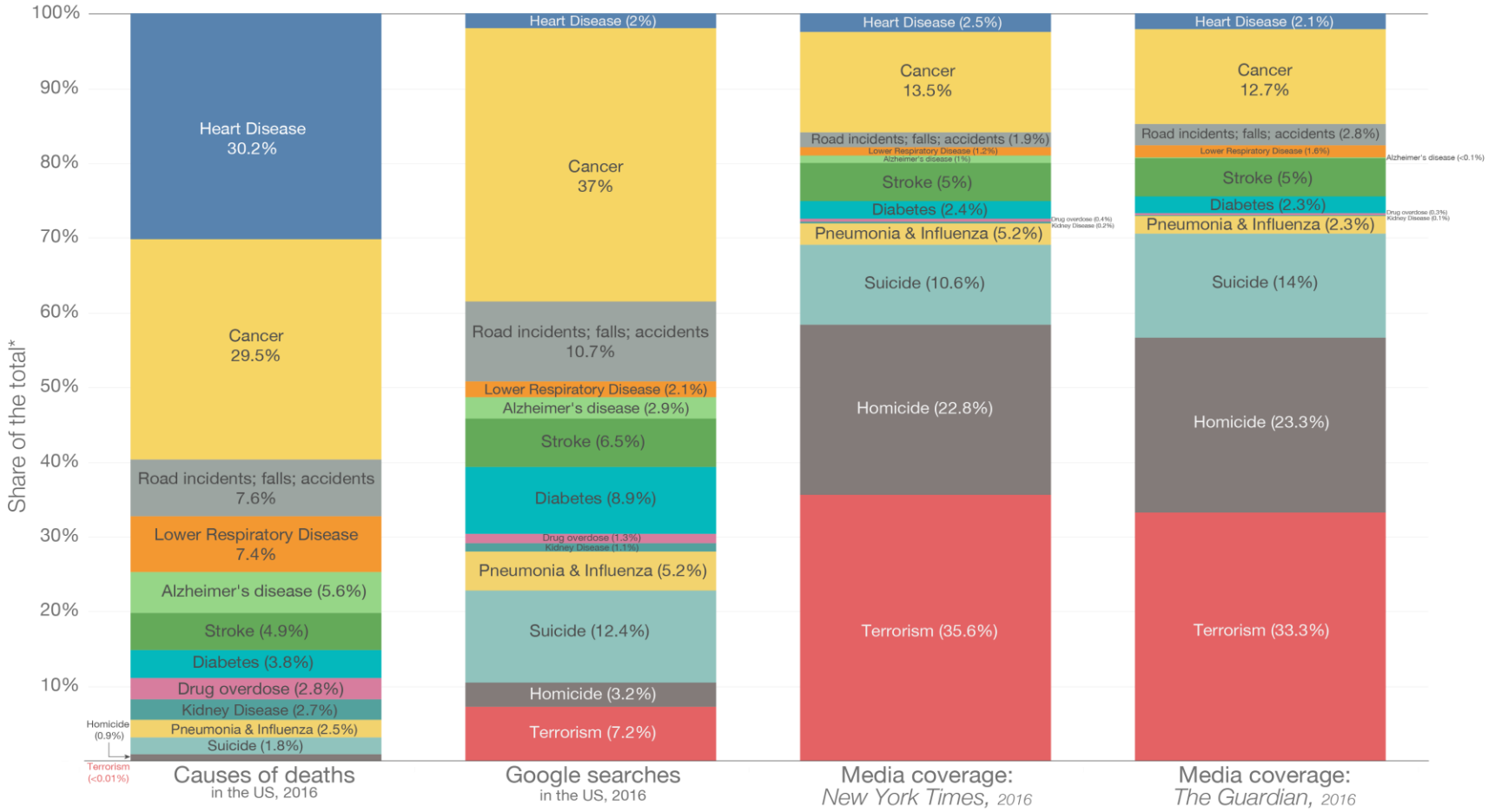
WWW.DRJOELKAHN.COM

KAHN CENTER FOR CARDIAC LONGEVITY

Causes of death in the US

What Americans die from, what they search on Google, and what the media reports on

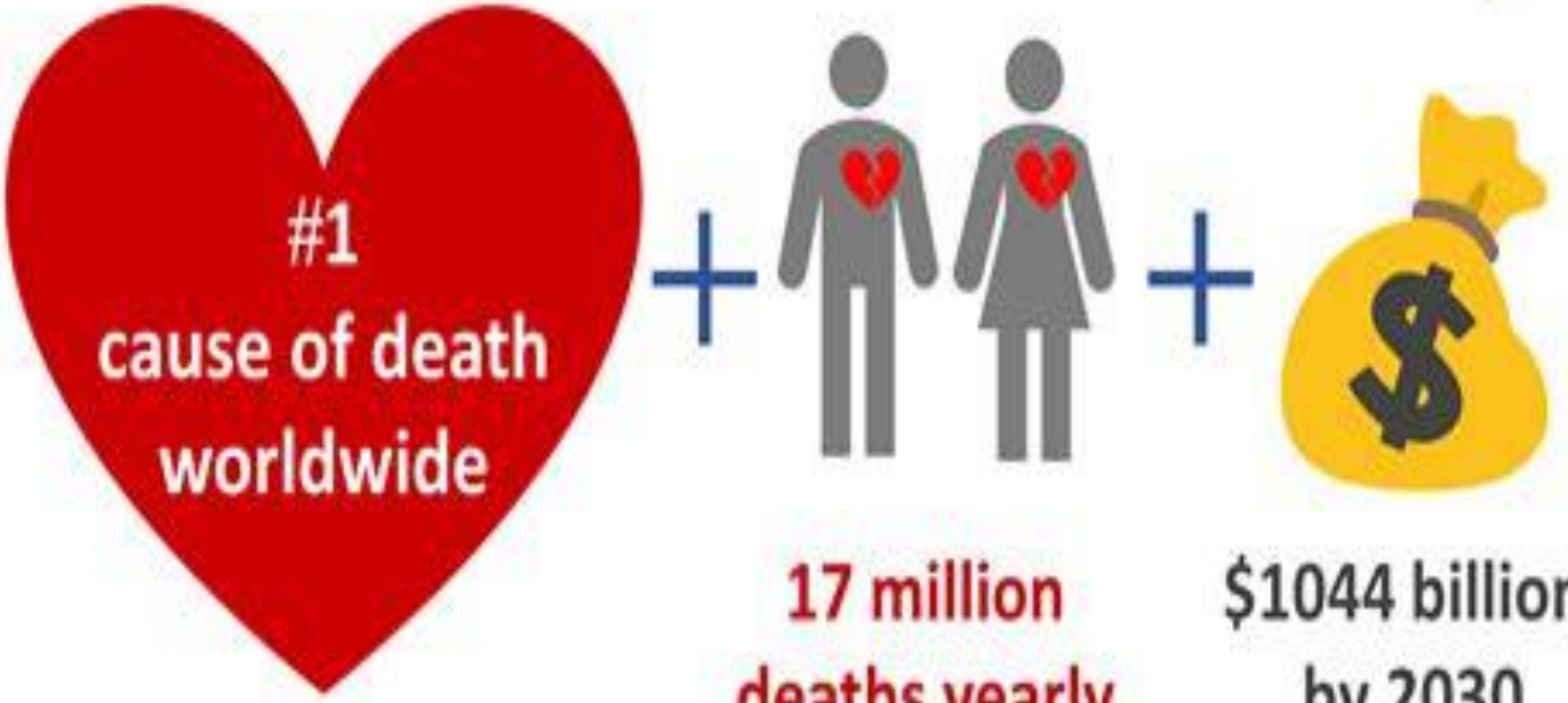
Our World in Data



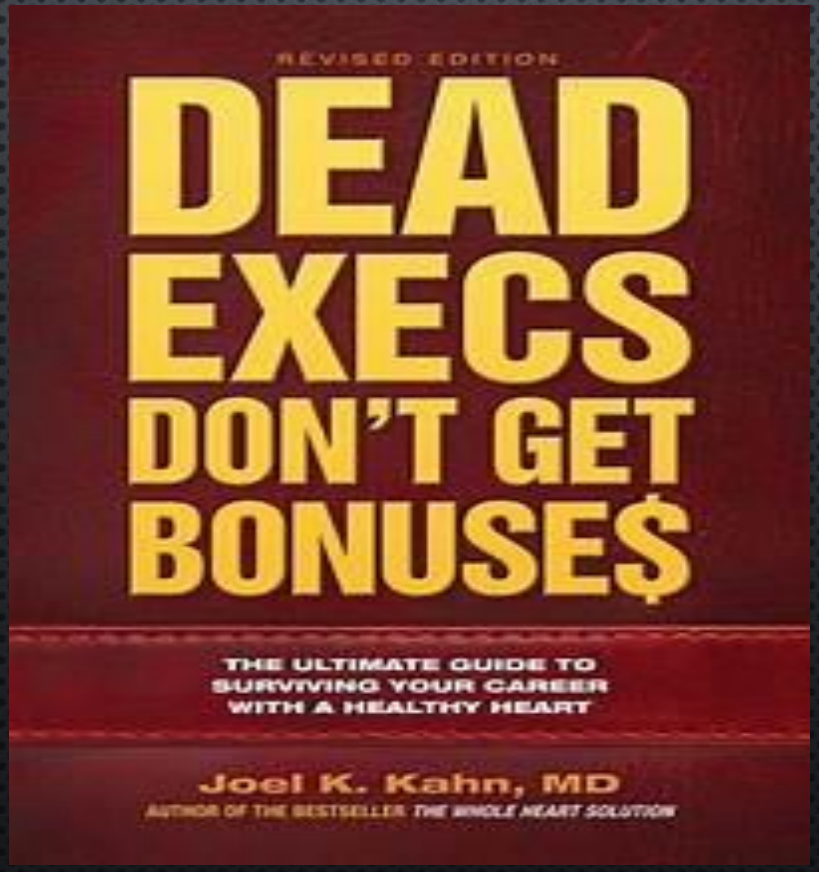
*This represents each causes's share of the top ten causes of death in the US plus homicides, drug overdoses and terrorism. Collectively these 13 causes accounted for approximately 88% of deaths in the US in 2016. Full breakdown of causes of death can be found at the CDC's WONDER public health database: https://wonder.cdc.gov/

Based on data from Shen et al (2018) – Death: reality vs. reported. *All data available at: https://owenshen24.github.io/charting-death*
All data refers to 2016.
Not all causes of death are shown: Shown is the data on the ten leading causes of death in the United States plus drug overdoses, homicides and terrorism.
All values are normalized to 100% so they represent their relative share of the top causes, rather than absolute counts (e.g. 'deaths' represents each causes' share of deaths within the 13 categories shown rather than total deaths). The causes of death shown here account for approximately 88% of total deaths in the United States in 2016.

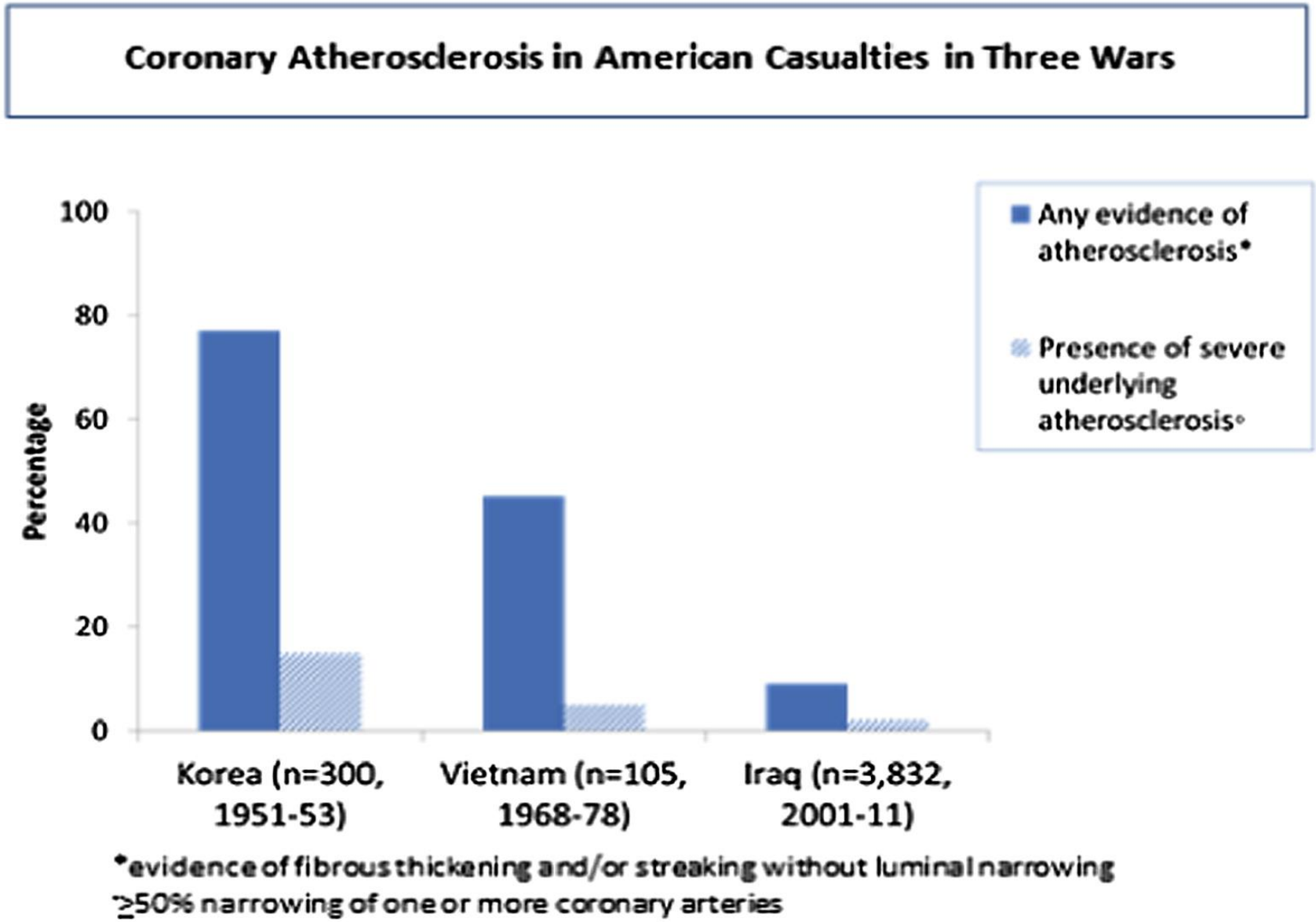
The burden of cardiovascular diseases



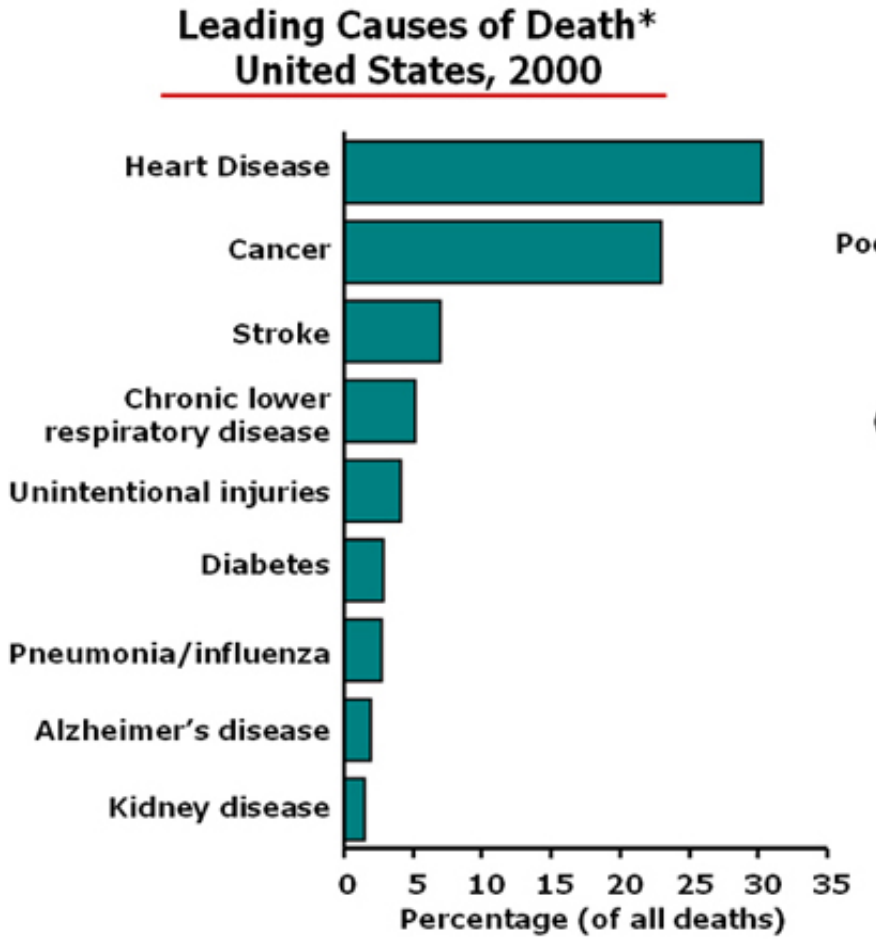
STEP 1: MAKE HEART DISEASE #1 IN YOUR PRACTICE

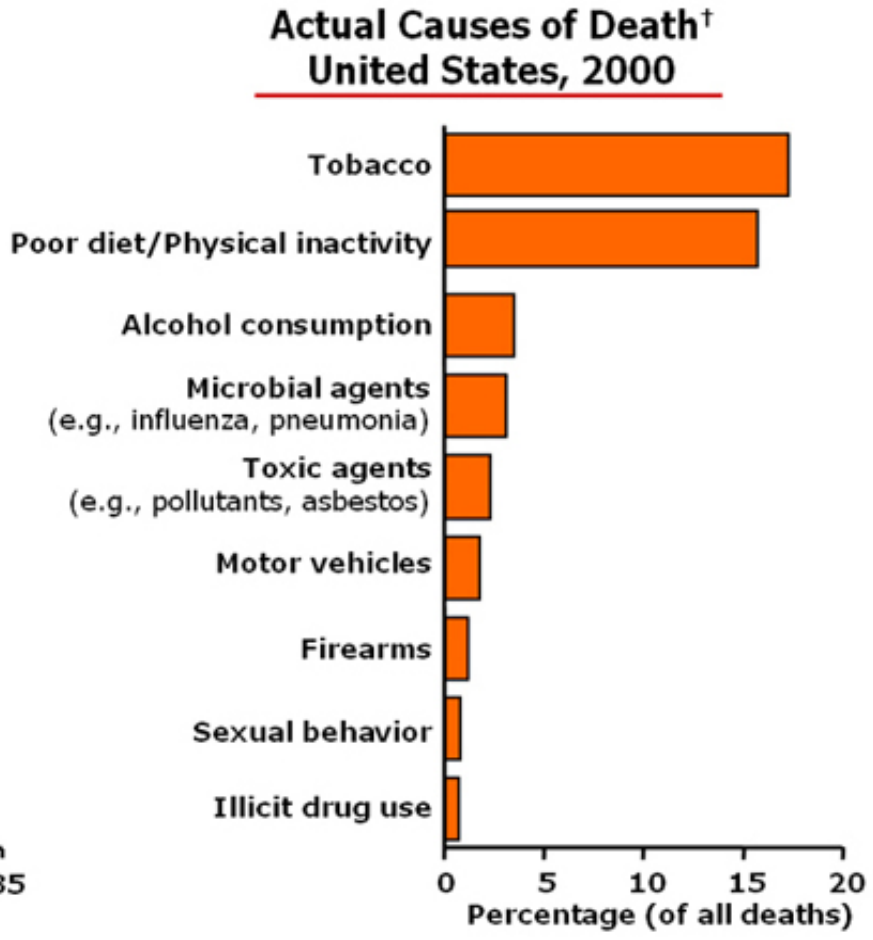


STEP 2: ADDRESS IT EARLY IN LIFE



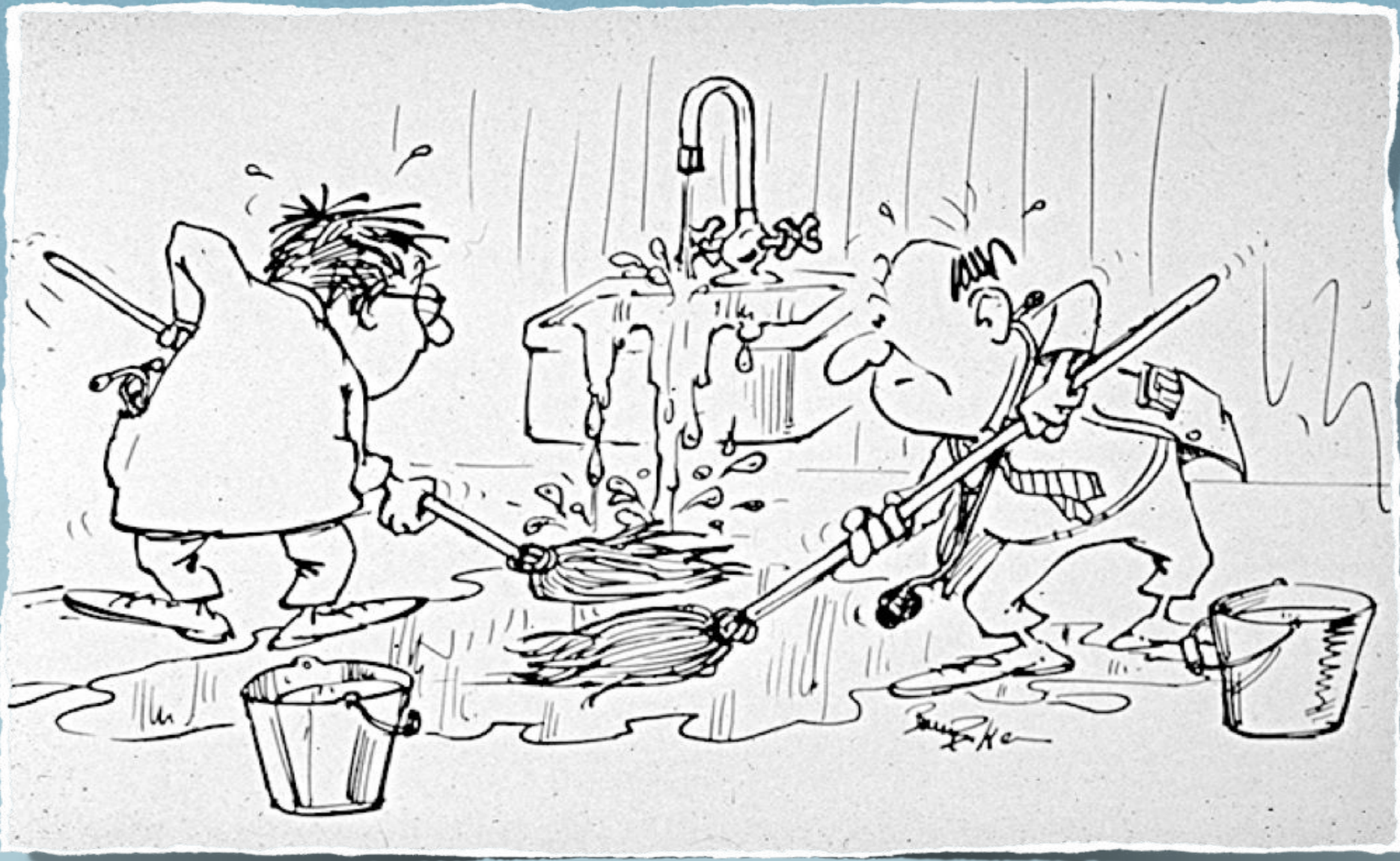
STEP 3: WE KNOW WHY





* Miniño AM, Arias E, Kochanek KD, Murphy SL, Smith BL. Deaths: final data for 2000. National Vital Statistics Reports 2002; 50(15):1-120.
† Mokdad AH, Marks JS, Stroup DF, Gerberding JL. Actual causes of death in the United States, 2000. JAMA. 2004;291(10):1238-1246.

Why Not Turn Off The Faucet?



PREVENTABLE DISEASES

- 85% HEART DISEASE
- 90% ADULT DIABETES
- 60% CANCER

PREVENT 85% OF HEART ATTACKS

- Don't smoke
- Walk 30-40 minutes daily
- Eat >5 servings of fruit/veg a day
- Sleep 7 hours a night
- Enjoy a few alcoholic beverages a week

- MORGEN study 2013 Netherlands 17,887 men and women
- Karolinska study 2014 Sweden 20,721 men

STEP 4: TEST NOT GUESS

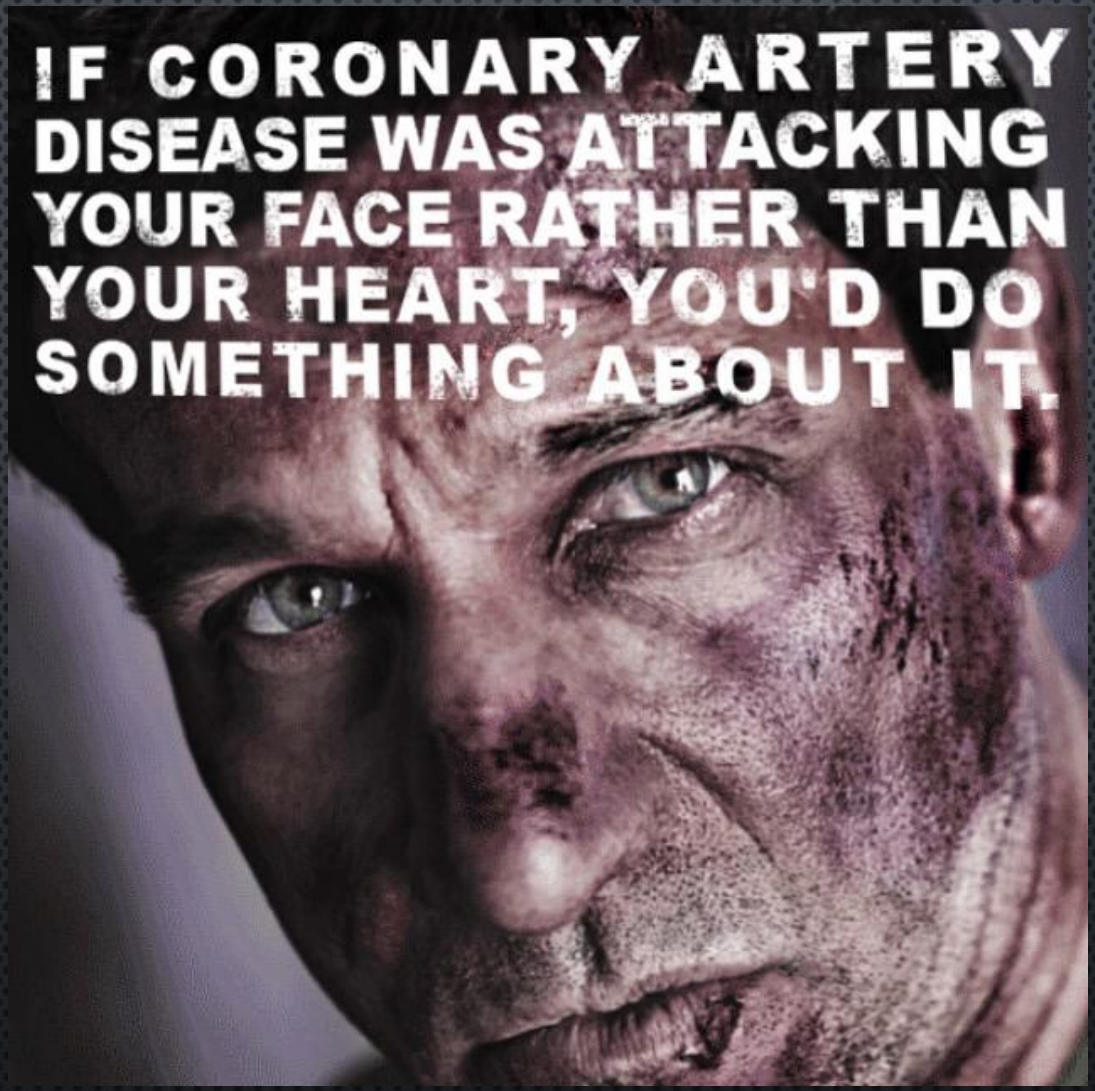
person

⬇

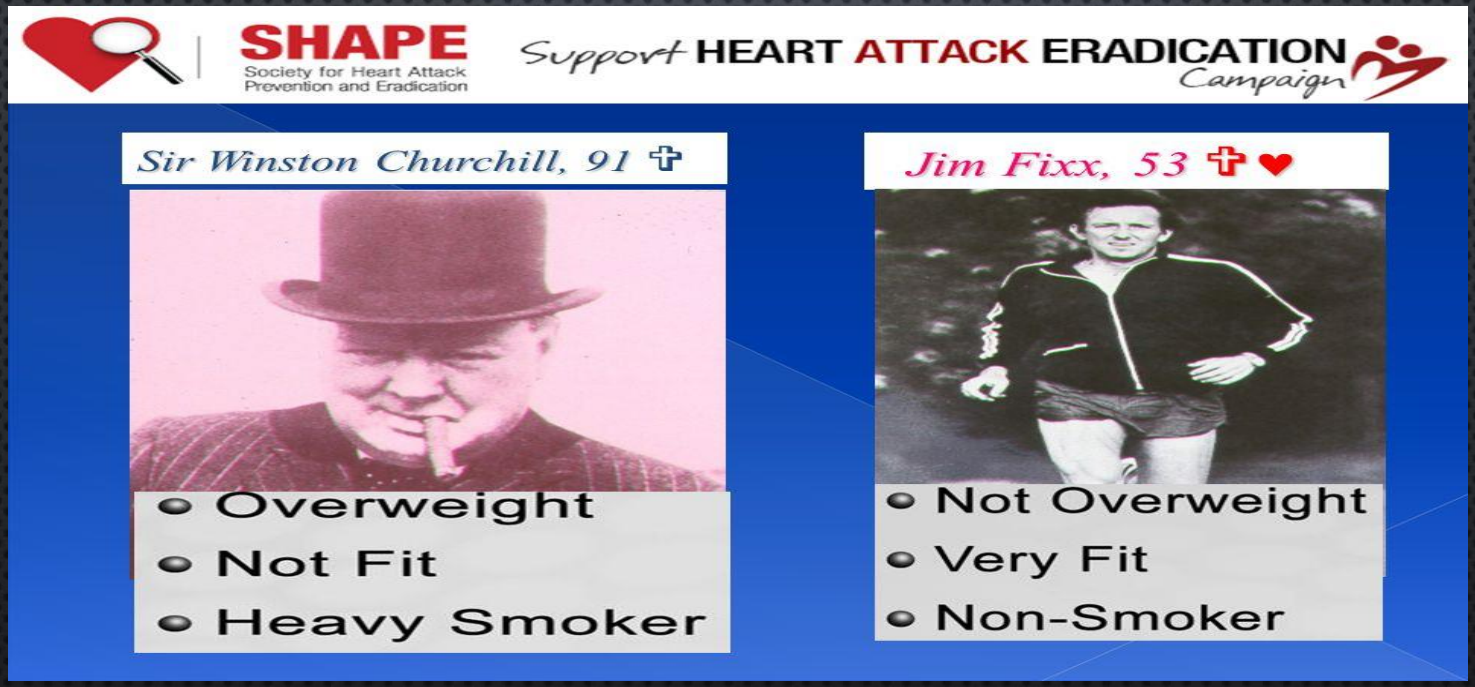
A man is as old as his arteries.

Thomas Sydenham

QuoteAddicts

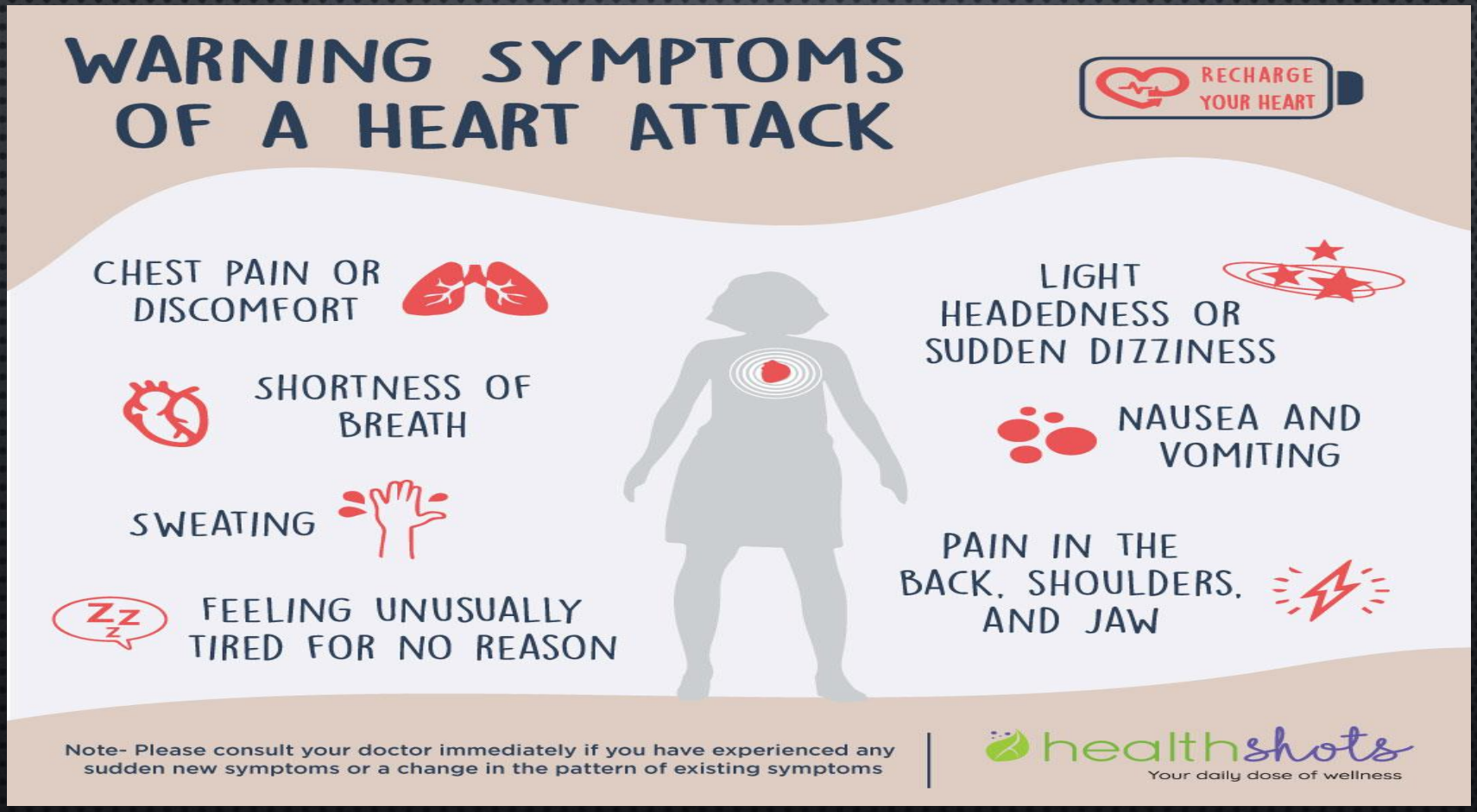

IF CORONARY ARTERY DISEASE WAS ATTACKING YOUR FACE RATHER THAN YOUR HEART, YOU'D DO SOMETHING ABOUT IT.

EARLY DETECTION OF AMERICA'S #1 KILLER



DO YOU HAVE THIS PROBLEM? THE WIDOWMAKER

DO NOT WAIT FOR A HEART ATTACK

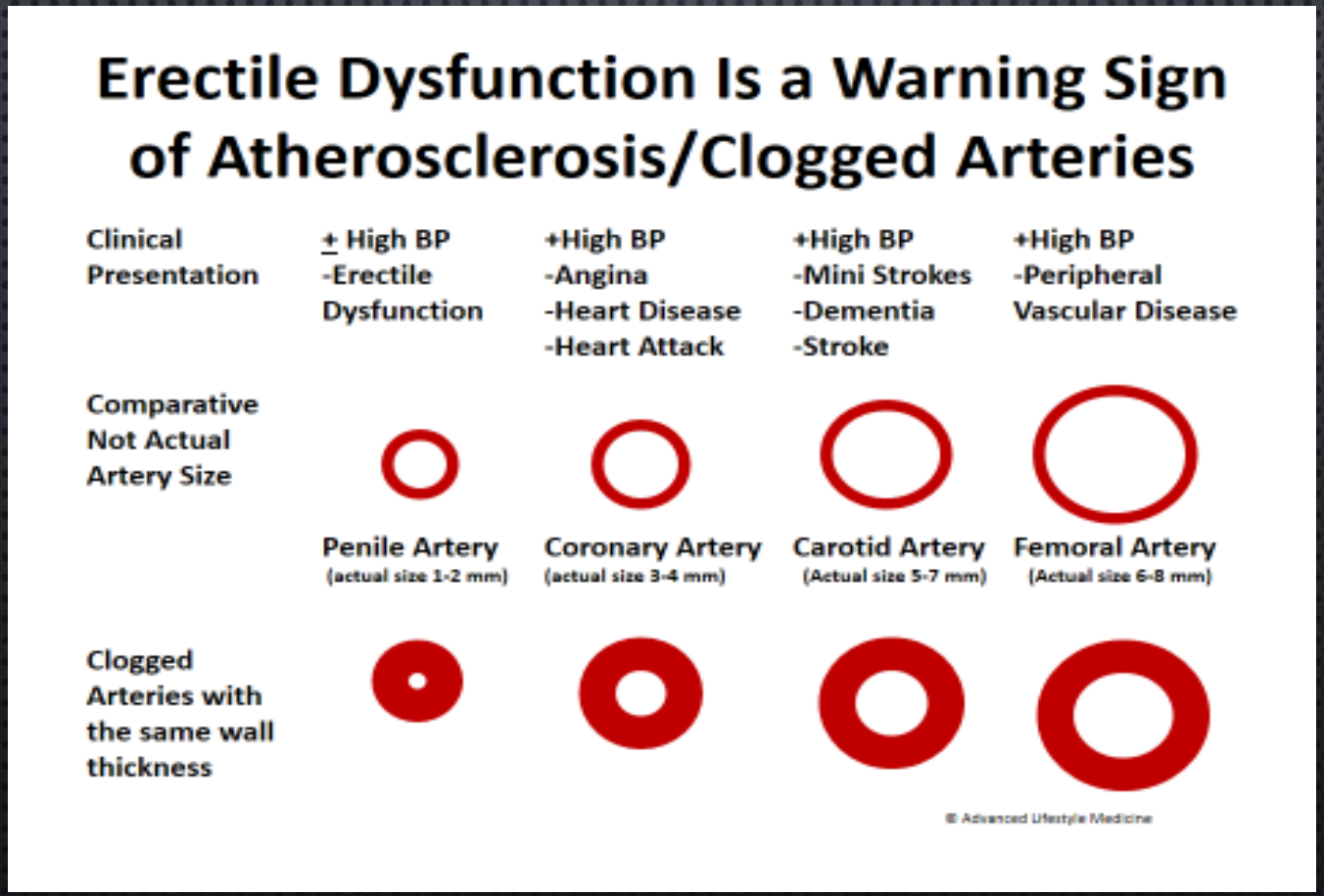


EARLY CLUES

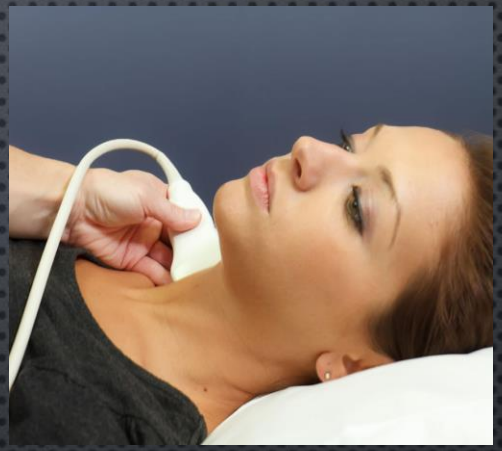

Signs That May Signal
Heart Attack Risk
Hair Loss (Crown)
Hair Loss (Temples)
Yellow Fatty Deposits on Eyelid
Earlobe Crease
Source - American Heart Association Scientific Sessions Abstract 15333

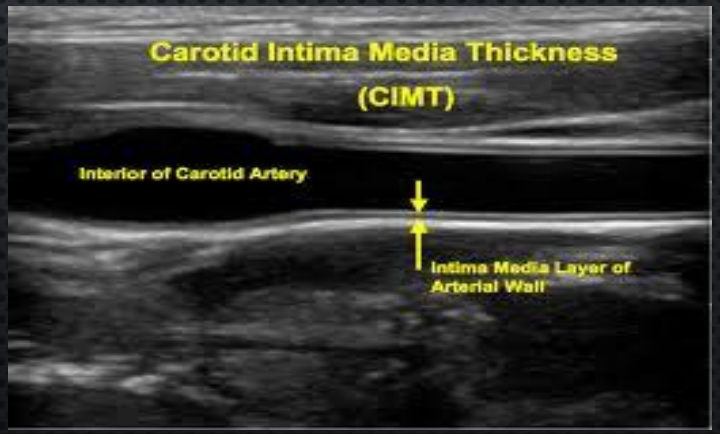
Diagonal EarLobe Crease: DELC

ED: Canary in the Coal Mine



TOOLS OF EARLY DETECTION

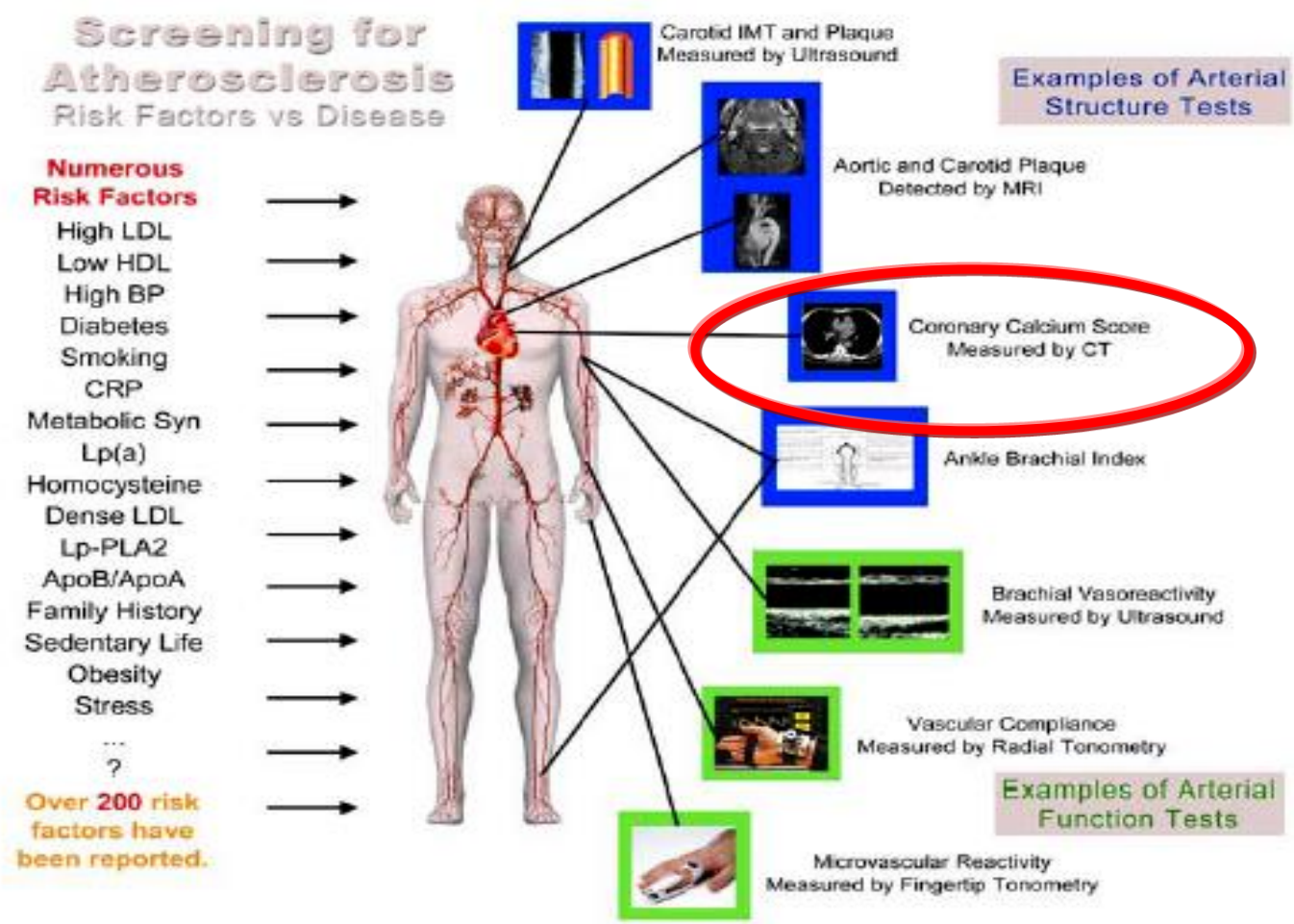




THE BEST TEST

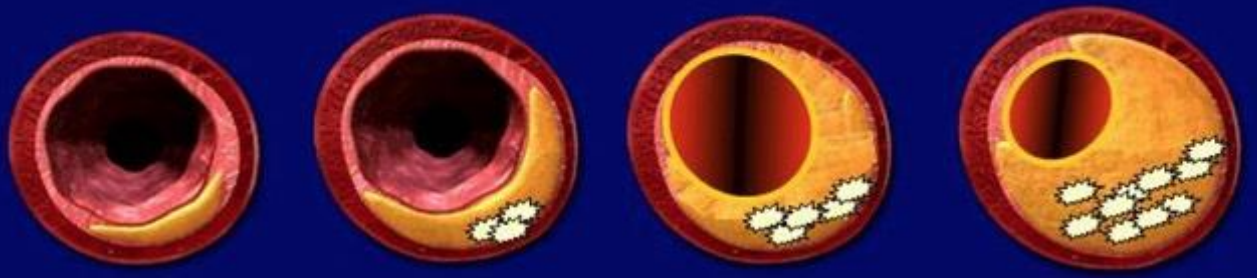
"The best test for prediction of the risk of atherosclerosis is the demonstration of atherosclerosis"

Dr. Ernest Schaeffer, Editor-in-Chief of Atherosclerosis


Screening for Atherosclerosis
Risk Factors vs Disease
Numerous Risk Factors
High LDL
Low HDL
High BP
Diabetes
Smoking
CRP
Metabolic Syn
Lp(a)
Homocysteine
Dense LDL
Lp-PLA2
ApoB/ApoA
Family History
Sedentary Life
Obesity
Stress
...
?
Over 200 risk factors have been reported.
Carotid IMT and Plaque Measured by Ultrasound
Examples of Arterial Structure Tests
Aortic and Carotid Plaque Detected by MRI
Coronary Calcium Score Measured by CT
Ankle Brachial Index
Brachial Vasoreactivity Measured by Ultrasound
Vascular Compliance Measured by Radial Tonometry
Examples of Arterial Function Tests
Microvascular Reactivity Measured by Fingertip Tonometry

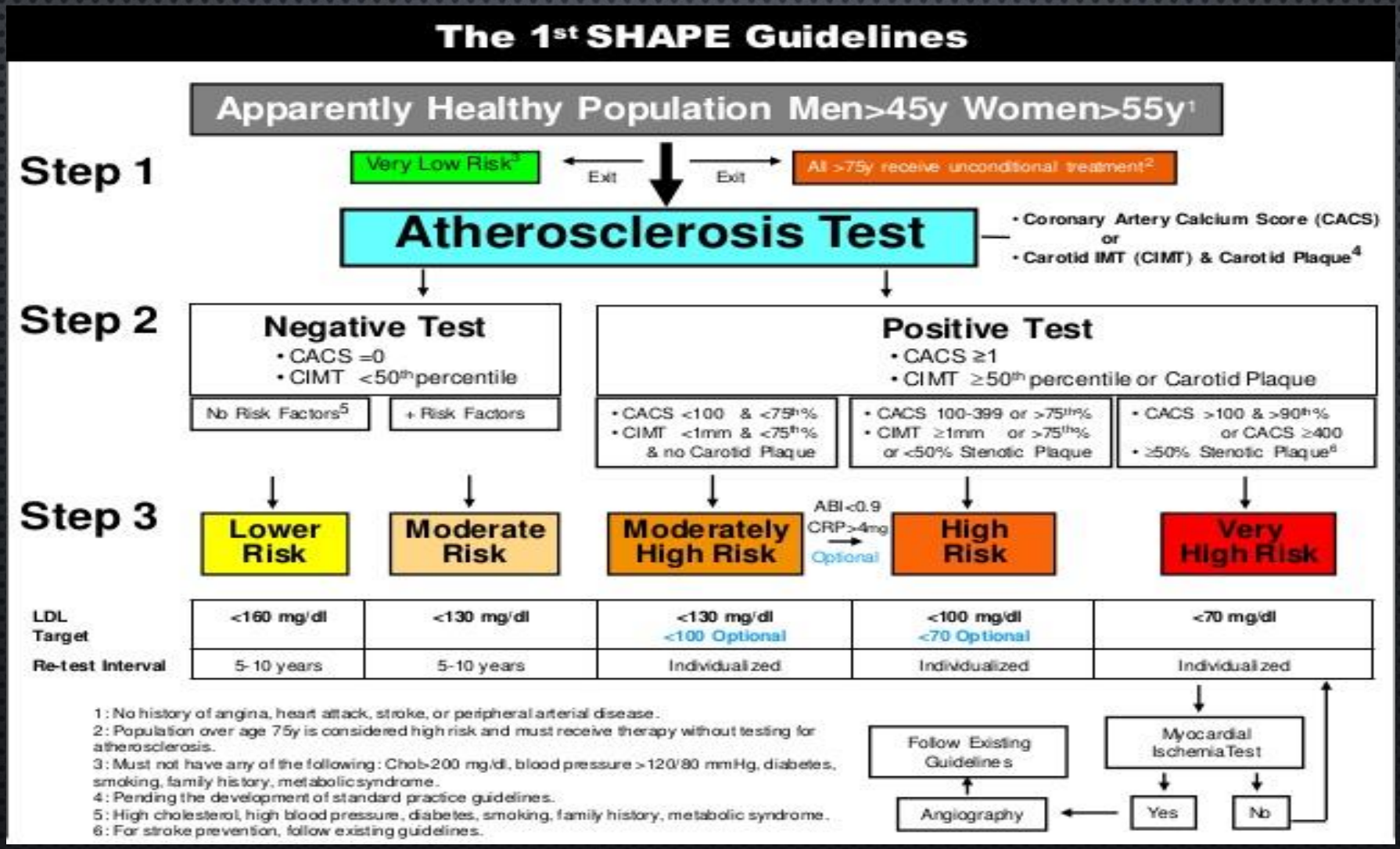
Detect Your Plaques Earlier

Comparing Detection by Positive Cardiac CT and Positive Nuclear Stress Test



Stages >>	Early	Moderate	Advanced	Late
Obstruction	none	20%	50%	70%
Symptoms	none	none	none	yes
Stress test	normal	normal	normal	abnormal
Cardiac CT	none	abnormal	abnormal	abnormal

SHAPESOCIETY.ORG



CORONARY ARTERY CALCIUM SCORE (CACS)

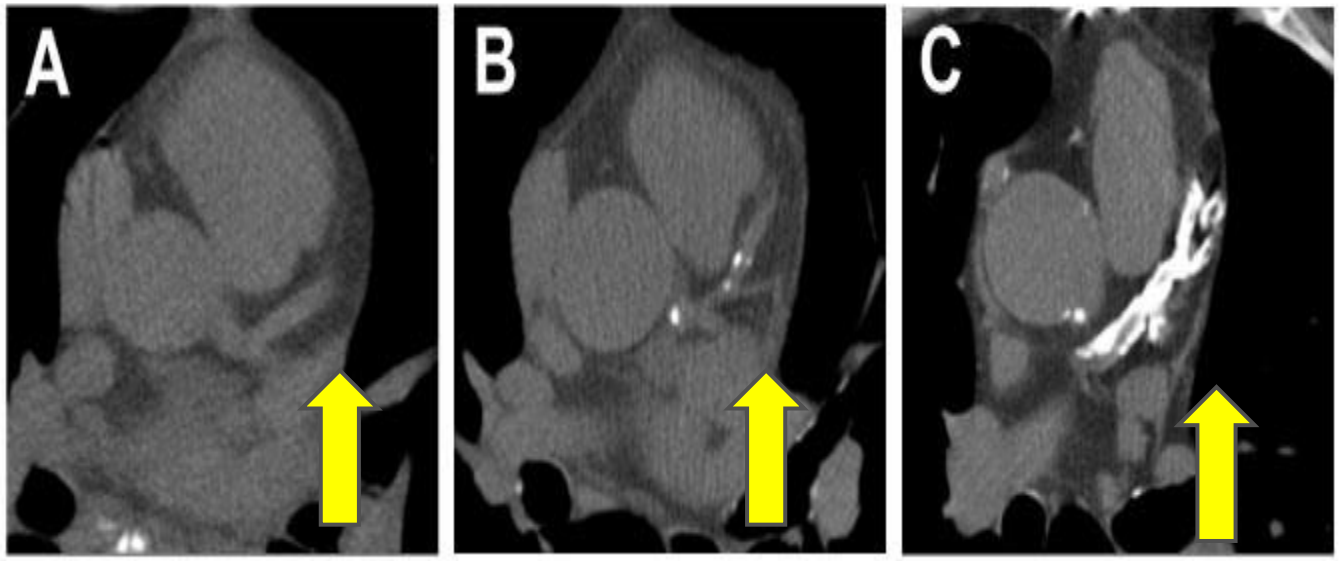
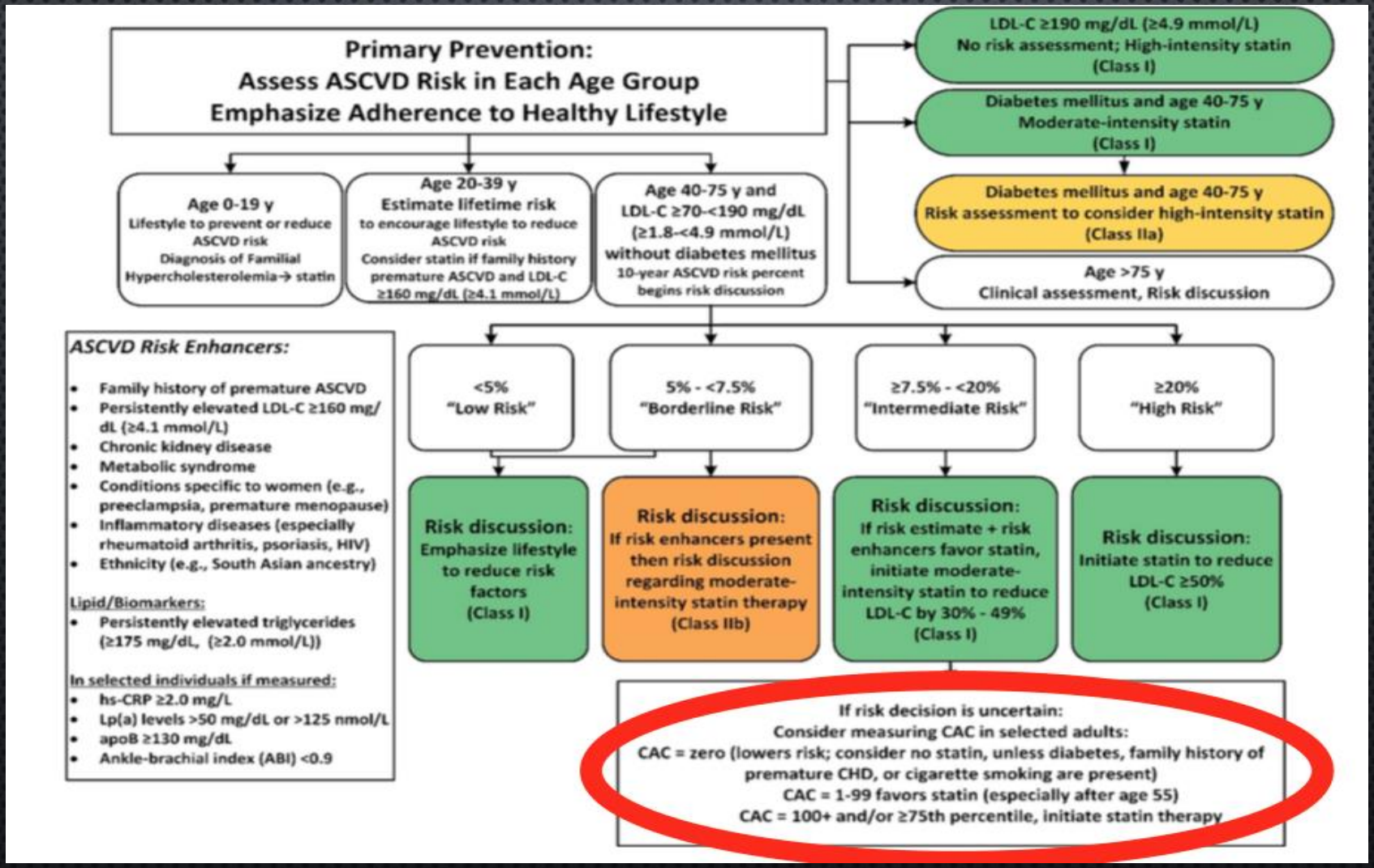


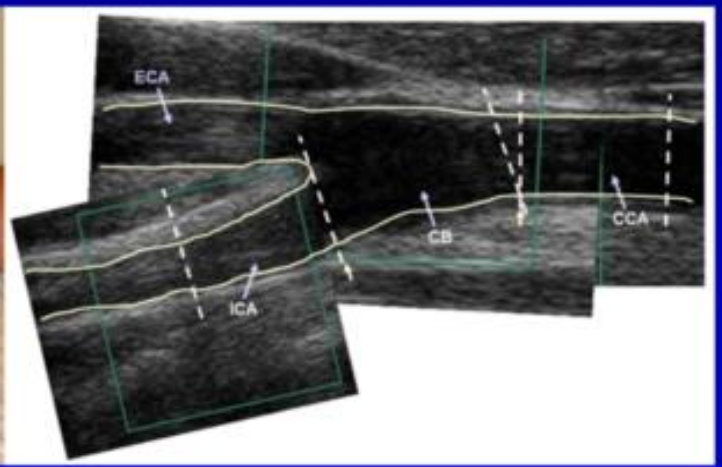
Figure 1 - *Images illustrating the coronary artery calcium score of three patients with increasing calcification grades in the territory of the anterior descending artery: A. no calcification; B. mild calcification; C. severe calcification.*

CACS: MAINSTREAM TEST AHA



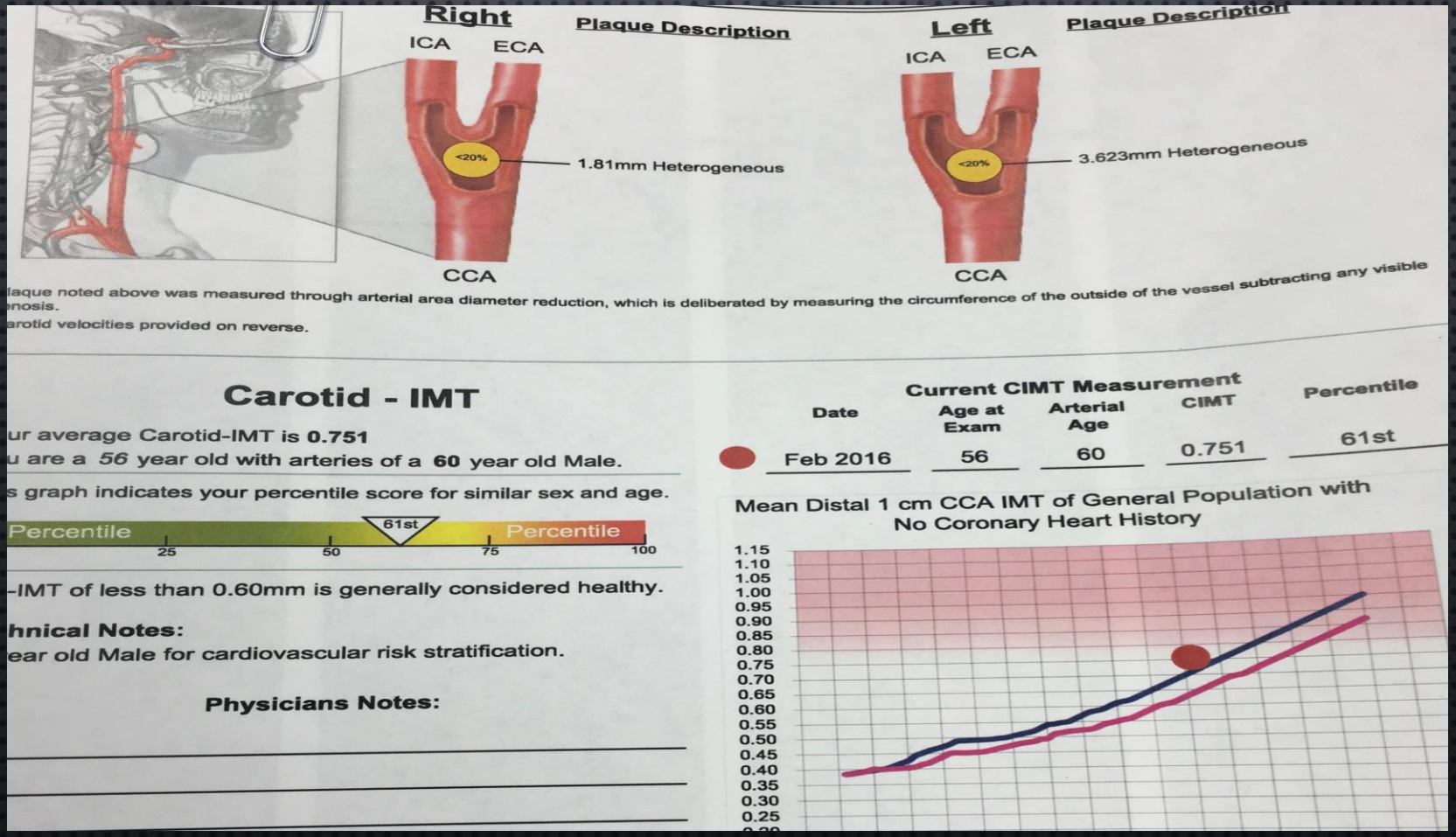
Carotid Intima Media Thickness (CIMT)

- Direct *in vivo* measurement of thickness of carotid artery wall by B-mode ultrasound
- Vessel wall thickness correlates with status of atherosclerosis and CV events
- Atherosclerosis is a systemic disorder
  - Atherosclerosis in the carotid artery is predictive of disease in other vascular beds



de Groot E, et al. *Circulation*. (2004) 109[Suppl III]:III-33-III-38.

CIMT: SILENT PLAQUE



Right — **Plaque Description**

ICA ECA

<20%

1.81mm Heterogeneous

CCA

Left — **Plaque Description**

ICA ECA

<20%

3.623mm Heterogeneous

CCA

laque noted above was measured through arterial area diameter reduction, which is deliberated by measuring the circumference of the outside of the vessel subtracting any visible
nosis.
arotid velocities provided on reverse.

Carotid - IMT

ur average Carotid-IMT is **0.751**

u are a *56* year old with arteries of a **60** year old Male.

s graph indicates your percentile score for similar sex and age.

Percentile | 25 | 50 | 61st | 75 | Percentile | 100

-IMT of less than 0.60mm is generally considered healthy.

hnical Notes:

ear old Male for cardiovascular risk stratification.

Physicians Notes:

Current CIMT Measurement

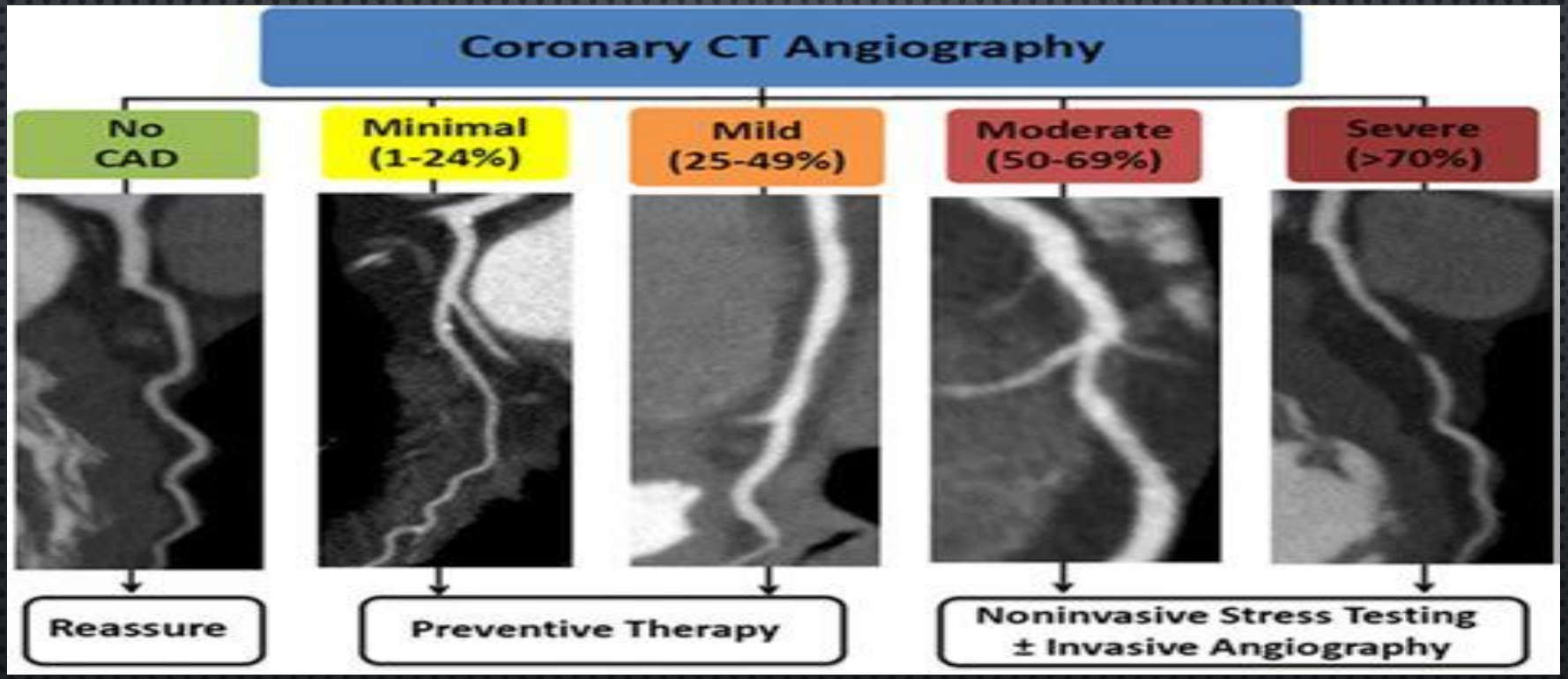
Date	Age at Exam	Arterial Age	CIMT	Percentile
Feb 2016	56	60	0.751	61st

Mean Distal 1 cm CCA IMT of General Population with No Coronary Heart History

1.15
1.10
1.05
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25

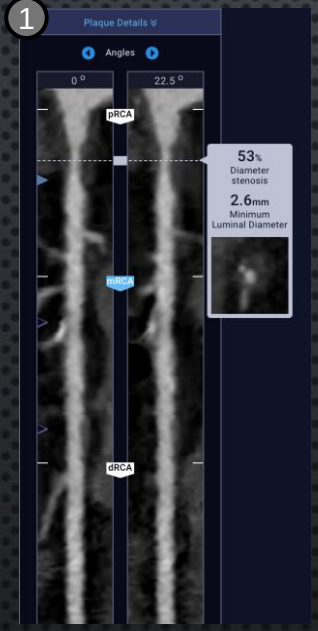
ACTION STEP

CORONARY CT ANGIOGRAPHY CCTA: 2010

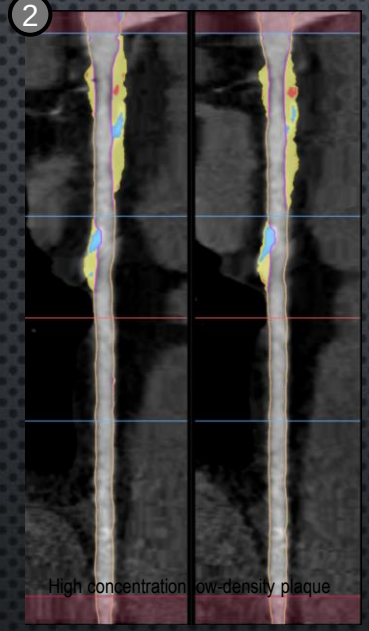


Coronary CCTA With AI Enables Comprehensive Evaluation of Individual Risk

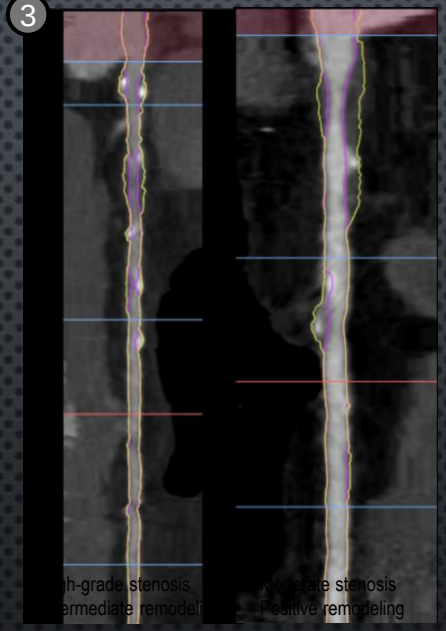
The four (4) most important features of risk: CONFIRM, ICONIC, PARADIGM, PROMISE, SCOT-HEART, ISCHEMIA, PROSPECT, etc.



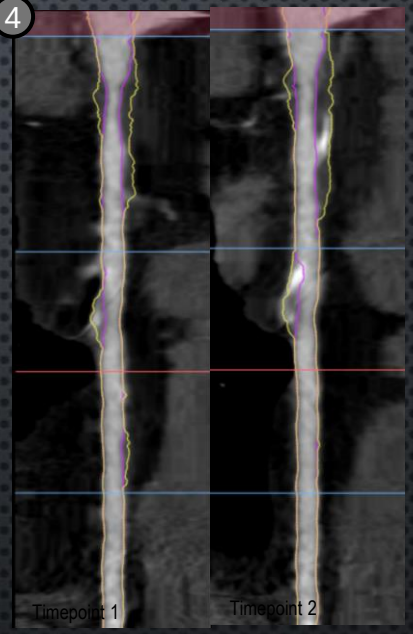
Plaque Burden



Plaque Composition



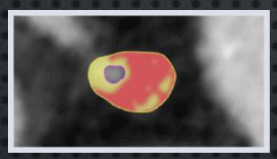
Vascular Morphology
(Stenosis / Remodeling)



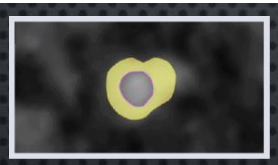
Plaque Progression

NOT ALL PLAQUE IS THE SAME

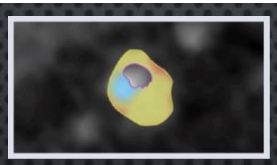
PLAQUES THAT LOOK DIFFERENT BEHAVE DIFFERENTLY.



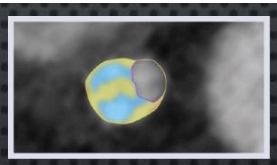
LOW-DENSITY NON-CALCIFIED PLAQUE (RED)



NON-CALCIFIED PLAQUE (YELLOW)



ALL PLAQUE TYPES

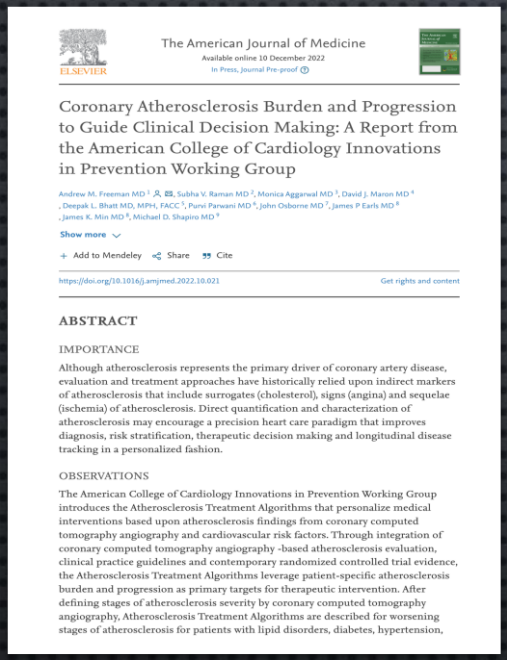


NON-CALCIFIED (YELLOW) AND CALCIFIED PLAQUE (BLUE)

CALCIFIED PLAQUE (BLUE)

HIGH RISK | INTERMEDIATE RISK | LOW RISK

Therapy Based on Plaque Stage



The American Journal of Medicine
Available online 10 December 2022
In Press, Journal Pre-proof

Coronary Atherosclerosis Burden and Progression to Guide Clinical Decision Making: A Report from the American College of Cardiology Innovations in Prevention Working Group

Andrew M. Freeman MD [1], Subha V. Raman MD [2], Monica Aggarwal MD [3], David J. Maron MD [4], Deepak L. Bhatt MD, MPH, FACC [5], Purvi Parwani MD [6], John Osborne MD [7], James P Earls MD [8], James K. Min MD [9], Michael D. Shapiro MD [9]

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ABSTRACT

IMPORTANCE

Although atherosclerosis represents the primary driver of coronary artery disease, evaluation and treatment approaches have historically relied upon indirect markers of atherosclerosis that include surrogates (cholesterol), signs (angina) and sequelae (ischemia) of atherosclerosis. Direct quantification and characterization of atherosclerosis may encourage a precision heart care paradigm that improves diagnosis, risk stratification, therapeutic decision making and longitudinal disease tracking in a personalized fashion.

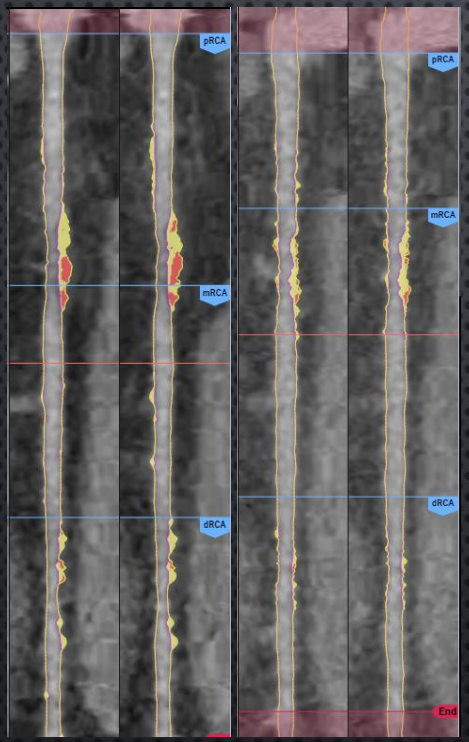
OBSERVATIONS

The American College of Cardiology Innovations in Prevention Working Group introduces the Atherosclerosis Treatment Algorithms that personalize medical interventions based upon atherosclerosis findings from coronary computed tomography angiography and cardiovascular risk factors. Through integration of coronary computed tomography angiography -based atherosclerosis evaluation, clinical practice guidelines and contemporary randomized controlled trial evidence, the Atherosclerosis Treatment Algorithms leverage patient-specific atherosclerosis burden and progression as primary targets for therapeutic intervention. After defining stages of atherosclerosis severity by coronary computed tomography angiography, Atherosclerosis Treatment Algorithms are described for worsening stages of atherosclerosis for patients with lipid disorders, diabetes, hypertension,

Freeman, A et al
Am J Med 2022

Stage	Stenoses	Action	Rescan (until stable):
Stage 0: No Plaque	0	• GDMT / Consider de-escalation	4 years
Stage 1: Mild	<50%	• Statin, Ezetimibe	3 years
Stage 2: Moderate	<50%	Stage 1 Plus • Aspirin, Rivaroxaban • GLP1 if diabetic	2 years
Stage 3: Severe	<50%	Stage 2 plus • Consider PCSK9, Icosapent ethyl, Inclisirin, Bempedoic acid, Colchicine • GLP1 and SGLT2 if diabetic	1 year

PLAQUE REGRESSION. 55-year-old man taking a PCSK9 inhibitor.



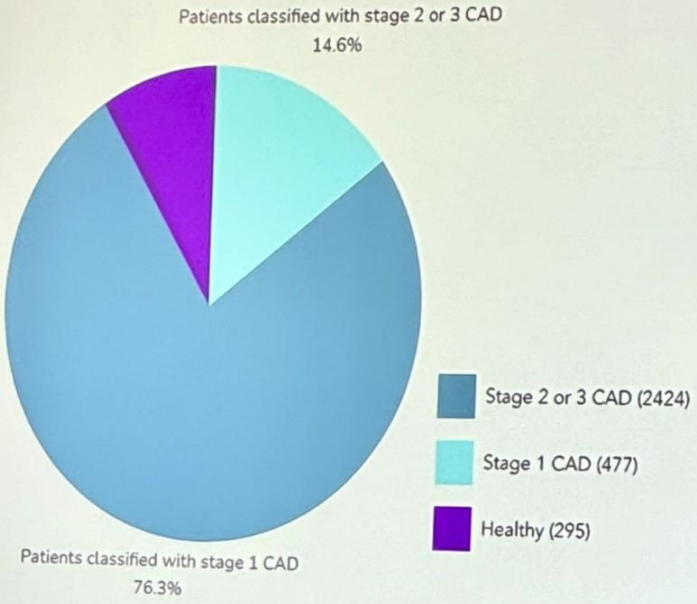
2017 2018

ALL	Current Cleerly ID: F9F050BC 3/1/2017		Compared Cleerly ID: 5D3467A0 10/31/2018
Total Plaque Volume (mm^3)	444.5	-133	311.5
Total Non-Calcified Plaque Volume (mm^3)	442.3	-144	298.3
Low-Density - Non-Calcified Plaque Volume (mm^3)	67.8	-35.3	32.5
Total Calcified Plaque Volume (mm^3)	2.2	+11	13.2
# of Severe Stenosis	0	=	0
# of Moderate Stenosis	1	-1	0
Highest Remodeling Index	1.7	-0.4	1.3
Greatest Diameter Stenosis (%)	53	-5	48
Greatest Area Stenosis (%)	78	-5	73
Length (mm)	634.3	+94.7	729

Per-Patient analysis:
- 34% total regression
- 33% regression of NCP
- 52% regression of Low density NCP

Per-Plaque analysis:
- 31% regression of pRCA plaque
- 39% regression of LD-NCP content

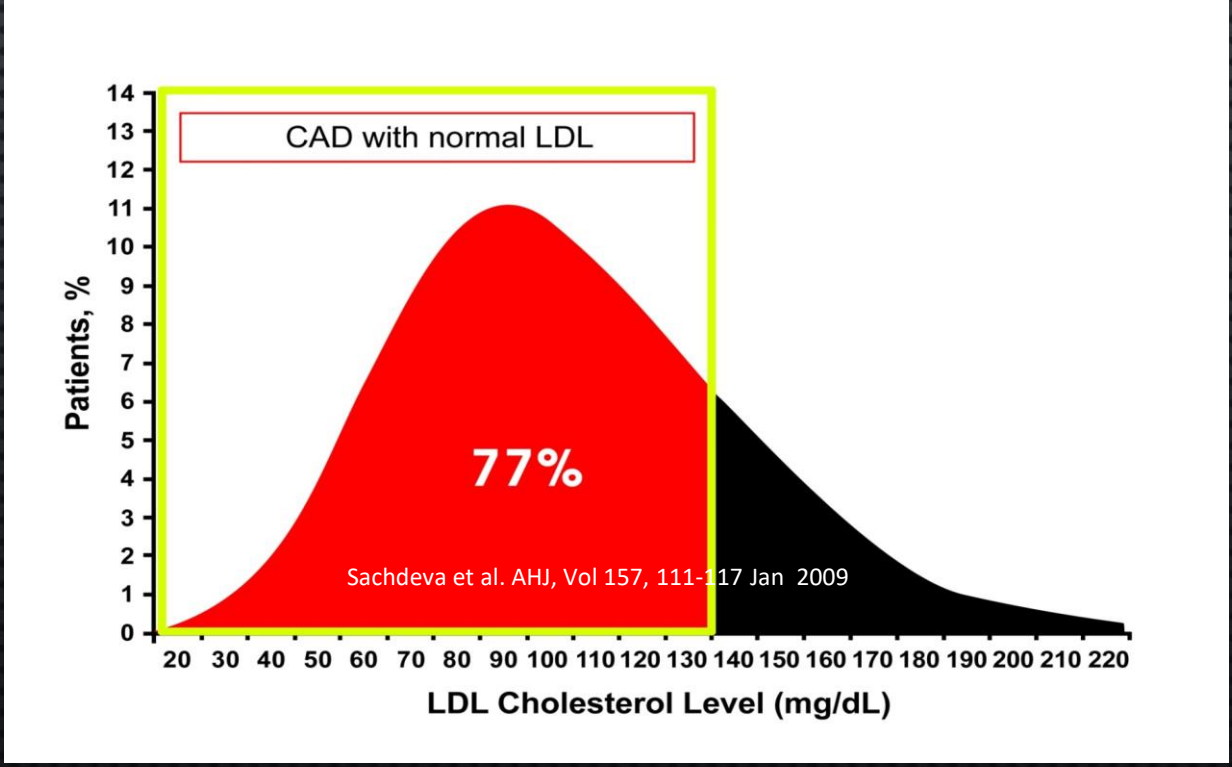
What I'm seeing - CCTA Testing with AI Read - Reveals (n=3,256)



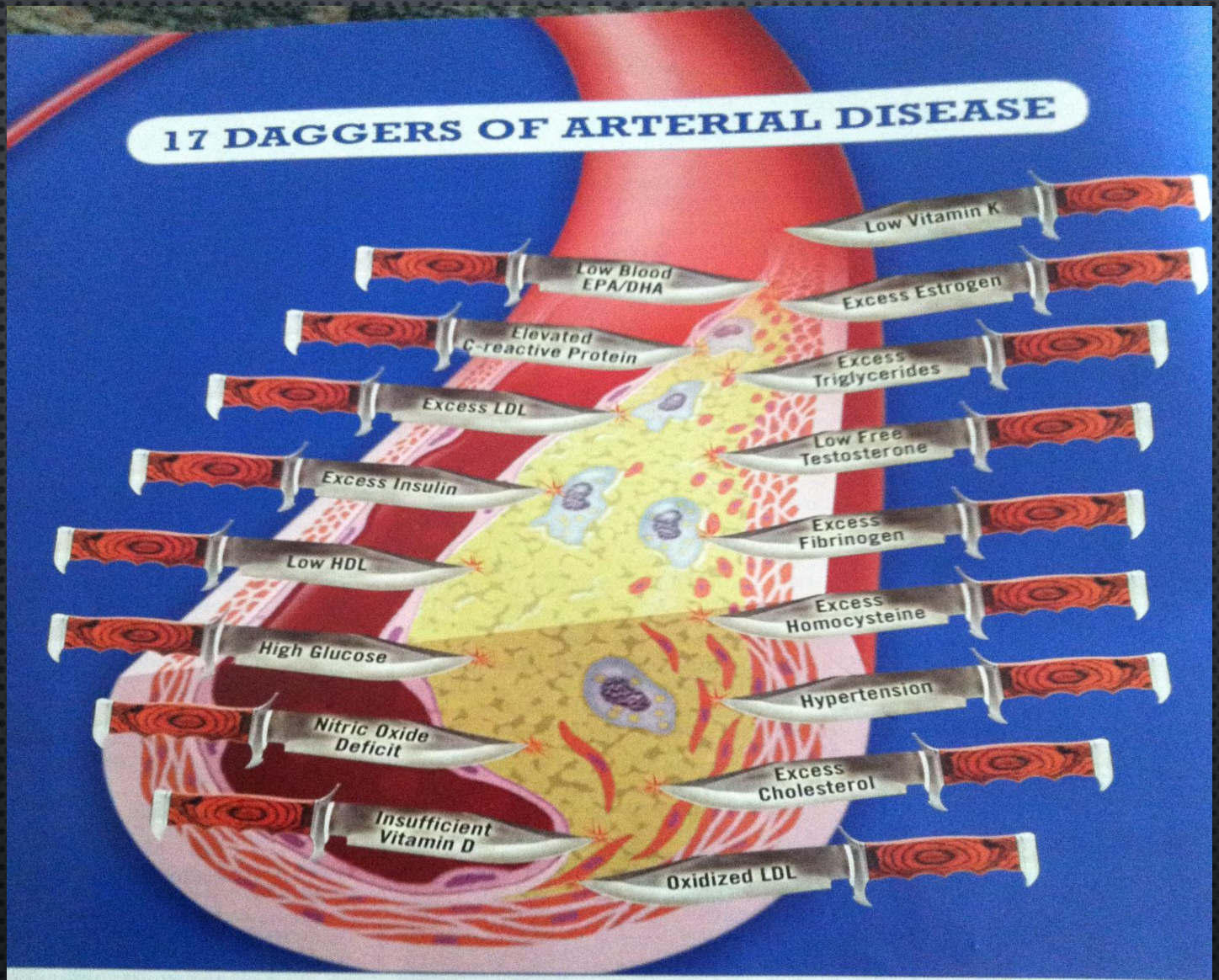
- Asymptomatic "healthy" population
- 15% (477) of people classified with stage 2 or 3 CAD
- 76% (2484) of patients classified with stage 1 CAD
  - 36% (889/2484) of stage 1 disease patients had **no calcified plaque** and **would be missed** by conventional methods
    - These are high risk for CAD event
  - 9% (295/3256) of patients had moderate and/or severe stenoses detected at their first study

STEP 5: Routine Labs are NOT Adequate

Of 136,905 patients hospitalized with CAD, 77% had LDL levels below 130 mg/dl



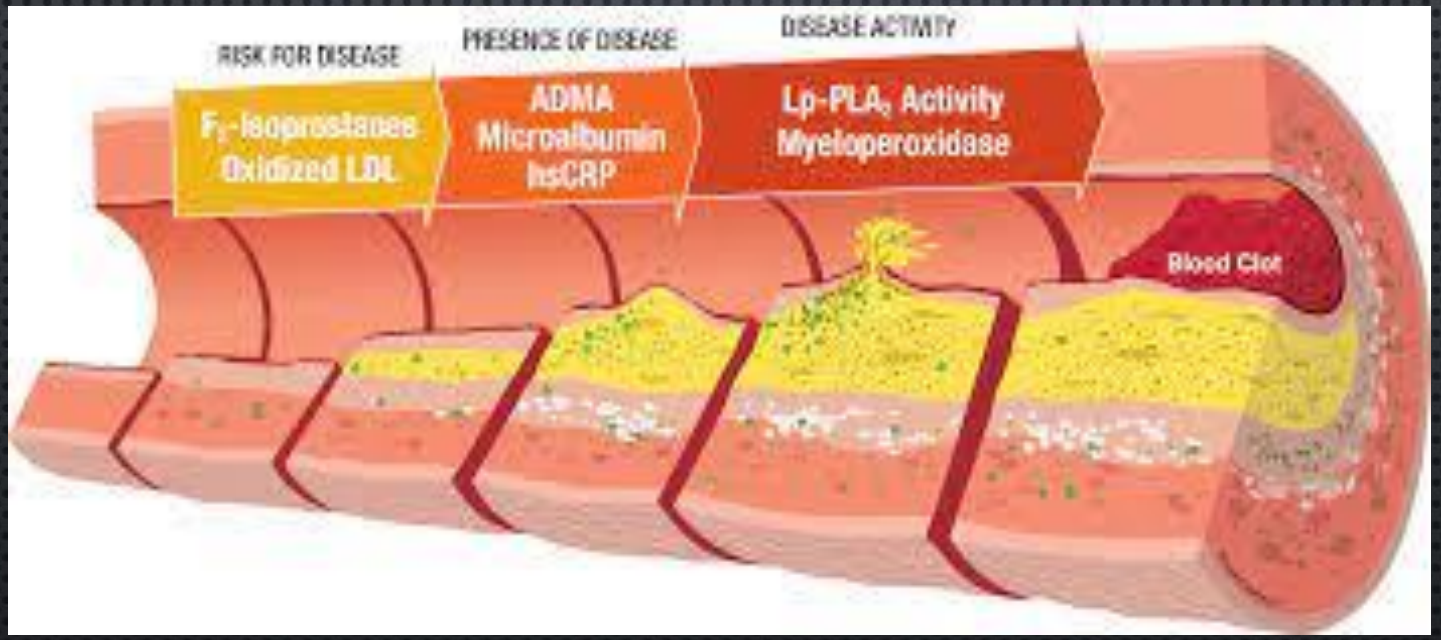
Sachdeva et al. AHJ, Vol 157, 111-117 Jan 2009



Life Extension has identified 17 independent factors for cardiovascular disease. This image

Any one of these 17 "daggers" can initiate

STEP 6: INFLAMMATION



Colchicine in Patients with Chronic Coronary Disease

MYOCARDIAL INFARCTION:
DOES COLCHICINE REDUCE RISK OF FURTHER ISCHEMIC CARDIOVASCULAR EVENTS?

0.5 MG COLCHICINE

5222 patients with evidence of coronary disease

PLACEBO

PRIMARY OUTCOME

Composite:
cardiovascular (CV) death,
spontaneous myocardial infarction
Ischemic stroke
Ischemia-driven coronary revascularization

Incidence: 2.5 vs. 3.6
events/100,000 person-years

HR = 0.69
95% CI 0.57 to 0.83, p<0.001

No difference in CV mortality, non-CV mortality, and all-cause mortality

Patients who received colchicine had a lower risk of composite CV events, but similar rates of death (CV, non-CV, or all-cause)

Nidorf et al. *NEJM*. August 31, 2020.

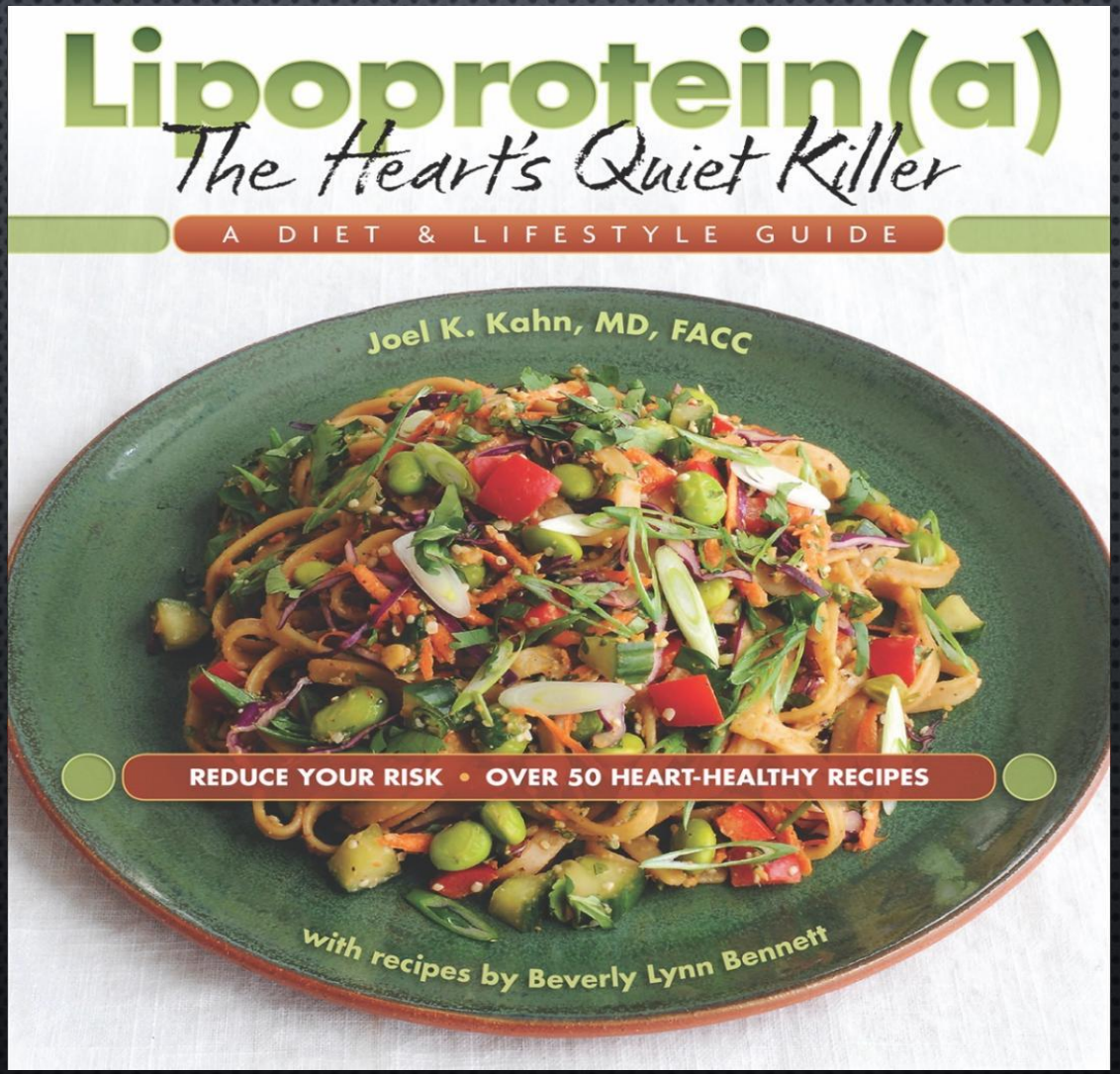
ACTION STEP

an absolute cure for
RESTLESS LEGS SYNDROME

GETTING TESTED FOR INFLAMMATION

"Life is not merely to be alive, but to be well." - Marcus Valerius Martial"

STEP 7

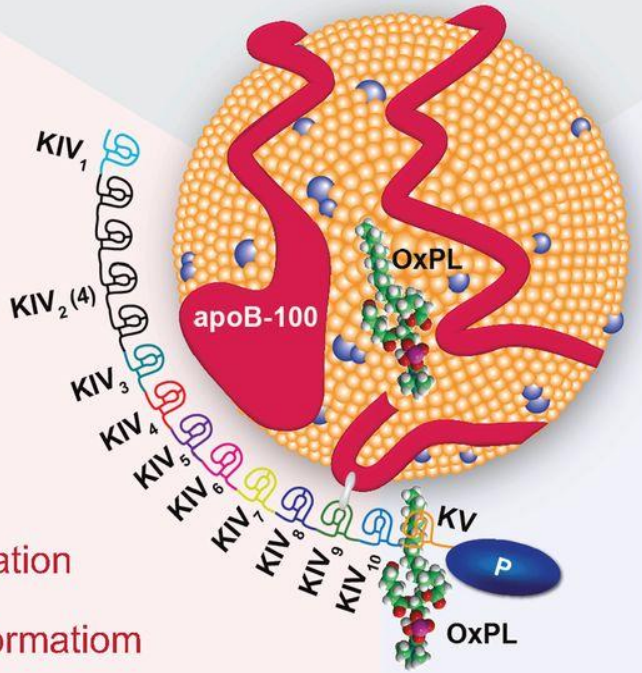

Lipoprotein(a)
The Heart's Quiet Killer
A DIET & LIFESTYLE GUIDE
Joel K. Kahn, MD, FACC
REDUCE YOUR RISK • OVER 50 HEART-HEALTHY RECIPES
with recipes by Beverly Lynn Bennett

Pro-inflammatory

- ↑ Macrophage IL-8 expression
- ↑ Monocyte cytokine release
- ↑ Oxidized Phosopholipids
- ↑ Monocyte chemotaxis/transmigration
- Carries MCP-1

Proatherogenic

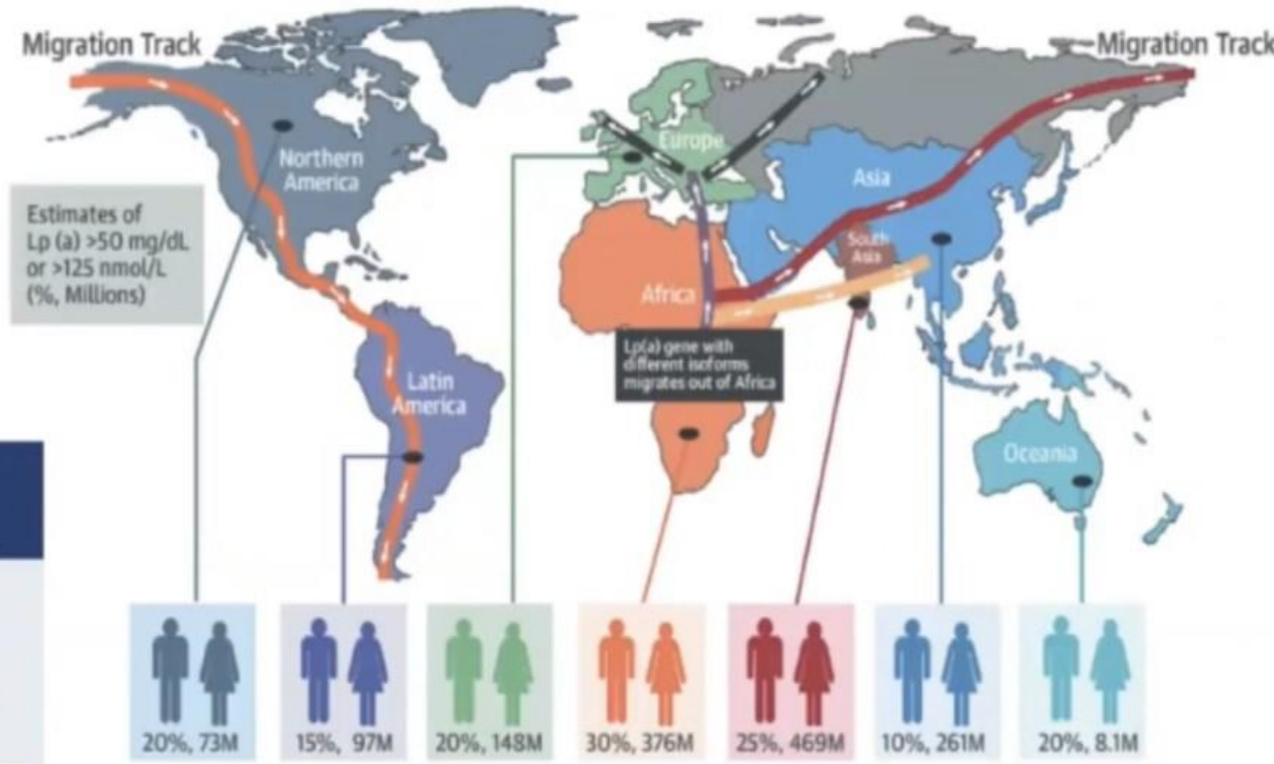
- ↑ EC binding
- ↑ Upregulation of adhesion molecules
- ↑ SMC proliferation
- ↑ Proteoglycan matrix binding
- ↑ Foam/cell formation
- ↑ Necrotic core formatiom
- ↑ Lesion calcification



Prothrombotic

- ↓ Plasminogen activation
- ↓ Fibrin degradation
- ↑ EC PAI-1 expression
- ↑ TFPI activity
- ↑ Platelet responsiveness

Prevalence elevated Lp(a)

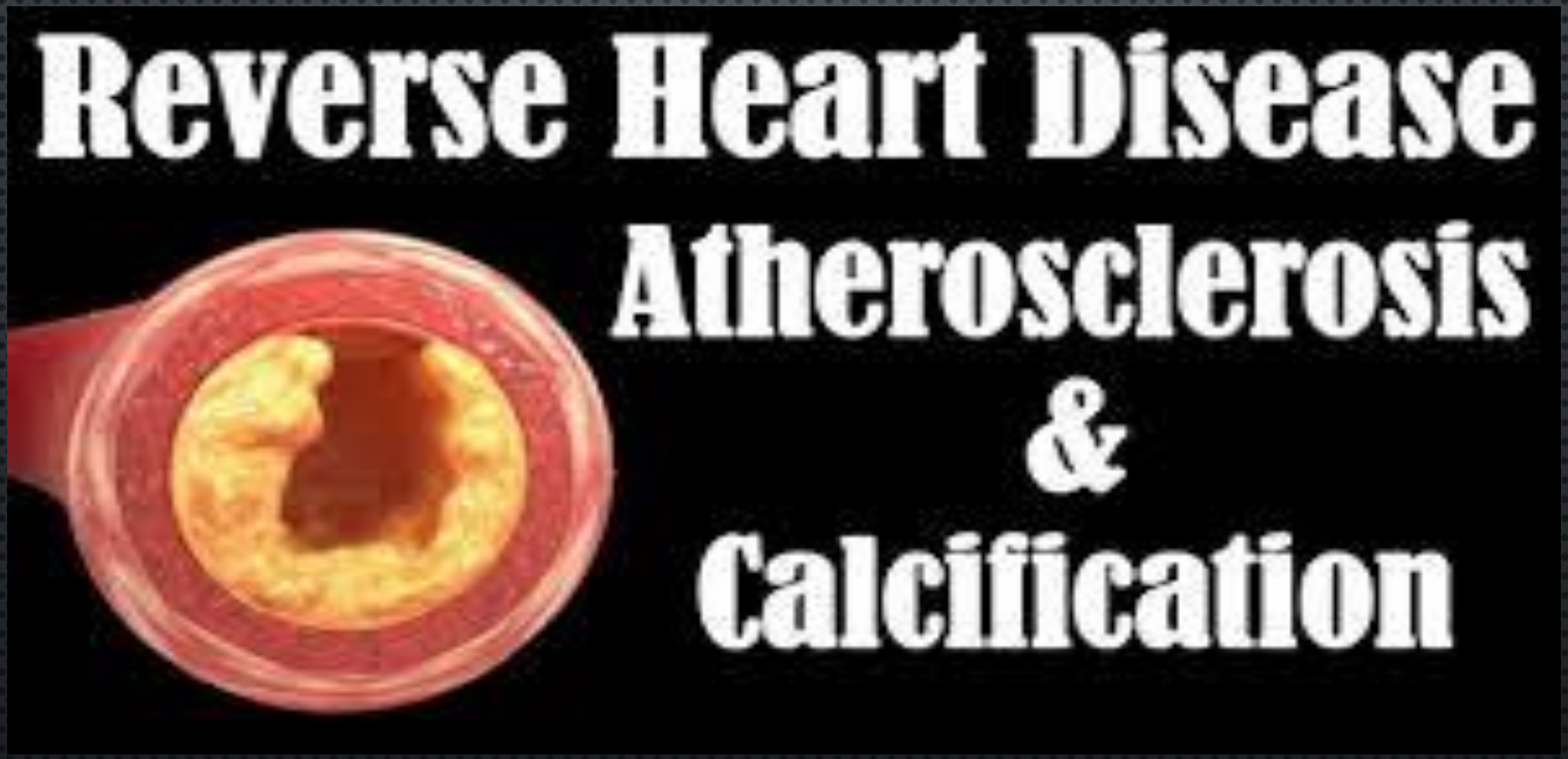


Prevalence of Lp(a)
> 50 mg/dL (> 125 nmol/L)

1:5 people
~1.4 billion worldwide

Tsimikas. JACC 2018. 71(2):177-192

STEP 8: REVERSAL



Intensive Lifestyle Changes for Reversal of Coronary Heart Disease

Dean Ornish, MD; Larry W. Scherwitz, PhD; James H. Billings, PhD, MPH; K. Lance Gould, MD; Terri A. Merritt, MS; Stephen Sparler, MA; William T. Armstrong, MD; Thomas A. Ports, MD; Richard L. Kirkeeide, PhD; Charissa Hogeboom, PhD; Richard J. Brand, PhD

Context.—The Lifestyle Heart Trial demonstrated that intensive lifestyle changes may lead to regression of coronary atherosclerosis after 1 year.

Objectives.—To determine the feasibility of patients to sustain intensive lifestyle changes for a total of 5 years and the effects of these lifestyle changes (without lipid-lowering drugs) on coronary heart disease.

Design.—Randomized controlled trial conducted from 1986 to 1992 using a randomized invitational design.

Patients.—Forty-eight patients with moderate to severe coronary heart disease were randomized to an intensive lifestyle change group or to a usual-care control group, and 35 completed the 5-year follow-up quantitative coronary arteriography.

Setting.—Two tertiary care university medical centers.

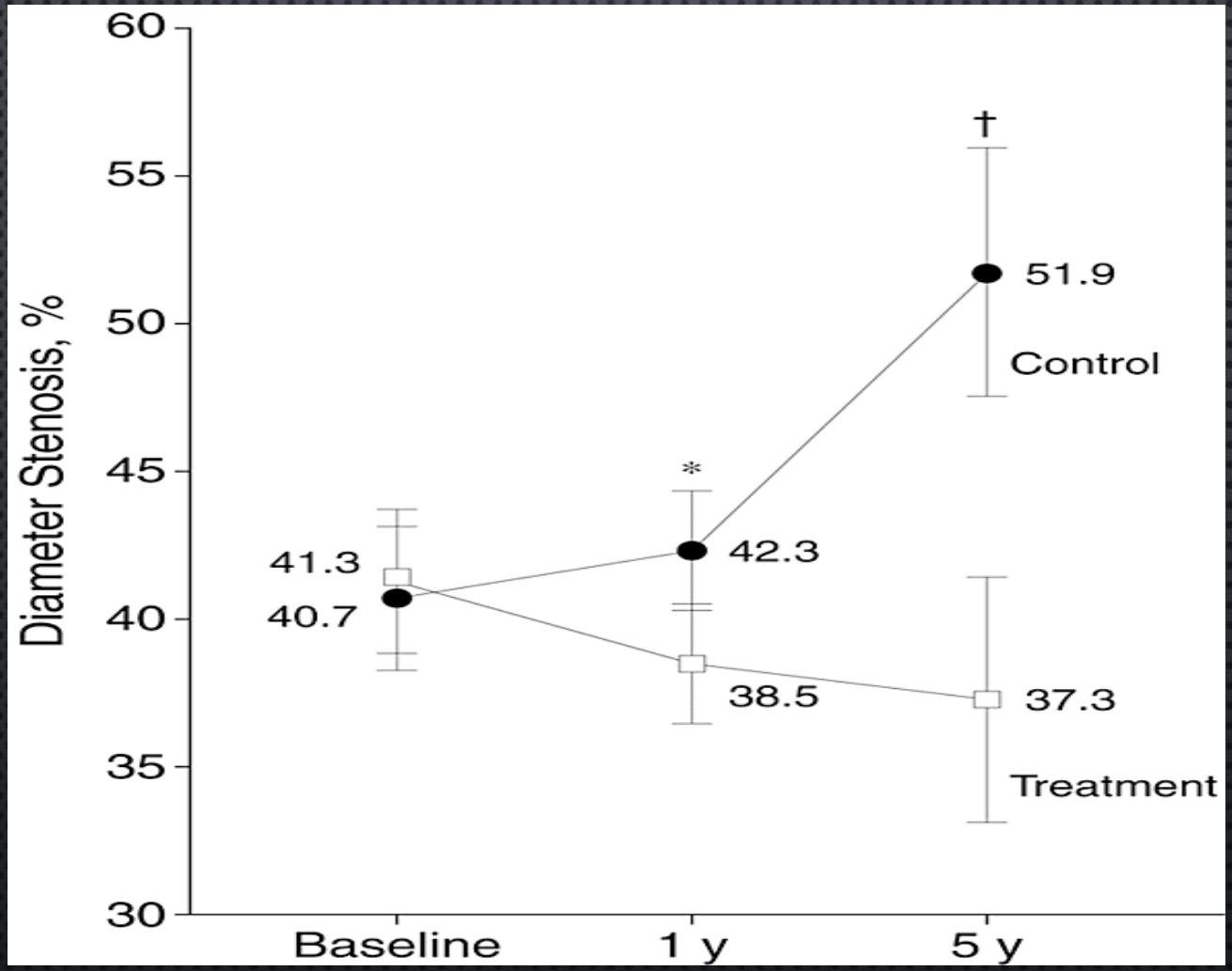
Intervention.—Intensive lifestyle changes (10% fat whole foods vegetarian diet, aerobic exercise, stress management training, smoking cessation, group psychosocial support) for 5 years.

Main Outcome Measures.—Adherence to intensive lifestyle changes, changes in coronary artery percent diameter stenosis, and cardiac events.

THE LIFESTYLE Heart Trial was the first randomized clinical trial to investigate whether ambulatory patients could be motivated to make and sustain comprehensive lifestyle changes and, if so, whether the progression of coronary atherosclerosis could be stopped or reversed without using lipid-lowering drugs as measured by computer-assisted quantitative coronary arteriography. This study derived from earlier studies that used noninvasive measures.[1,2]

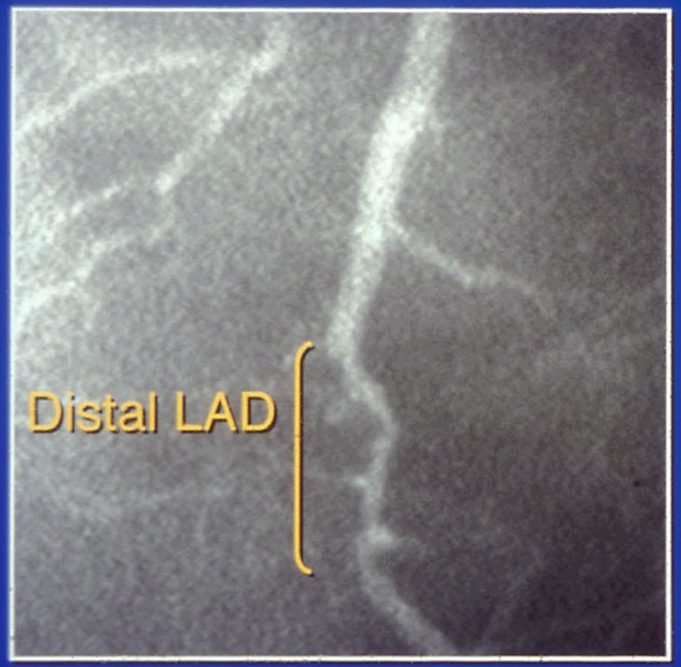
After 1 year, we found that experimental group participants were able to make and maintain intensive lifestyle changes and had a 37.2% reduction in low-density lipoprotein (LDL) choles-

Ornish, D. et al. (1998). JAMA, 280, 2001–2007

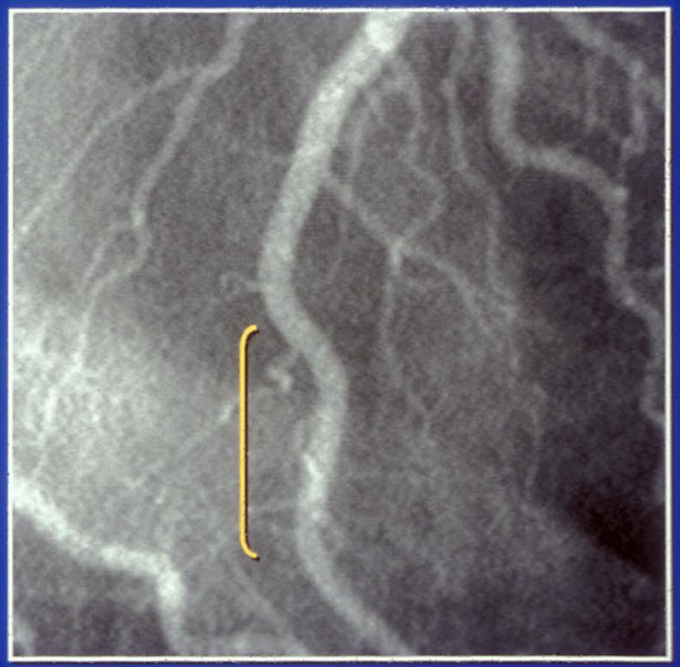

60
55
50
45
40
35
30
Diameter Stenosis, %
†
51.9
Control
*
41.3
40.7
42.3
38.5
37.3
Treatment
Baseline
1 y
5 y

Reversal of Coronary Disease

November 27,1996



July 22, 1999



Ornish and Pritikin Programs Approved by CMS

In August 2010, the Centers for Medicare and Medicaid Services (CMS) approved the Ornish Program for Reversing Heart Disease and the Pritikin Program for inclusion in the list of approved intensive cardiac rehabilitation (ICR) programs for Medicaid and Medicare reimbursement.

The Ornish Program for Reversing Heart Disease (also known as the Multisite Cardiac Lifestyle Intervention Program, Multicenter Cardiac Lifestyle Intervention Program, and the Lifestyle Heart Trial program) was initially described in the 1970s and incorporates comprehensive lifestyle modifications, including exercise, a low-fat diet, smoking cessation, stress management training, and group support sessions. Extensive research has continued over the past 30 years, although the focus of the intervention (lifestyle modifications) did not change.

The Pritikin Program (also known as the Pritikin Longevity Program) originated in the 1950s and is a comprehensive program that is provided in a physician's office and incorporates a specific diet (10-15 percent of calories from fat, 15-20 percent from protein, 65-75 percent from complex carbohydrates), exercise, and counseling lasting 21-26 days. An optional residential component is also available for participants.

To qualify for reimbursement, the Ornish and Pritikin programs had to meet the ICR program requirements set forth by Congress in the Social Security Act and in CMS regulations. As required by the Social Security Act, an ICR program must show, in peer-reviewed published research, that it improves patients' cardiovascular disease through specific outcomes. The program must also demonstrate through peer-reviewed, published research that it has accomplished one or more of the following for its patients: (1) positively affected the progression of coronary heart disease, (2) reduced the need for coronary bypass surgery, and (3) reduced the need for percutaneous coronary interventions. Additionally, the program must show that it accomplished a statistically significant reduction in five or more of the following measures for patients from their levels before cardiac rehabilitation services to after cardiac rehabilitation services: (1) low density lipoprotein, (2) triglycerides, (3) body mass index, (4) systolic blood pressure, (5) diastolic blood pressure, and (6) the need for cholesterol, blood pressure, and diabetes medications. Intensive cardiac rehabilitation programs must be approved through the NCD process to ensure that they demonstrate these accomplishments; ICR sessions are limited to 72 one-hour sessions, up to six sessions per day, over a period of up to 18 weeks.

CMS staff reviewed six studies of the Pritikin program and nine on the Ornish version appearing in peer-reviewed publications. Ornish's most recent study—"The Effectiveness and Efficacy of an Intensive Cardiac Rehabilitation Program in 24 Sites"—was published in the March/April issue of *The Science of Health Promotion*. This study summarizes the experience of almost 3,000 patients who went through 24 different hospital programs that the Preventive Medicine Research Institute trained in various parts of the country. In brief, the investigators found significant improvements in all metrics and that these were sustained for at least one year.

Individual hospitals and clinics wishing to provide the Ornish program for the Medicare and Medicaid patients should go to http://www.pmri.org/certified_programs.html for further information. Additional information and the official CMS approval is listed at: http://www.cms.gov/MedicareApprovedFacilitie/07_ICR.asp#TopOfPage.

Bravewell Seeks Best Practices

The Bravewell Collaborative has launched a new program to recognize and highlight best practices from integrative medicine centers and programs throughout the United States. The submission process is open to anyone. Best practices are reviewed by a committee of experts and, if approved, posted on the Bravewell Web site to share with the field.

"By documenting best practices and making them easily available to those working within health care, we hope to bring attention to how integrative medicine can improve patient care," said Teresa Bonner, vice president of programs for the Bravewell Collaborative.

Best practices should be submitted to: info@bravewell.org. Please put "Best Practices" in the subject line.

Criteria

To be considered a best practice, the model, program, or intervention must have been in use for the more than three years and be based on documented patient outcomes. Please include information on the following in the submission:

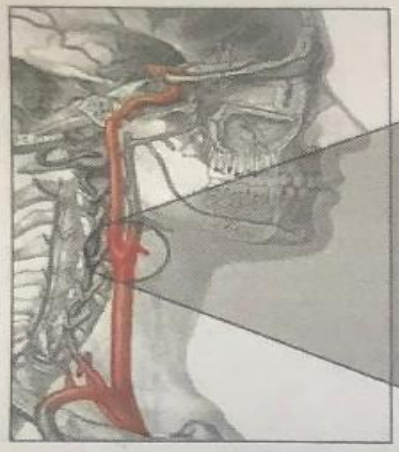
- name and contact information of author
- name and description of clinic, center, or hospital where the practice is in use
- what health challenge is being treated
- a complete description of the model of care, program, or practice
- what type of healthcare providers deliver the best practice and how they are credentialed
- how patients are recruited or selected for the practice
- patient intake and assessment forms used
- patient outcomes data
- any cost-effectiveness data
- a description of how the program or practice interfaces with the larger organization

George Family Foundation Integrative Nursing Fellowship

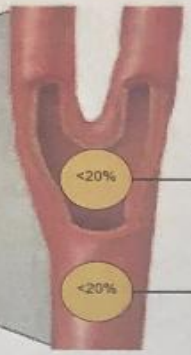
The George Family Foundation recently awarded a grant of $556,000 to the Center for Spirituality & Healing at the University of Minnesota to create a fellowship and cocurricular program that will prepare nurse leaders in integrative health and healing.

Over the next six years, the fellowship program will provide unprecedented clin-

CIMT: PLAQUE REVERSAL



Right — **Plaque Description**



2.3mm

2.061mm Heterogeneous

1.541mm Heterogeneous

3.3mm

Left — **Plaque Description**

4.9mm 5/14/18

1.543mm Heterogeneous

1.114mm Heterogeneous

2.3mm

*Plaque noted above was measured through arterial area diameter reduction, which is deliberated by measuring the circumference of the outside of the vessel subtracting any visible stenosis.

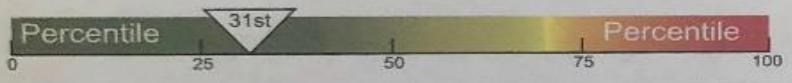
*Carotid velocities provided on reverse.

Carotid - IMT

Your average Carotid-IMT is **0.539**

You are a *46* year old with arteries of a **34** year old Male.

This graph indicates your percentile score for similar sex and age.



A C-IMT of less than 0.60mm is generally considered healthy.

Current and Previous CIMT Measurements

Date	Age	Arterial Age	CIMT	Percentile
May 2019	46	34	0.539	31st
May 2018	45	41	0.583	43rd

Better

Mean Distal 1 cm CCA IMT of General Population with No Coronary Heart History

1.15

MAKING ARTERIES 14 YEARS YOUNGER

Carotid - IMT

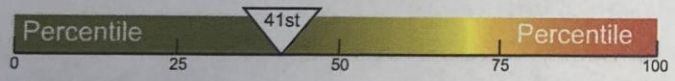
Better!

Your average Carotid-IMT is **0.765**

75yo

You are a *67* year old with arteries of a **61** year old Male.

This graph indicates your percentile score for similar sex and age.



A C-IMT of less than 0.60mm is generally considered healthy.

Technical Notes:

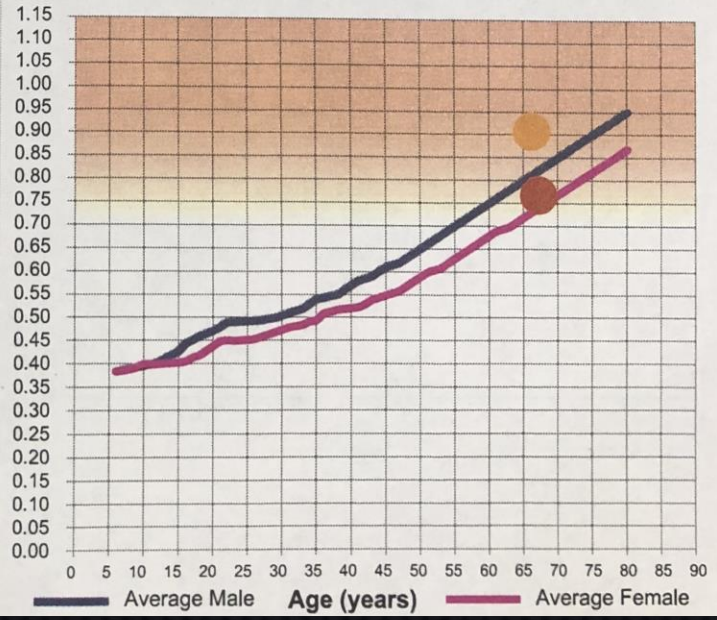
67 year old Male for cardiovascular risk stratification.

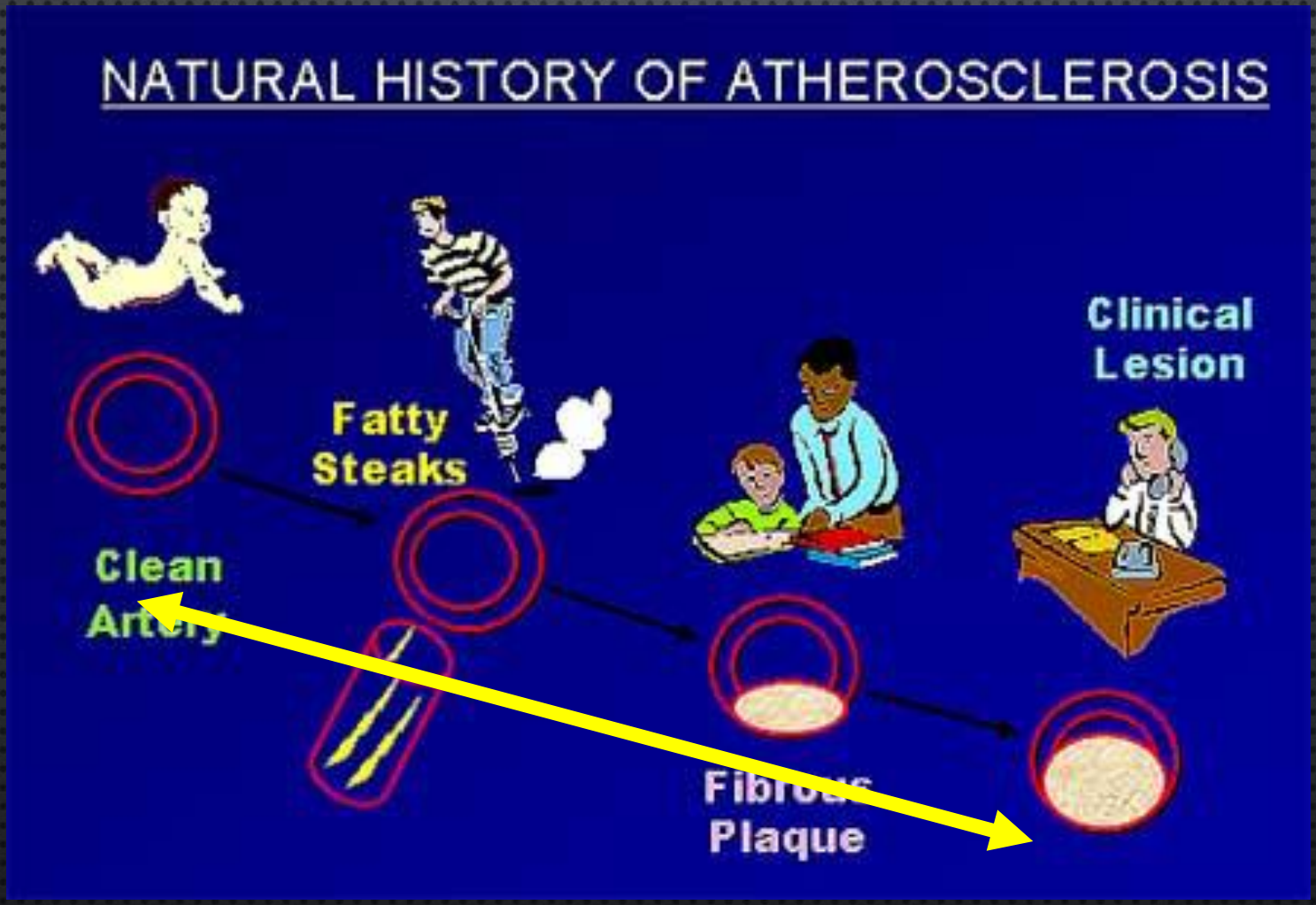
Physicians Notes:

Current and Previous CIMT Measurements

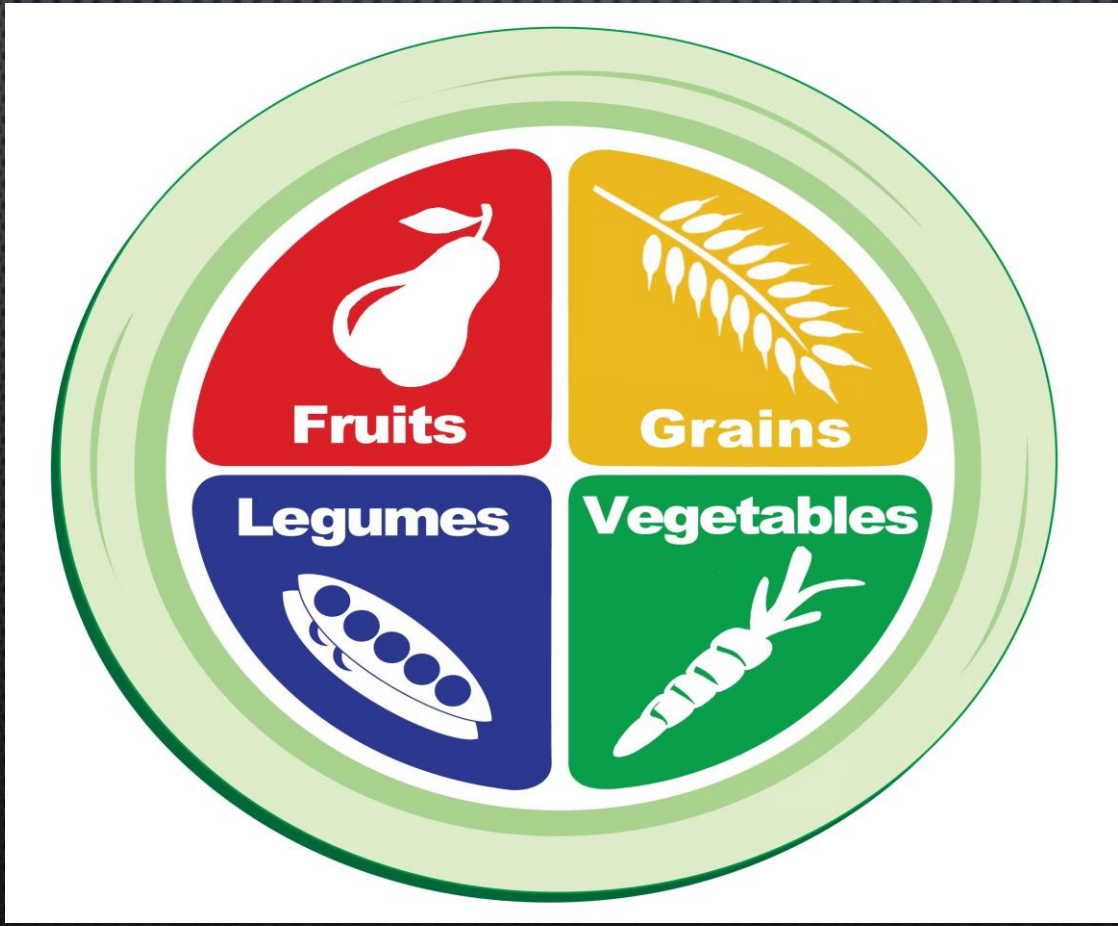
Date	Age	CIMT	Percentile
May 2018	67	0.765	41st
Oct 2017	66	0.904	70th

Mean Distal 1 cm CCA IMT of General Population with No Coronary Heart History

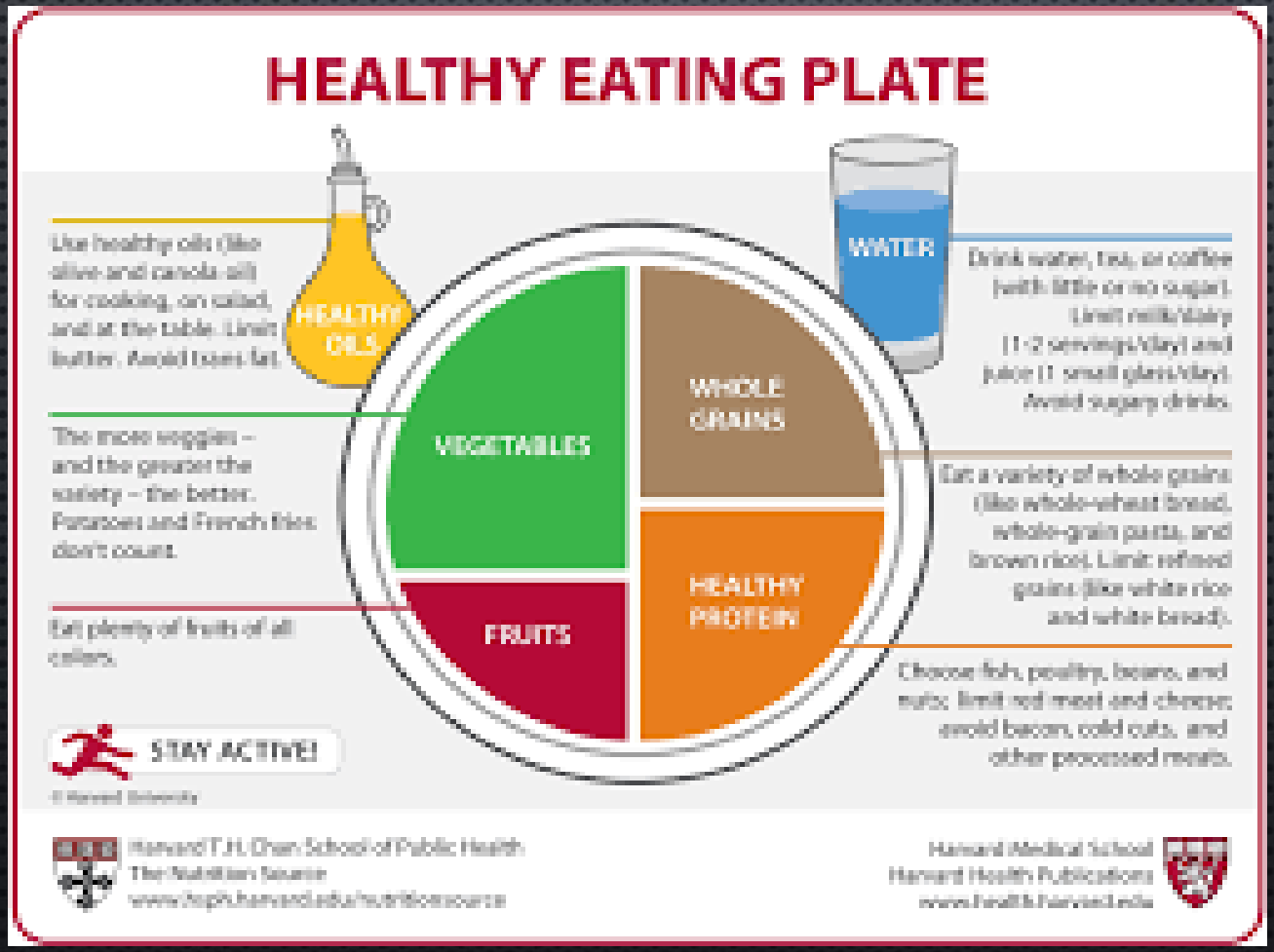



NATURAL HISTORY OF ATHEROSCLEROSIS
Fatty Steaks
Clinical Lesion
Clean Artery
Fibrous Plaque

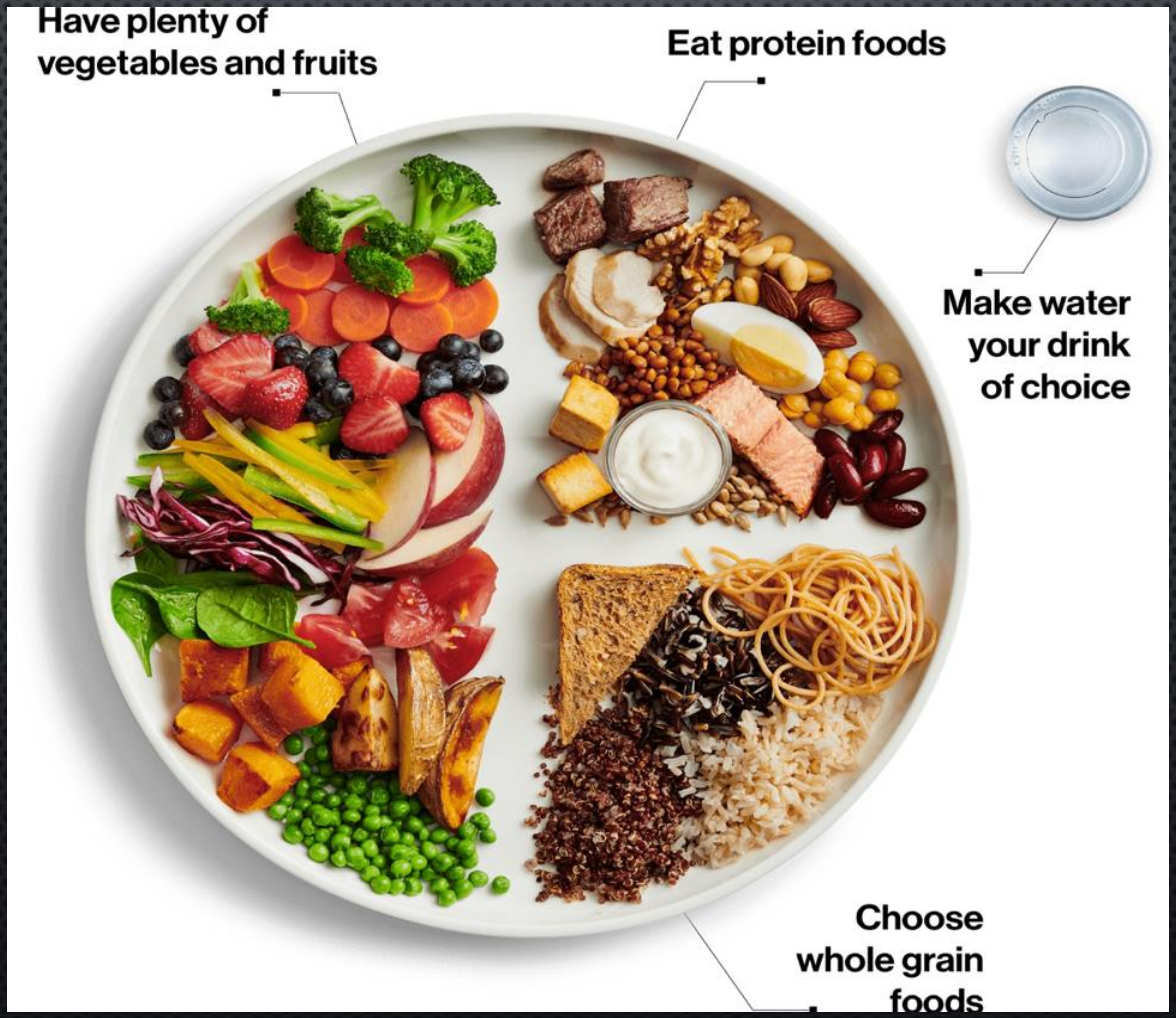
STEP 9: NUTRITION



HARVARD HEALTHY EATING PLATE 2011



CANADIAN FOOD PLATE 2019



Cardiovascular disease is the leading cause of death in the U.S. **But we can change that.**

Healthy lifestyle choices can prevent:

- 8 out of 10 cases of coronary heart disease
- 7 out of 10 strokes

Source: New England Journal of Medicine

Alliance for the Million Hearts Campaign