Cardiovascular Risk Factors and Primary Prevention in Athletes

Dr. James McKinney, M.D., FRCP(C)

Sports Medicine Rounds

January 6th 2016

Disclosures

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- Cardiac risk factors are NOT exciting
- Not a lot is known about the CV risk profile of athletes
- No one is going to give you a:

For starting a medication or recommending health behaviour change(s)

T/F – CVD is the number cause of death in Canada

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Leading causes of death, by sex (Both sexes)

	2011		
	Both sexes		
	rank	number	%
Total, all causes of death	...	**242,074**	**100.0**
Malignant neoplasms (cancer)	1	72,476	29.9
Diseases of heart (heart disease)	2	47,627	19.7
Cerebrovascular diseases (stroke)	3	13,283	5.5
Chronic lower respiratory diseases	4	11,184	4.6
Accidents (unintentional injuries)	5	10,716	4.4
Diabetes mellitus (diabetes)	6	7,194	3.0
Alzheimer's disease	7	6,356	2.6
Influenza and pneumonia	8	5,767	2.4
Intentional self-harm (suicide)	9	3,728	1.5
Nephritis, nephrotic syndrome and nephrosis (kidney disease)	10	3,294	1.4

Notes: Causes of death are coded to the 10th revision of the World Health Organization's International Statistical Classification of Diseases and Related Health Problems (ICD-10).
Sources: Statistics Canada, CANSIM table 102-0561.
Last modified: 2014-01-28.

FALSE!!!!

For more information, consult Health in Canada.

T/F – CVD is the number cause of death worldwide

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Globally, 1 in 3 deaths will be caused by CVD

TRUE!!!!

WHO Stats Sheet 2012

Primary Prevention

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- Primary prevention focuses on the modification of known risk factors
- Is aimed at preventing the clinical manifestations of CVD
  - such as myocardial infarction (MI) and stroke
- Primary prevention is paramount for the large number of individuals who are at high risk for CVD

What is Ideal Cardiovascular Health?

- The absence of cardiovascular disease
- A healthy lifestyle
  - (sufficient exercise, a healthy diet, absence of smoking, and BMI , 25 kg/m2)
  - Ideal health factors (untreated normal values of blood pressure, cholesterol, and fasting glucose)
- These parameters, termed 'Life's Simple 7', are presented in an AHA educational site, mylifecheck.org

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The Simple 7 – Primordial Prevention

- Cigarette smoking: nonsmoking is ideal
- Physical activity: ≥150 min moderate intensity or equivalent exercise per week is ideal
- BMI: <25 kg/m^2 is ideal
- Healthy diet: achieving at least four of the five important dietary components, focusing on fruits and vegetables, fish, fibre, and sodium intake and sweetened beverage intake
- Total cholesterol level: <200 mg/dl is ideal in adults, <170 mg/dl is ideal in children
- Blood pressure: <120/80 mmHg is ideal
- Fasting plasma glucose level: <100 mg/dl is ideal

What % of American adults have >5 of 7 of the ‘simple 7’

- A – 10%
- B – 20%
- C – 30%
- D – 40%
- E – 50%

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What % of American adults have >5 of 7 of the 'simple 7'

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- A – 10%
- **B – 20%**
- C – 30%
- D – 40%
- E – 50%

Only 40% of children >5/7 of the simple 7

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What is a risk factor?

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- A risk factor is a characteristic or feature of an individual or population that presents early in life and associates with an increased risk of developing future disease
- To have clinical usefulness, it must predate the onset of clinical disease
- The risk marker of interest may be an:
  - acquired behavior (e.g.,smoking)
  - an inherited trait (e.g., familial hyperlipidemia)
  - a laboratory value (e.g. LDL)
  - an exposure (radiation)
  - a location (Chernobyl)

What is a risk factor?

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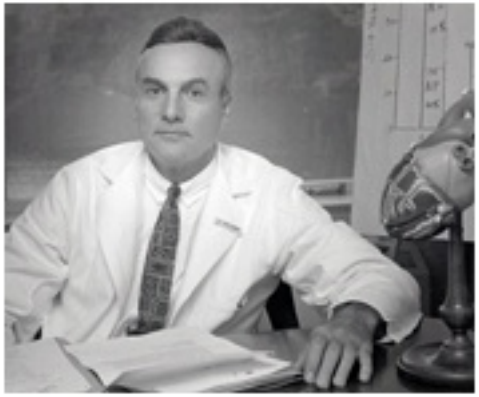
Factors of Risk in the Development of Coronary Heart Disease—
Six-Year Follow-up Experience

The Framingham Study

WILLIAM B. KANNEL, M.D., THOMAS R. DAWBER, M.D., F.A.C.P.,
ABRAHAM KAGAN, M.D., F.A.C.P., NICHOLAS REVOTSKIE, M.D.,
AND JOSEPH STOKES, III, M.D.
Framingham, Massachusetts



Thomas Dawber, M.D.

- The term "risk factor" was popularized in the medical lexicon by Dawber and Kannel in their 1961 publication

Who are these people?

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True or False? The smoker died first?

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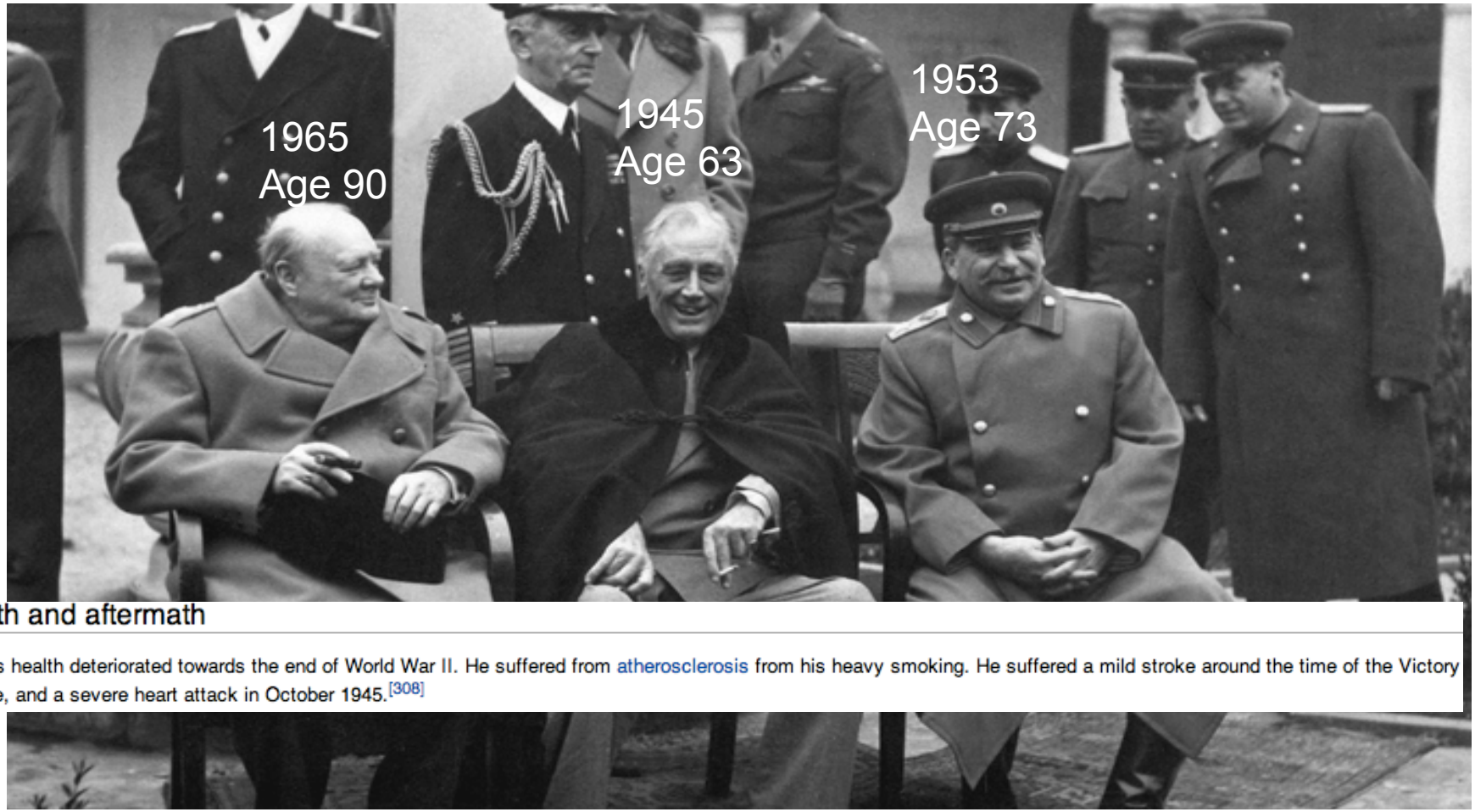
True or False? The smoker died first

True or False? The person with the highest CAD risk died first?



Death and aftermath

Stalin's health deteriorated towards the end of World War II. He suffered from atherosclerosis from his heavy smoking. He suffered a mild stroke around the time of the Victory Parade, and a severe heart attack in October 1945.[308]

Framingham

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- What is it?
- How old is it?
- Has it taught us anything? What?

Framingham Heart Study

A Project of the National Heart, Lung, and Blood Institute and Boston University

This is Framingham

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FDR

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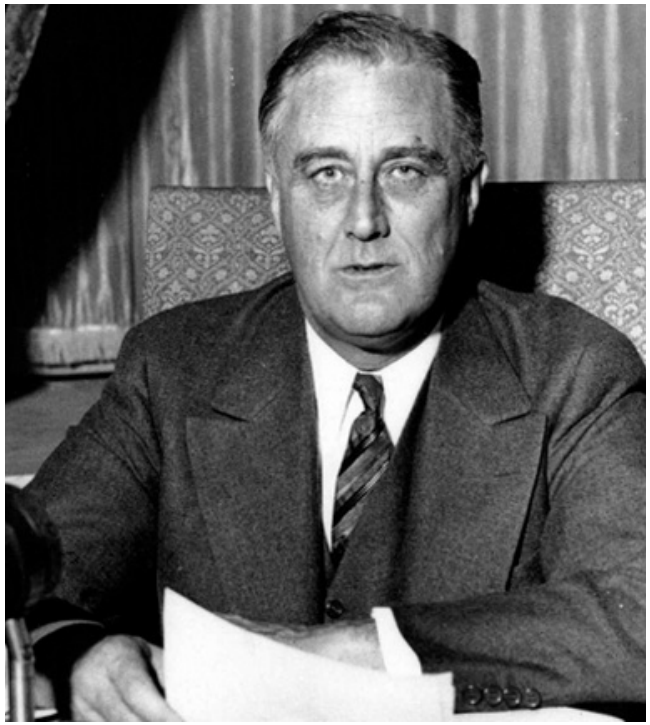
- Franklin D Roosevelt, the war-time President of the USA from 1933 to 1945
- 1932 - his blood pressure was 140/100 mm Hg
- President chose an ENT as his personal physician
- 1935 and 1941, FDR's BP rose from 136/78 to 188/105
- "no more than normal for a man of his age" -ENT doc



Howard G Bruenn

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- FDR - admitted for dyspnea on exertion, diaphoresis, and abdominal distension
- Cardiologist Howard G Bruenn, noted “blood pressure 186/108” and a chest radiograph showing an “increase in size of the cardiac shadow”
- The young cardiologist gave Roosevelt his first diagnosis of “hypertension, hypertensive heart disease, and cardiac failure”
- Bruenn had few therapeutic options to provide, and suggested digitalis and reduction of salt intake
- CXR 2 wks later showed decr heart size

EXTRA

Los Angeles Times

Pictorial

ROOSEVELT DEAD!

Cerebral Hemorrhage Proves Fatal; President Truman Sworn in Office

Yanks Near Suburb Area of Berlin

Emergency Cabinet Session Summoned; Parley Plan in Doubt

Framingham, MA

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- By the 1940's CVD was the number cause of death of Americans
  - Accounting for 50% of deaths
  - *and they didn't know why*
- Chosen b/c close to Harvard Cardiologists, physicians in town were keen, and represented an 'ideal' population of Americans
- Sept 29, 1948 - first patient screened

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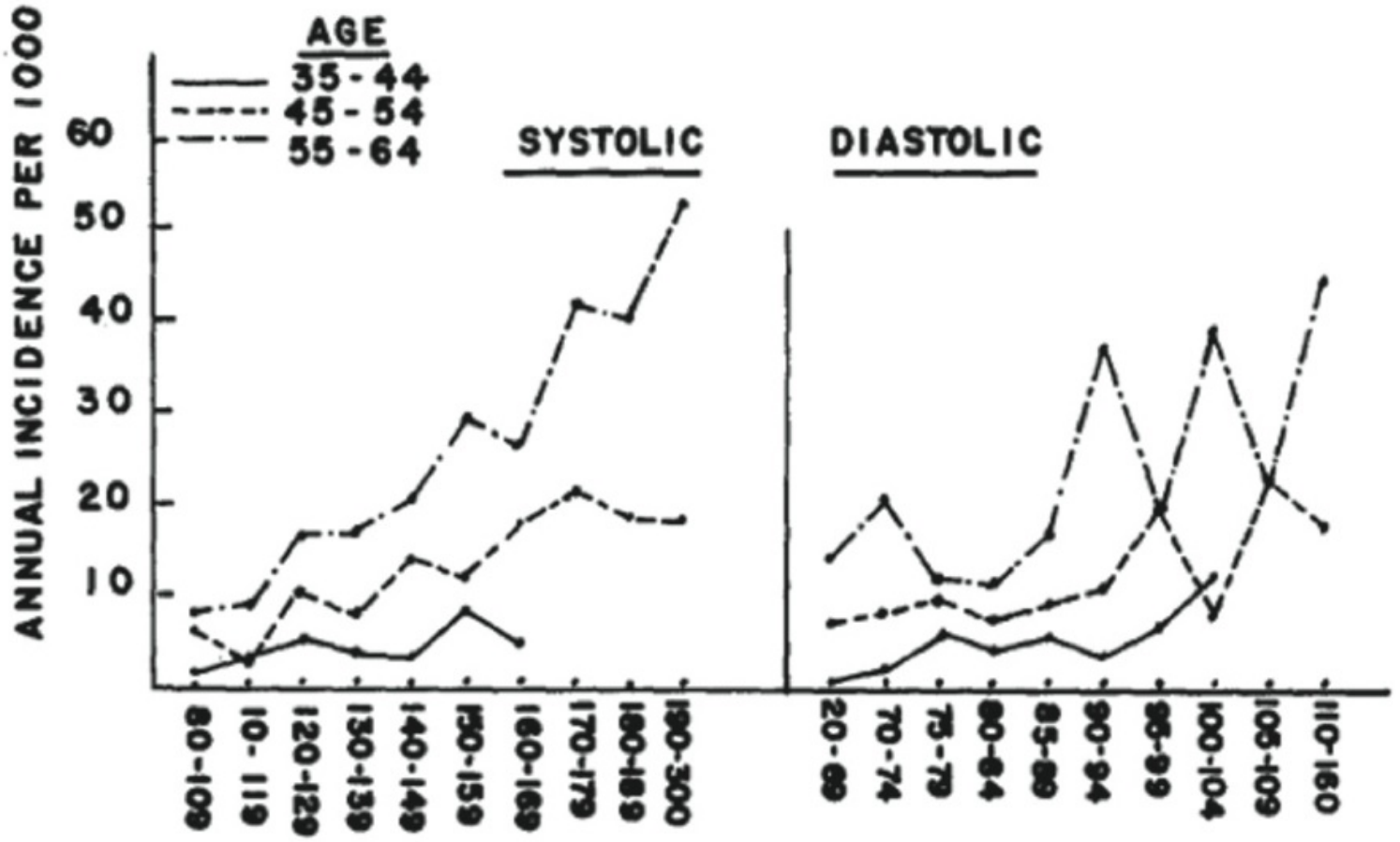
1957 – SBP identified as risk factor for CHD



Prevailing wisdom at the time thought than ‘normal’ BP was 100 + Age

So what has Framingham taught us

Framingham Risk Score[1]

Atrial Fibrillation as an Independent Risk

Journal of the American College of Cardiology
© 1999 by the American College of Cardiology
Published by Elsevier Science Inc.

Vol. 33, No. 7, 1999
ISSN 0735-1097/99/$20.00

Congestive Heart Failure in
Subjects With Normal Versus

Obesity and the Risk of New-Onset Atrial Fibrillati

Thomas J. Wang, MD
Helen Parise, ScD
Daniel Levy, MD
Ralph B. D'Agostino, Sr, PhD
Philip A. Wolf, MD
Ramachandran S. Vasan, MD
Emelia J. Benjamin, MD, ScM

Context Obesity is associated with a function, both known predictors of atri obesity is a risk factor for AF.

Objective To examine the associatio of developing AF.

Design, Setting, and Participants cohort in Framingham, Mass. We stu years; 2898 women [55%]) without flutter). Body mass index (calculated as weight in kilograms divided by square of height

curate than in mortality studies.

Panel: **Criteria for heart failure**

Major

- Paroxysmal nocturnal dyspnoea or orthopnoea
- Neck-vein distension (not counting supine position)
- Rales in presence of unexplained dyspnoea
- Cardiomegaly and pulmonary hilar congestion (diagnosed by radiograph in absence of left-to-right shunt), or increasing heart size
- Acute pulmonary oedema described in hospital records
- Ventricular gallop
- Increased venous pressure (>16 cm H_2O from right atrium)
- Circulation time (>24 s from arm to tongue)
- Hepato-jugular reflux
- Weight loss (≥4·5 kg) in 5 days, due to therapy for heart failure

Minor

- Ankle oedema
- Night cough
- Dyspnoea on ordinary exertion
- Hepatomegaly
- Pleural effusion
- Decreased vital capacity by a third from maximum records
- Tachycardia (≥120 beats per min)
- Weight loss (≥4·5 kg) in 5 days, not related to therapy for heart failure

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Risk Factors – Can you name 10

Non-Modifiable

- Age (↑)
- Gender (Male)
- Ethnicity (First Nations, South East Asian)
- Genetics
- Family History
  - 1st degree male <55 years or 1st degree female <65 years

Modifiable

- Hypertension
- Diabetes
- Dyslipidaemia
- Smoking
- Physical Inactivity
- Obesity and Abdominal Girth
- Psychosocial
- Alcohol Consumption

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Calculating risk

Low risk

5-9% MI or CHD death over next 10 years

Moderate risk

10-19% risk

High risk

≥20% risk

May Require further risk stratification

Framingham Risk Score[1]

Risk assessment tool for estimating a patient's 10-year risk of developing cardiovascular disease

Age:	Years
Gender:	Female Male
Total cholesterol:	mmol/L
HDL cholesterol:	mmol/L
Smoker:	Yes No
Diabetes:	Yes No
Systolic blood pressure:	mm Hg
Is the patient being treated for high blood pressure?	Yes No

Calculate risk

This online assessment tool is intended as a clinical practice aid for use by experienced healthcare professionals. Results obtained from this tool should not be used alone as a guide for patient care.

What is the 10-year risk of a 60 year old man with normal lipids, non-smoker, not HTNive

- A – 5%
- B – 10%
- C – 15%
- D – 20%

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What is the 10-year risk of a 60 year old man with normal lipids, non-smoker, not HTNive

- A – 5%
- **B – 10%**
- C – 15%
- D – 20%

Age:	60 Years
Gender:	○ Female ◉ Male
Total cholesterol:	4 mmol/L
HDL cholesterol:	1.25 mmol/L
Smoker:	○ Yes ◉ No
Diabetes:	○ Yes ◉ No
Systolic blood pressure:	120 mm Hg
Is the patient being treated for high blood pressure?	○ Yes ◉ No

Calculate risk

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What is the 10-year risk of a 60 year old man with normal lipids, non-smoker, not HTNive

- A – 5%
- **B – 10%**
- C – 15%
- D – 20%

Framingham Risk Score - RESULTS[1,4]

Your patient's Framingham Risk Score is 11.2%

2009 CCS Canadian Cholesterol Guidelines Recommendation[1]

Risk Level	Initiate/consider treatment if any of the following:	Primary LDL-C targets
Moderate† (FRS 10-19%)	• LDL-C > 3.5 mmol/L • T C:HDL-C ratio of > 5.0 • hsCRP > 2 mg/L (in men > 50 and women > 60)‡	Either: • < 2.0 mmol/L or • ≥ 50% reduction

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What if that same patient is now **70**

Age:	70 Years
Gender:	○ Female ◉ Male
Total cholesterol:	4 mmol/L
HDL cholesterol:	1.25 mmol/L
Smoker:	○ Yes ◉ No
Diabetes:	○ Yes ◉ No
Systolic blood pressure:	120 mm Hg
Is the patient being treated for high blood pressure?	○ Yes ◉ No

Calculate risk

Framingham Risk Score - RESULTS[1,4]

Your patient's Framingham Risk Score is 18.4%

2009 CCS Canadian Cholesterol Guidelines Recommendation[1]

Risk Level	Initiate/consider treatment if any of the following:	Primary LDL-C targets
Moderate† (FRS 10-19%)	• LDL-C > 3.5 mmol/L • T C:HDL-C ratio of > 5.0 • hsCRP > 2 mg/L (in men > 50 and women > 60)‡	Either: • < 2.0 mmol/L or • ≥ 50% reduction

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T/F – you should double a persons FRS 10-year risk if they have a FHx of premature CAD?

- TRUE

in first-degree relatives) increases an individual's calculated Framingham percent risk by approximately 2-fold.[30] The 10-year Framingham risk percent doubled for family history of premature CVD will be referred to as the modified FRS.

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Risk Stratification

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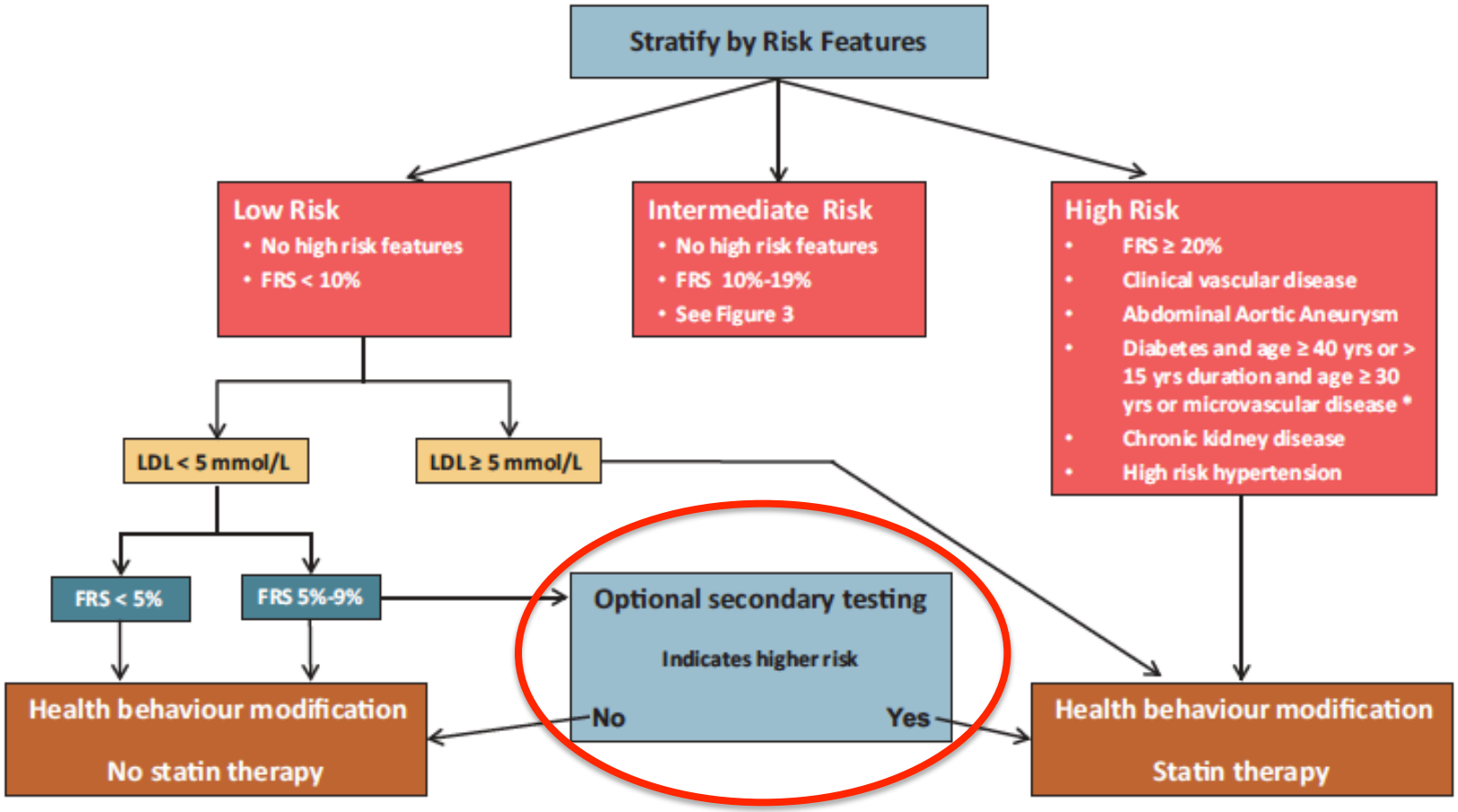

CCS 2012 Lipid Guidelines, Canadian Journal of Cardiology

Intermediate Risk

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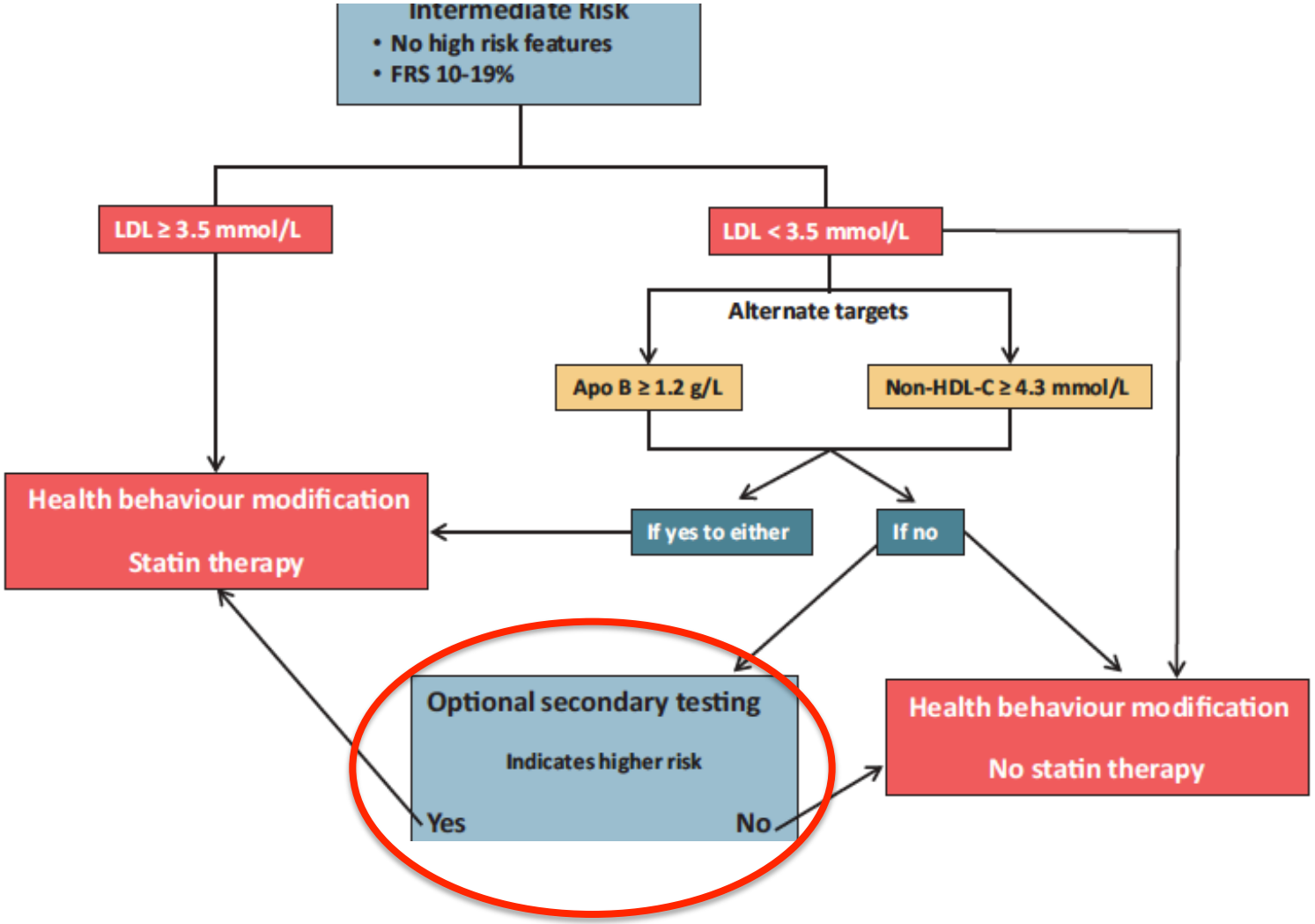

Secondary Testing

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- Meant to aid clinicians in decision making for starting statin therapy
- Emerging evidence however suggests a more liberal approach to statin use
  - Especially in those with above low risk or moderate risk (5-19%)

Secondary Testing

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- NOT performed for low (<5%) or high risk (>20%) patients
- Biomarkers
  - **Lipoprotein (a):**
    - LDL-like particle
    - Genetic link
    - Proatherogenic
    - Increased risk with > 300mg/L concentrations
  - **hsCRP**
    - not causally related to CVD risk, NOT target for Tx
    - Inflammatory marker
    - CRP>2.0mg/L (HR 1.5 for CVD)

Biomarkers

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- **HbA1c**
  - Relationship with HbA1c and CVD risk in non-diabetics
  - Each 1% increase in A1c above 5% had RR1.24
- **ACR**
  - Albuminuria associated with hypertension and diabetes (risk factor for CVD)

Secondary Testing

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Noninvasive test	Indications for testing	Normal Range	Frequency of testing
Graded exercise stress test	Selected asymptomatic adults with CVD risk factors especially those who are embarking on a vigorous exercise program Selected adults in the intermediate risk category	Duke Score[a] Low risk ≥ +5 Moderate risk -10 to +4 High risk ≤ -11	If symptoms develop
Carotid imaging	Selected asymptomatic adults not candidates for statin Rx based on conventional risk factors. Only in centres with clear expertise	Carotid intima-media thickness (CIMT) <1.0 mm No visible plaque[b]	q 5-10 y as indicated for reassessment of risk
ABI	Selected asymptomatic adults, not candidates for statin Rx based on conventional risk factors (particularly smokers, diabetes)	Ankle-brachial index (ABI) 1.0-1.3[c]	q 5-10 y as indicated for reassessment of risk or if symptoms develop
CAC	Selected asymptomatic adults who are not candidates for statin Rx based on conventional risk factors	CAC Low risk 0 Increased risk 0 – 99 High risk 100-299[d] Very high risk > 300[e]	CAC = 0 q 10y where clinically indicated CAC = 0 – 100 q 3-5y if Rx is deferred

Name 4 Non-pharm strategies to lower cholesterol

Intervention (minimal dose for effect)	Expected Outcome
Dietary cholesterol intake[10] < 300 mg/day (NCEP step I diet) < 200 mg/day (NCEP step II diet)	↓ LDL-C 10-12% 12-16%
Saturated fats <7% of daily caloric intake[8]	↓ LDL-C 5-10%; ↓ CVD mortality 14%
Phytosterols 1-2 gm/day[1]	↓ LDL-C 5-8%
Soy proteins with isoflavones 25g/day[2]	↓ LDL-C 3-5%
Viscous fibre 10 g/day[3]	↓ LDL-C 3-5%
Nuts 30-67g /day[4]	↓ LDL-C 5-7%, ↓ TG 5-10%
Portfolio type diet[5]	↓ LDL-C 8-14%
Mediterranean type diet[6]	↓ LDL-C 5-10%; ↓ CVD mortality
DASH (Dietary Approaches to Stop Hypertension) diet[7]	↓ CVD mortality in those with hypertension
Moderated Alcohol intake 1-2 drinks/day	↑ HDL 5-10%, ↓ CVD events
Weight loss and reduction of abdominal obesity[11] 5-10% of body weight loss	↓ LDL-C, ↑ HDL, ↓ TG, ↓cardiometabolic risk
Omega -3 - 2-4 g of eicosapentaenoic acid (EPA) plus docosahexaenoic acid (DHA)/day	↓ TG 25-30% in those with ↑ TG
Exercise[12,13] 30-60 min/day moderate to vigourous intensity	↑ HDL 5-10%, ↓ CVD events
Smoking cessation	↑ HDL, ↓ CVD events

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Treatment and Targets

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Risk level	Initiate therapy if	Primary target LDL C	Alternate target
High FRS ≥ 20%	Consider treatment in all (Strong, High)	≤ 2 mmol/L or ≥ 50% decrease in LDL-C (Strong, High)	➢ Apo B ≤ 0.8 g/L ➢ Non HDL-C ≤ 2.6 mmol/L (Strong, High)
Intermediate FRS 10%-19%	➢ LDL-C ≥ 3.5 mmol/L (Strong, Moderate) ➢ For LDL-C < 3.5 consider if: Apo B ≥ 1.2 g/L or Non-HDL-C ≥ 4.3 mmol/L (Strong, Moderate)	≤ 2 mmol/L or ≥ 50% decrease in LDL-C (Strong, Moderate)	➢ Apo B ≤ 0.8 mg/L ➢ Non HDL-C ≤ 2.6 mmol/L (Strong, Moderate)
Low FRS < 10%	➢ LDL-C ≥ 5.0 mmol/L ➢ Familial hypercholesterolemia (Strong, Moderate)	≥ 50% reduction in LDL-C (Strong, Moderate)	

LDL < 2.0

CCS 2012 Lipid Guidelines, Canadian Journal of Cardiology

INTERHEART

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Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study

*Salim Yusuf, Steven Hawken, Stephanie Ôunpuu, Tony Dans, Alvaro Avezum, Fernando Lanas, Matthew McQueen, Andrzej Budaj, Prem Pais, John Varigos, Liu Lisheng, on behalf of the INTERHEART Study Investigators**

- CASE CONTROL STUDY looking at RF for CAD
  - 14820 healthy control subjects
  - 15152 first-MI patients
- Conducted in 52 countries
- **9** risk factors are associated with more than **90%** of the risk of an acute myocardial infarction

INTERHEART Risk Factors

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	Prevalence		Odds ratio (99% CI) adjusted for age, sex, and smoking (OR 1)	PAR (99% CI)
	Controls (%)	Cases (%)		
Risk factor				
Current smoking*	26·76	45·17	2·95 (2·72–3·20)	–
Current and former smoking*	48·12	65·19	2·27 (2·11–2·44)	36·4% (33·9–39·0)
Diabetes	7·52	18·45	3·08 (2·77–3·42)	12·3% (11·2–13·5)
Hypertension	21·91	39·02	2·48 (2·30–2·68)	23·4% (21·7–25·1)
Abdominal obesity (2 *vs* 1)†	33·40	30·21	1·36 (1·24–1·48)	–
Abdominal obesity (3 *vs* 1)†	33·32	46·31	2·24 (2·06–2·45)	33·7% (30·2–37·4)
All psychosocial‡	–	–	2·51 (2·15–2·93)	28·8% (22·6–35·8)
Vegetables and fruit daily*	42·36	35·79	0·70 (0·64–0·77)	12·9% (10·0–16·6)
Exercise*	19·28	14·27	0·72 (0·65–0·79)	25·5% (20·1–31·8)
Alcohol intake*	24·45	24·01	0·79 (0·73–0·86)	13·9% (9·3–20·2)
ApoB/ApoA1 ratio (2 *vs* 1)§	19·99	14·26	1·47 (1·28–1·68)	–
ApoB/ApoA1 ratio (3 *vs* 1)§	20·02	18·05	2·00 (1·74–2·29)	–
ApoB/ApoA1 ratio (4 *vs* 1)§	19·99	24·22	2·72 (2·38–3·10)	–
ApoB/ApoA1 ratio (5 *vs* 1)§	20·00	33·49	3·87 (3·39–4·42)	54·1% (49·6–58·6)
All above risk factors combined¶	–	–	129·20 (90·24–184·99)	90·4% (88·1–92·4)

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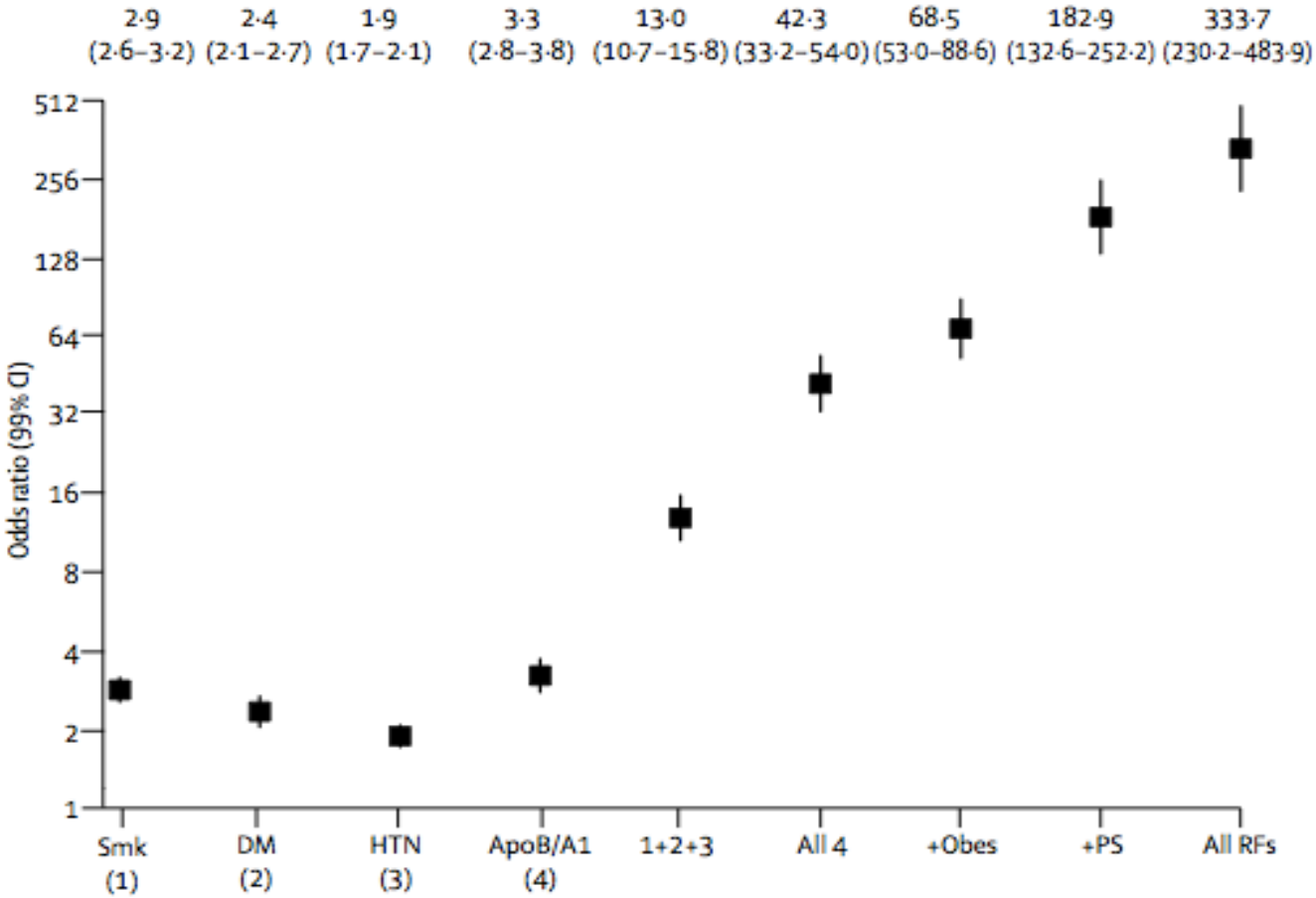
INTERHEART – cumulative risk



Lipids

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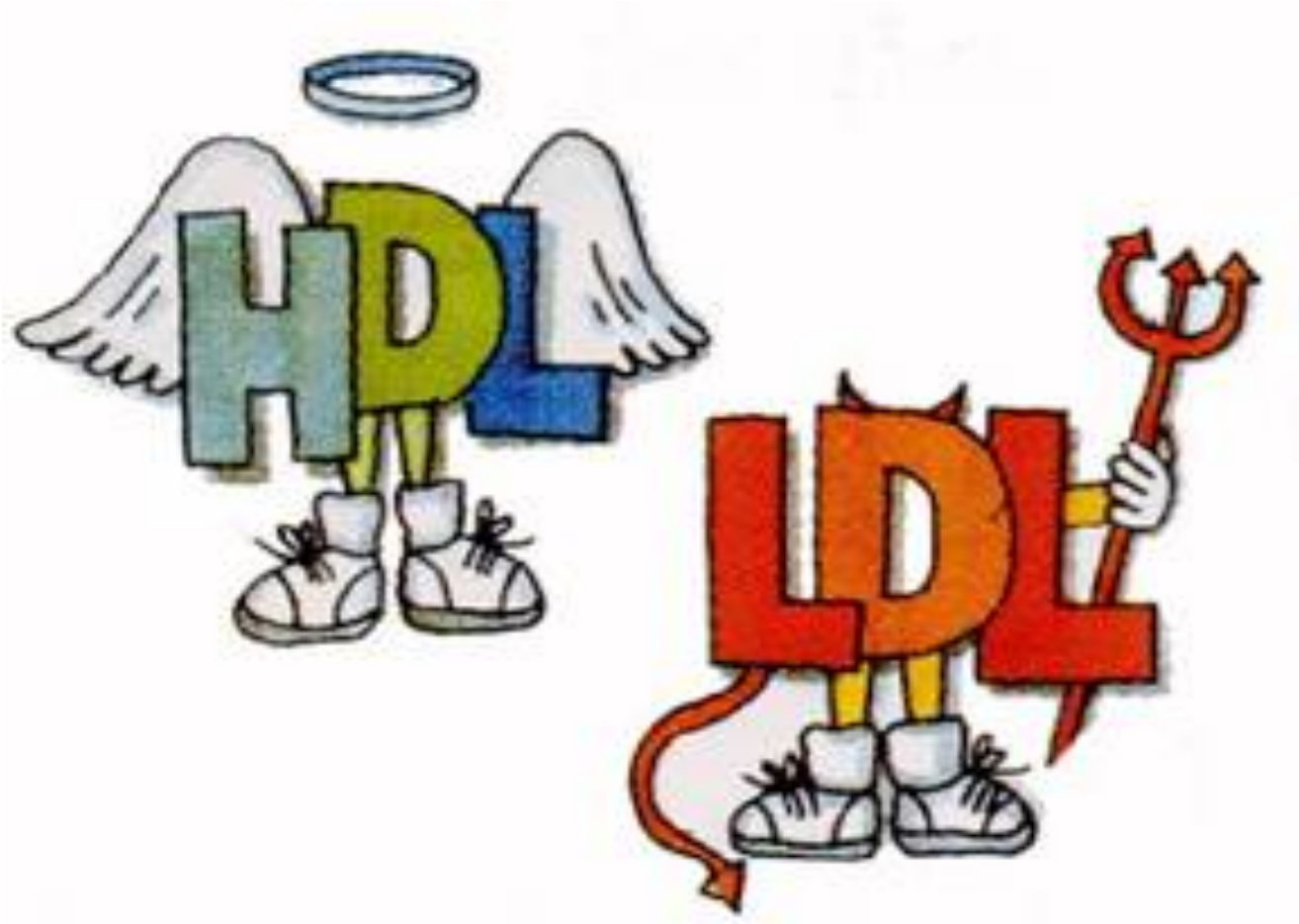

T/F - For every 1mmol of LDL lowering there is a 20% reduction in CV events

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- True!

The effects of lowering LDL cholesterol with statin therapy in people at low risk of vascular disease: meta-analysis of individual data from 27 randomised trials

*Cholesterol Treatment Trialists' (CTT) Collaborators**

Summary

Background Statins reduce LDL cholesterol and prevent vascular events, but their net effects in people at low risk of vascular events remain uncertain.

Methods This meta-analysis included individual participant data from 22 trials of statin versus control (n=134 537; mean LDL cholesterol difference 1·08 mmol/L; median follow-up 4·8 years) and five trials of more versus less statin (n=39 612; difference 0·51 mmol/L; 5·1 years). Major vascular events were major coronary events (ie, non-fatal myocardial infarction or coronary death), strokes, or coronary revascularisations. Participants were separated into five categories of baseline 5-year major vascular event risk on control therapy (no statin or low-intensity statin) (<5%, ≥5% to <10%, ≥10% to <20%, ≥20% to <30%, ≥30%); in each, the rate ratio (RR) per 1·0 mmol/L LDL cholesterol reduction was estimated.

Findings Reduction of LDL cholesterol with a statin reduced the risk of major vascular events (RR 0·79, 95% CI 0·77–0·81, per 1·0 mmol/L reduction), largely irrespective of age, sex, baseline LDL cholesterol or previous vascular disease, and of vascular and all-cause mortality. The proportional reduction in major vascular events was at

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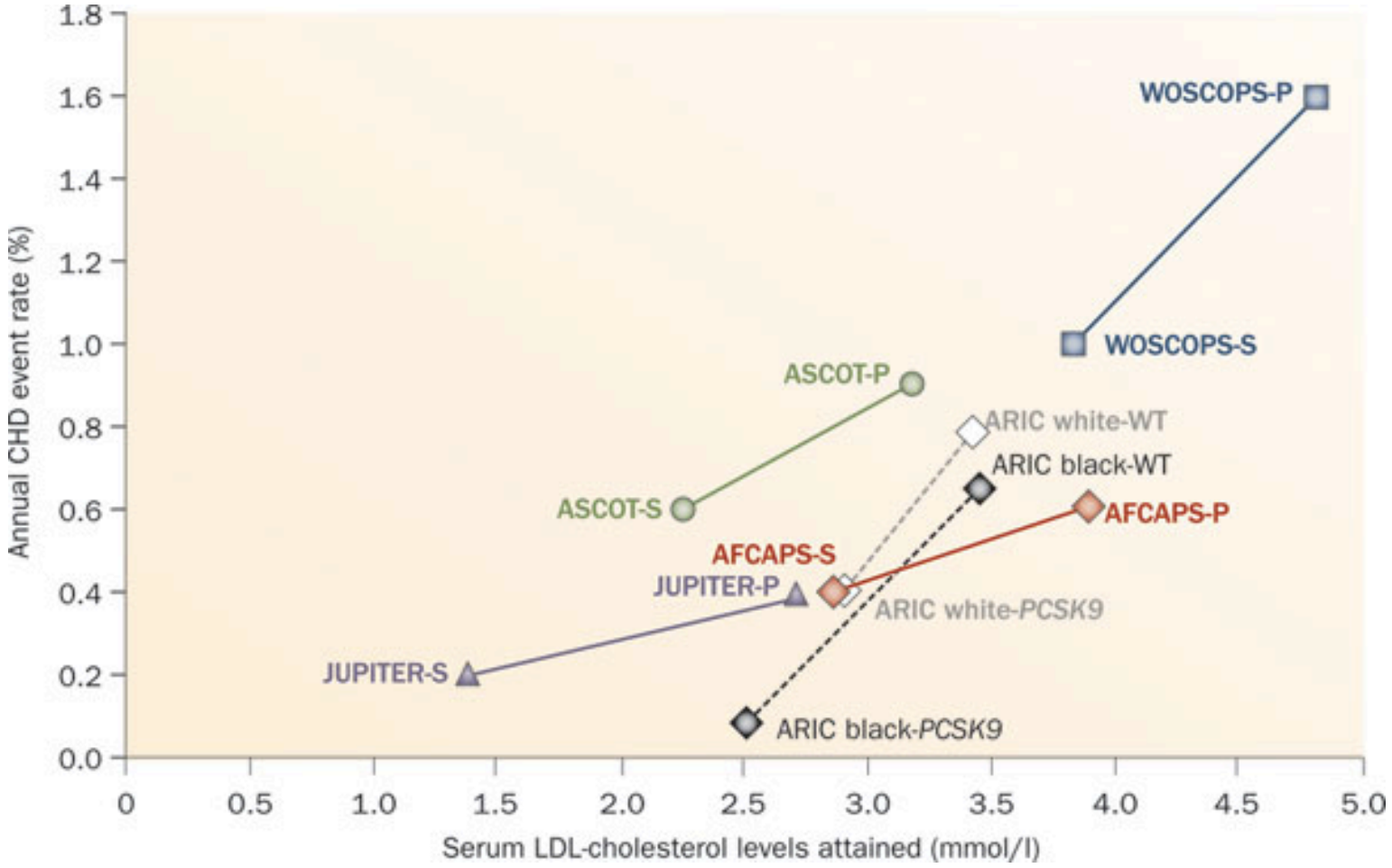
Primary Prevention Trials



What about statins for low risk patients? Do they work?

Statins for the primary prevention of cardiovascular disease (Review)

Taylor F, Huffman MD, Macedo AF, Moore THM, Burke M, Davey Smith G, Ward K, Ebrahim S

THE COCHRANE COLLABORATION®

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Statins for Primary Prevention

- Over five years, the number needed to treat (NNT5) to avoid one cardiovascular event was 50
- The NNT5 for people at 10%, 20%, and 30% predicted cardiovascular event risk over 10 years were 74, 37, and 25 respectively
- These compare with NNT5 values of between 12 and 34 in secondary prevention

Statins Primary Prevention

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Table 6 Outcome improvements with statin therapy in primary prevention found in the Cochrane review[298]

Outcome	Risk ratio (95% CI)
Total mortality	0.83 (0.73–0.95)
Fatal and nonfatal CHD events	0.72 (0.65–0.79)
Fatal and nonfatal stroke	0.78 (0.65–0.94)

38M. No past medical hx aside from erectile dysfunction. Should he have his lipids checked?

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- YES!

Who to Screen

Men ≥ 40 years of age, and women ≥ 50 years of age or postmenopausal
(consider earlier in ethnic groups at increased risk such as South Asians or First Nations individuals)
or
All patients with any of the following conditions, regardless of age:

- Current cigarette smoking
- Diabetes
- Arterial hypertension
- Family history of premature CVD
- Family history of hyperlipidemia
- Erectile dysfunction
- Chronic kidney disease

- Inflammatory disease
- HIV infection
- Chronic obstructive pulmonary disease
- Clinical evidence of atherosclerosis or abdominal aneurysm
- Clinical manifestation of hyperlipidemia
- Obesity (body mass index > 27)

How to screen

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Canadian Journal of Cardiology 29 (2013) 151–167

Society Guidelines

2012 Update of the Canadian Cardiovascular Society Guidelines for the Diagnosis and Treatment of Dyslipidemia for the Prevention of Cardiovascular Disease in the Adult

Todd J. Anderson, MD,[a] Jean Grégoire, MD,[b] Robert A. Hegele, MD,[c]

For all: History and examination, LDL, HDL, TG, non-HDL (will be calculated from profile), glucose, eGFR
Optional: apoB (instead of standard lipid panel), urine albumin:creatinine ratio (if eGFR < 60, hypertension, diabetes)

Framingham Risk Score < 5%

Repeat every 3-5 years

Framingham Risk Score ≥ 5%

Repeat every year

How do statins work?

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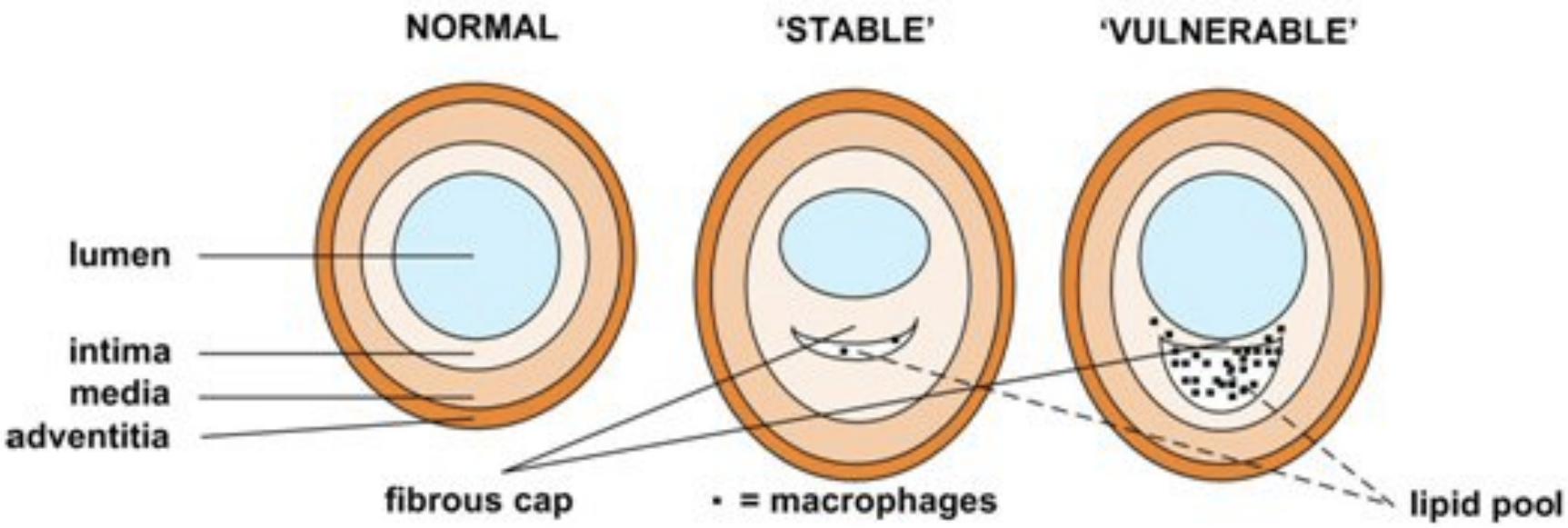
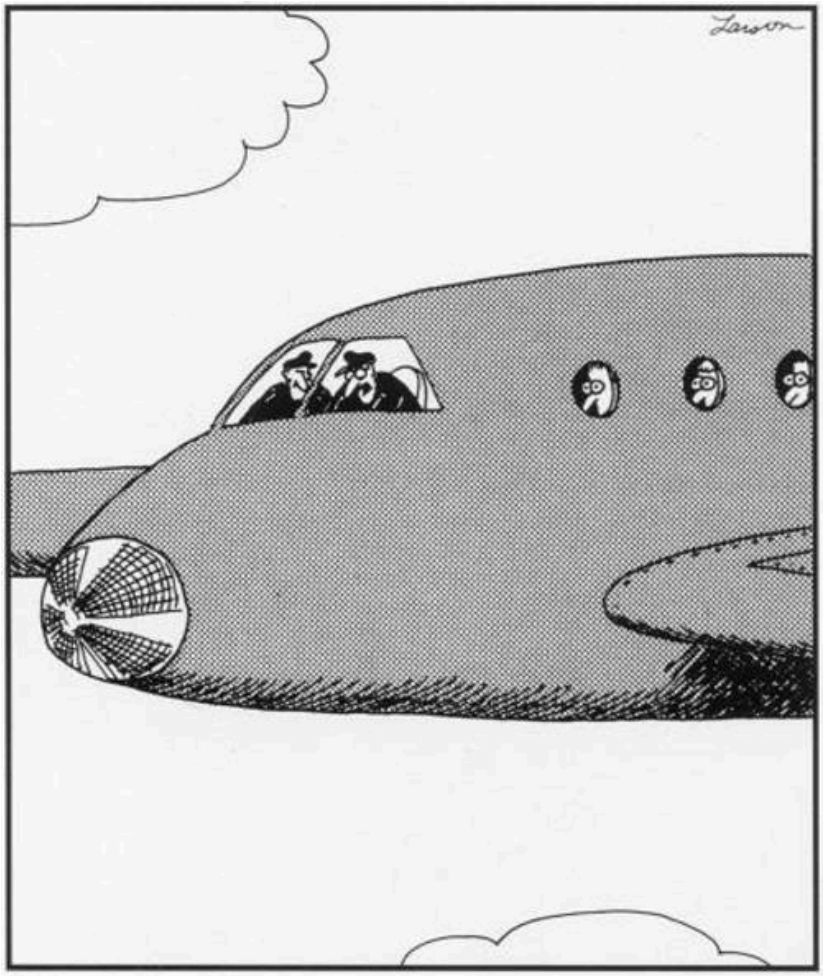


Don’t Panic!

SPORTSCARDIOLOGYBC



“The fuel light’s on, Frank! We’re all going to die! …
Wait, wait. … Oh, my mistake—
that’s the intercom light.”

T/F – Simvastatin impairs adaptation to exercise?

- TRUE

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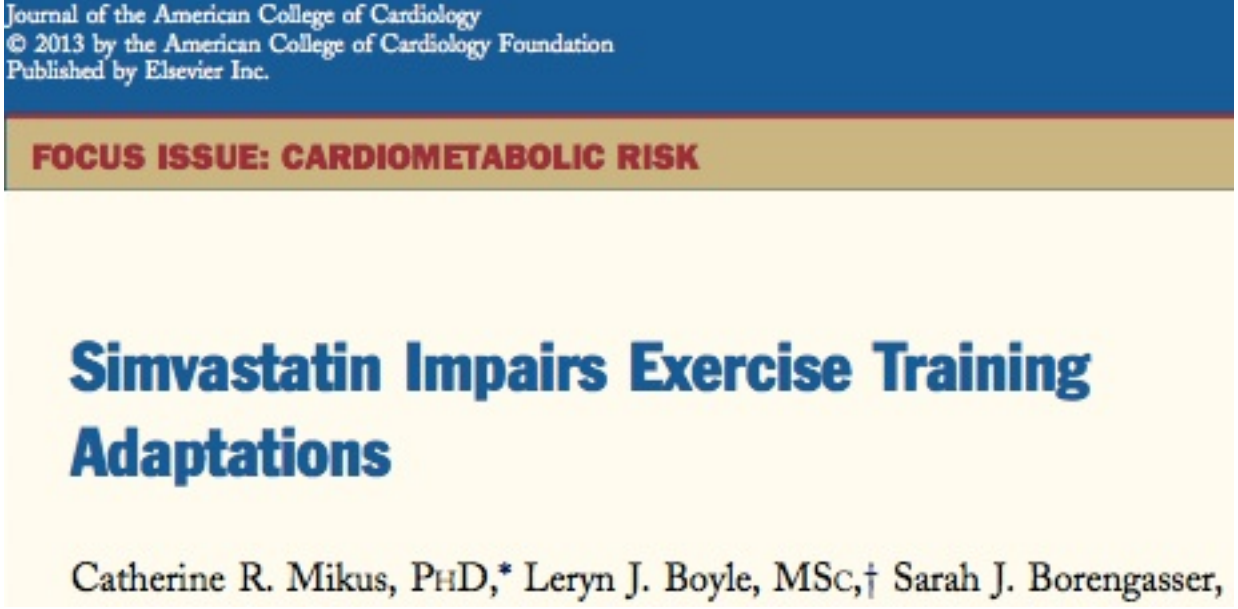
Journal of the American College of Cardiology
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Published by Elsevier Inc.

FOCUS ISSUE: CARDIOMETABOLIC RISK

Simvastatin Impairs Exercise Training Adaptations

Catherine R. Mikus, PhD,* Leryn J. Boyle, MSc,† Sarah J. Borengasser,

SPORTSCARDIOLOGYBC

- In sedentary adults (n=37) patients on simvastatin had lower increase in VO2 than compared non-statin sedentary participants after 12 weeks
- Skeletal muscle citrate synthase activity increased by 13% in the exercise only group ($P < 0.05$), but decreased by 4.5% in the simvastatin plus exercise group

Interactive effects of fitness and statin treatment on mortality risk in veterans with dyslipidaemia: a cohort study

Peter F Kokkinos, Charles Faselis, Jonathan Myers, Demosthenes Panagiotakos, Michael Doumas

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	Deaths (n; %)	Unadjusted HR	Age-adjusted HR	Fully adjusted HR*	p value†
Least fit, statins (n=1060)	389 (37%)	1	1	1	..
Least fit, no statins (n=1024)	531 (52%)	1·22 (1·07–1·39)	1·22 (1·07–1·38)	1·35 (1·17–1·54)	<0·0001
Moderately fit, statins (n=1573)	329 (21%)	0·57 (0·49–0·66)	0·64 (0·56–0·75)	0·65 (0·56–0·75)	<0·0001
Moderately fit, no statins (n=1154)	397 (34%)	0·81 (0·70–0·93)	0·89 (0·77–1·02)	1·02 (0·88–1·12)	0·81
Fit, statins (n=1705)	173 (10%)	0·28 (0·23–0·33)	0·40 (0·33–0·48)	0·41 (0·34–0·49)	<0·0001
Fit, no statins (n=1335)	270 (20%)	0·50 (0·43–0·58)	0·69 (0·59–0·81)	0·81 (0·69–0·96)	0·01
Highly fit, statins (n=694)	39 (6%)	0·16 (0·12–0·22)	0·27 (0·19–0·38)	0·30 (0·21–0·41)	<0·0001
Highly fit, no statins (n=1498)	190 (13%)	0·27 (0·22–0·32)	0·42 (0·35–0·51)	0·53 (0·44–0·65)	<0·0001

Interactive effects of fitness and statin treatment on mortality risk in veterans with dyslipidaemia: a cohort study

Peter F Kokkinos, Charles Faselis, Jonathan Myers, Demosthenes Panagiotakos, Michael Doumas

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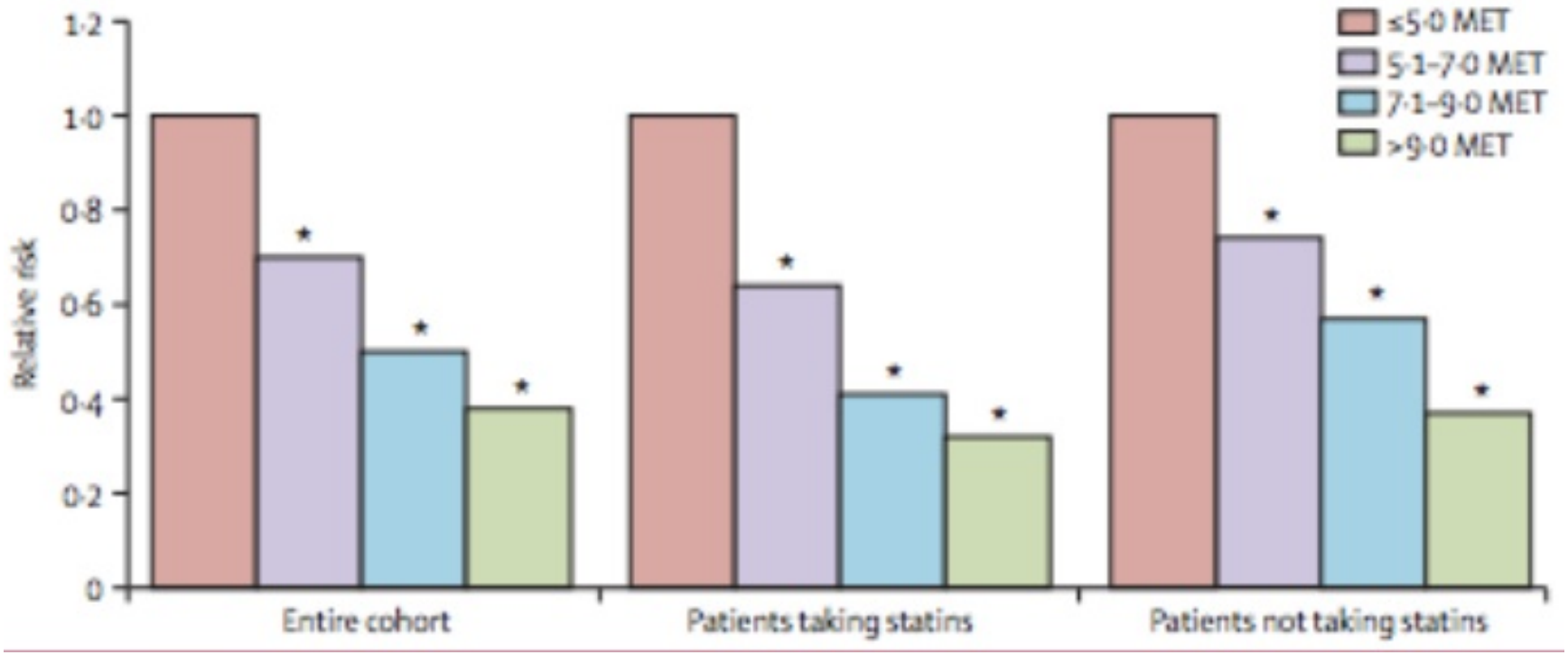

Smoking

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NOT ONE SINGLE CASE OF THROAT IRRITATION *due to smoking* CAMELS!

Yes, these were the findings of noted throat specialis after a total of 2,470 weekly examinations of the throa of hundreds of men and women who smoked Camels and only Camels—for 30 consecutive days.

According to a recent Nationwide

MORE DOCTORS SMOK THAN ANY OTHER CI

DOCTORS in every branch of medicine—113,597 in all—were queried in this nationwide study of cigarette preference. Three leading research organizations made the survey. The gist of the query was—What cigarette do you smoke, Doctor?

The brand named most was Camel!

The rich, full flavor and cool mildness of Camel's superb blend of costlier tobaccos seem to have the same appeal to the smoking tastes of doctors as to millions of other smokers. If you are a Camel smoker, this preference among doctors will hardly surprise you. If you're not—well, try Camels now.

CAMELS *Costlier Tobaccos*

Start your own 30-Day Camel MILDNESS Test Today!

It's fun—it's enlightening! All you do is smoke Camels, and only Camels, for 30 days. Compare them in your "T-Zone" (T for taste, T for throat), but if that rich, full Camel flavor and that cool, cool Camel mildness doesn't win you to Camels for keeps,

. . . AND THOUSANDS MORE AGREE!






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Viceroys
FILTER
the Smoke!
TWINAX
VICEROY
Filter Tip
CIGARETTES
VICEROY
As your Dentist,
I would recommend
VICEROYS

Guard Against Throat-Scratch

enjoy the smooth smoking of fine tobaccos

Study This Puff Chart:

PUFF BY PUFF...YOU'RE ALWAYS AHEAD WITH PALL MALL

The further your cigarette filters the smoke through fine tobaccos, the milder that smoke becomes. At the first puff, PALL MALL's smoke is filtered further than that of any other leading cigarette.

Again after 5 puffs of each cigarette your own eyes can measure the extra length for extra mildness as the smoke of PALL MALL's traditionally fine tobaccos is filtered further. Moreover, after 10 puffs of each cigarette....

....or 17 puffs, Pall Mall's greater length of fine tobaccos still travels the smoke further ...filters the smoke and makes it mild. Thus Pall Mall gives you a smoothness, mildness and satisfaction no other cigarette offers you.

Wherever you go today, you will see more and more people smoking PALL MALL—*the cigarette whose mildness you can measure.*

Outstanding

...and they are mild!

P.S. LET A CARTON OF PALL MALLS SAY "MERRY CHRISTMAS" FOR YOU

Gee, Dad, you always get the best of everything ...even

Marlboro!

T/F – 1 in 5 Canadians smoke

T/F – 1 Billion people in the world smoke

TRUE!!!

Shafey O, : The Tobacco Atlas, 3rd ed. Atlanta, American Cancer Society, 2009.

Tobacco Use

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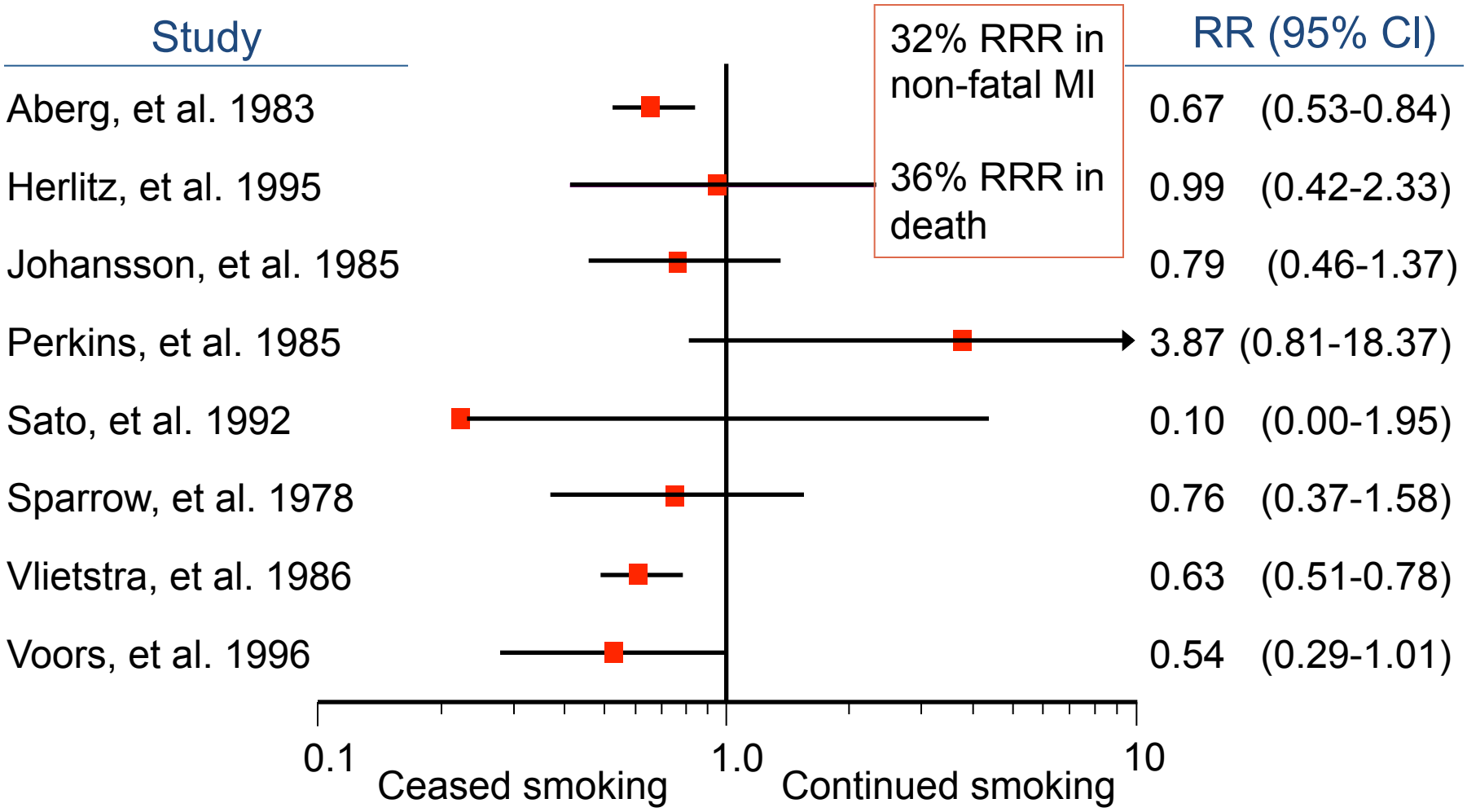
- Single most important modifiable risk factor
  - >400,000 deaths annually
  - 35-40% of these are related to CAD
- Cessation of cigarette consumption overwhelmingly remains the single most important intervention in preventive cardiology…
  - more effective than any other secondary prevention strategy

Cigarette smoking cessation: Risk of Non-fatal Myocardial Infarction*

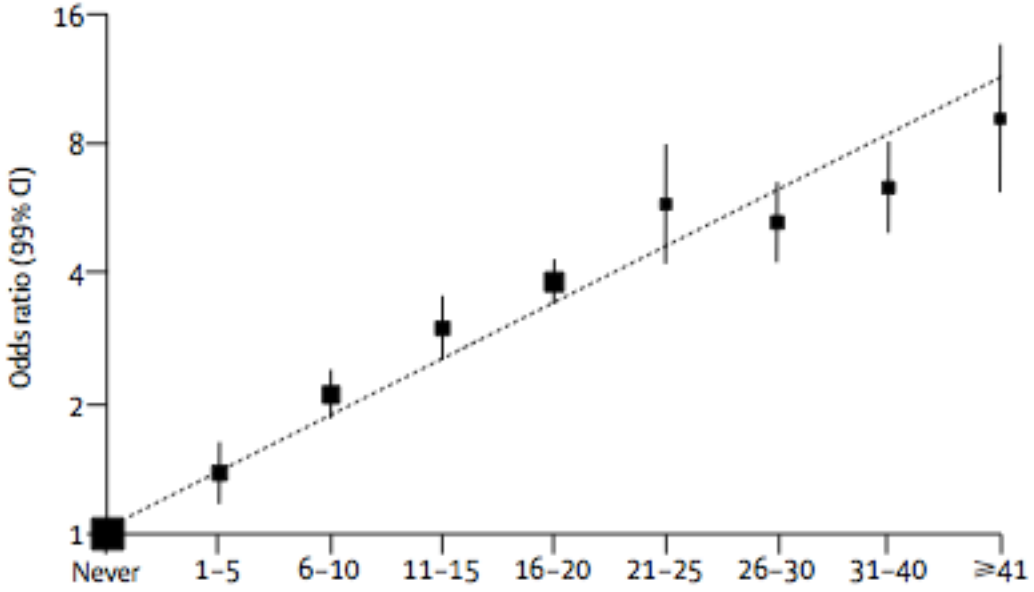


*Includes those with known coronary heart disease

Critchley JA et al. *JAMA* 2003;290:86-97

Risk of MI is the same in people who smoke 5 vs 25 cigarettes

- FALSE!



Number of controls	7489	727	1031	446	1058	96	230	168	56
Number of cases	4223	469	1021	623	1832	254	538	459	218
Odds ratio	1	1·38	2·10	2·99	3·83	5·80	5·26	6·34	9·16

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Quitters never win?

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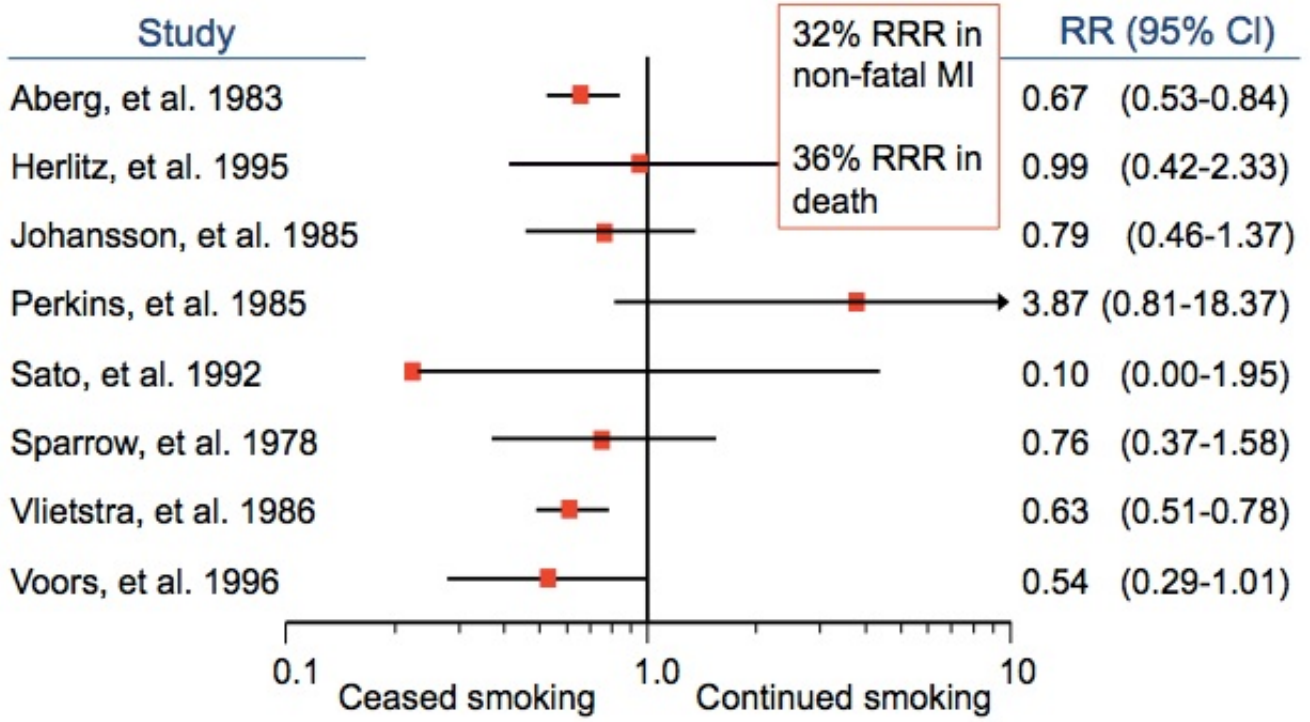
- Reduced coronary heart disease mortality by 36%
- Back to baseline risk at 2-3 years



*Includes those with known coronary heart disease

Critchley JA et al. *JAMA* 2003;290:86-97

T/F – Smoking then Cholesterol are the biggest risk factors for stroke

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Risk factors for ischaemic and intracerebral haemorrhagic stroke in 22 countries (the INTERSTROKE study): a case-control study

- hypertension - OR 2·64
- current smoking – OR 2·09
- waist-to-hip ratio – OR 1·65
- diet risk – OR 1·35
- regular physical activity – OR 0·69
- diabetes mellitus – OR 1·36
- alcohol intake OR - 1·51
- psychosocial stress OR- 1·30,
- ratio of apo B to A1 OR - 1·89
- Collectively, these risk factors accounted for 88·1% of the PAR for all stroke

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Risk factors for ischaemic and intracerebral haemorrhagic stroke in 22 countries (the INTERSTROKE study): a case-control study

- **hypertension - OR 2·64**
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- alcohol intake OR - 1·51
- psychosocial stress OR- 1·30,
- **ratio of apo B to A1 OR - 1·89**
- Collectively, these risk factors accounted for 88·1% of the PAR for all stroke.

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Hypertension

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Prevalence of HTN in Canada

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21.8%

Number of Canadian adults 18+ suffering from hypertension

3.3%* of those age 18 to 39

21.8% of those age 40 to 59

52.4% of those age 60 to 70

…have hypertension.

T/F – the target home BP is 140/90

FALSE!

Daytime >135/85 = HTN

24 hour >130/80 = HTN

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Health Behaviours in Adults with Hypertension: Summary

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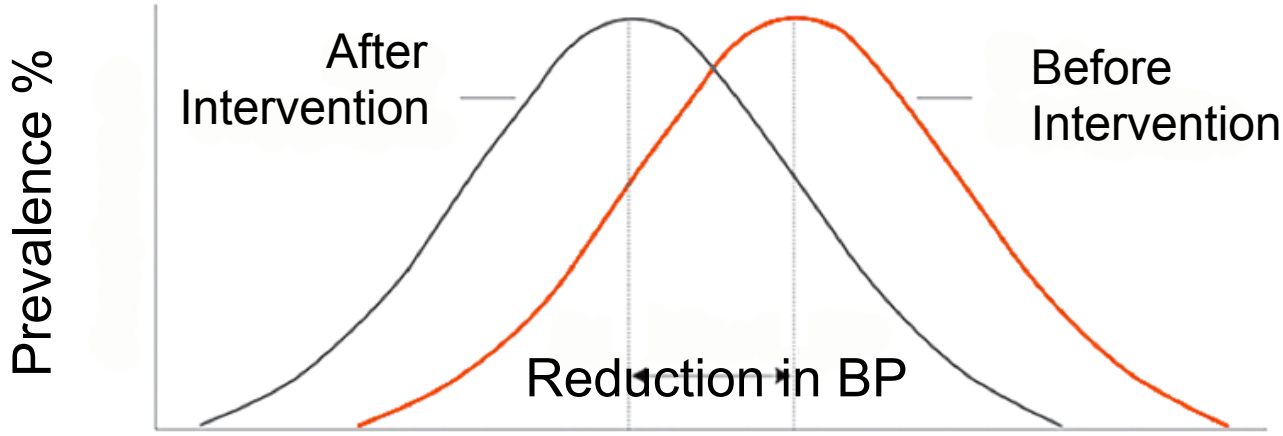
Intervention	Target
Reduce foods with added sodium	⟶ 2000 mg /day
Weight loss	BMI <25 kg/m^2
Alcohol restriction	≤ 2 drinks/day
Physical activity	30-60 minutes 4-7 days/week
Dietary patterns	DASH diet
Smoking cessation	Smoke free environment
Waist circumference	Men <102 cm Women <88 cm

Epidemiologic impact on mortality of blood pressure reduction in the population



Reduction in SBP (mmHg)	% Reduction in Mortality		
	Stroke	**CHD**	**Total**
2	-6	-4	-3
3	-8	-5	-4
5	-14	-9	-7

Adapted from Whelton, PK et al. *JAMA* 2002;288:1882-1888

T/F – 90% of Canadians have other CV risks in addition to HTN

- TRUE! 90% of hypertensive Canadians have other cardiovascular risks

- So… you should screen for them… HOW?

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CHEP: Routine Laboratory Tests

Preliminary Investigations of patients with hypertension

1. Urinalysis
2. Blood chemistry (potassium, sodium and creatinine)
3. Fasting glucose and/or glycated hemoglobin (A1c)
4. Fasting total cholesterol and high density lipoprotein cholesterol (HDL), low density lipoprotein cholesterol (LDL), triglycerides
5. Standard 12-leads ECG

Currently there is insufficient evidence to recommend routine testing of microalbuminuria in people with hypertension who do not have diabetes

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Does diet really matter?

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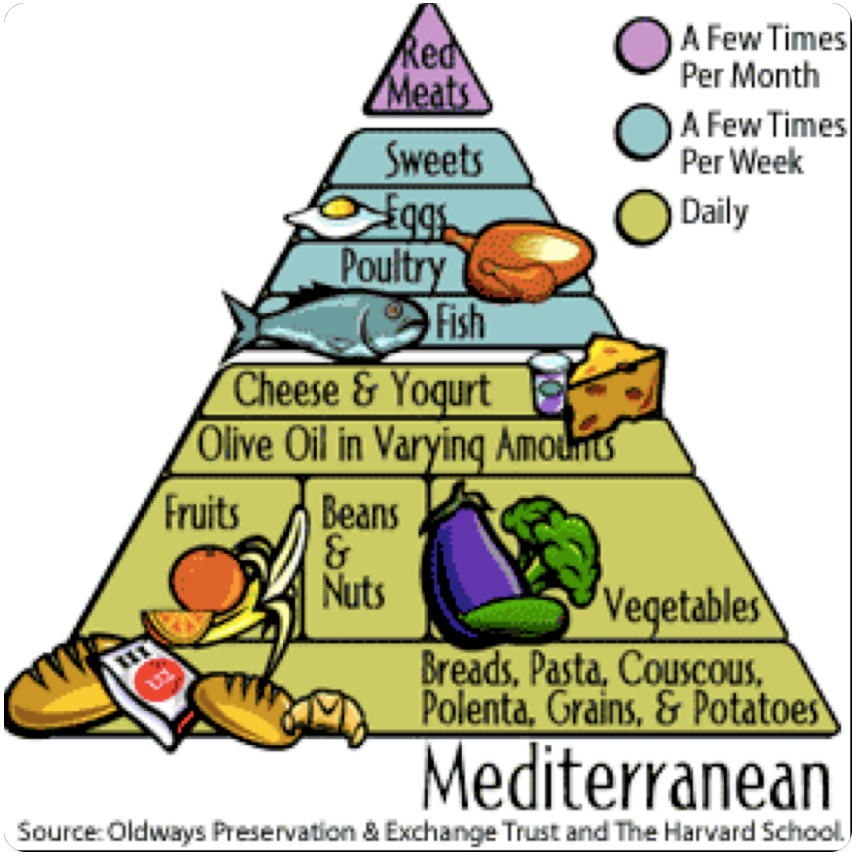

Lyon Diet Heart Study

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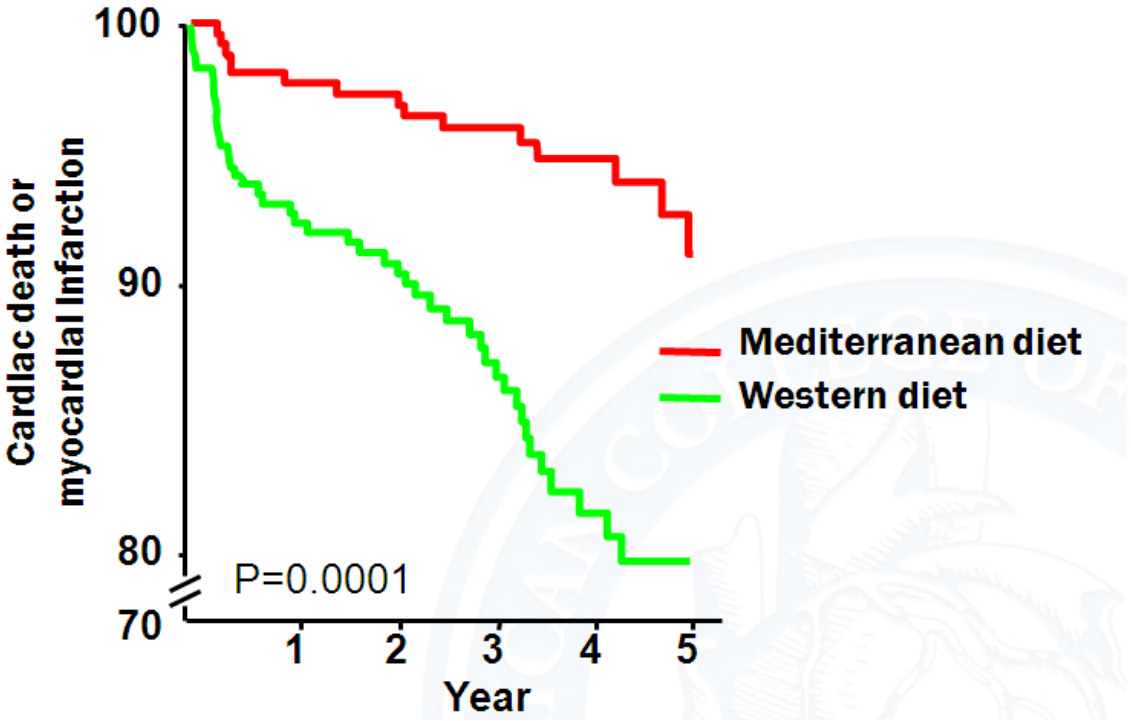
605 patients following a MI randomized to a Mediterranean* or Western** diet for 4 years



A Mediterranean diet reduces CV events post MI (secondary prevention)

*High in polyunsaturated fat and fiber,
**High in saturated fat and low in fiber

De Lorgeril M et al. *Circulation* 1999;99:779-785

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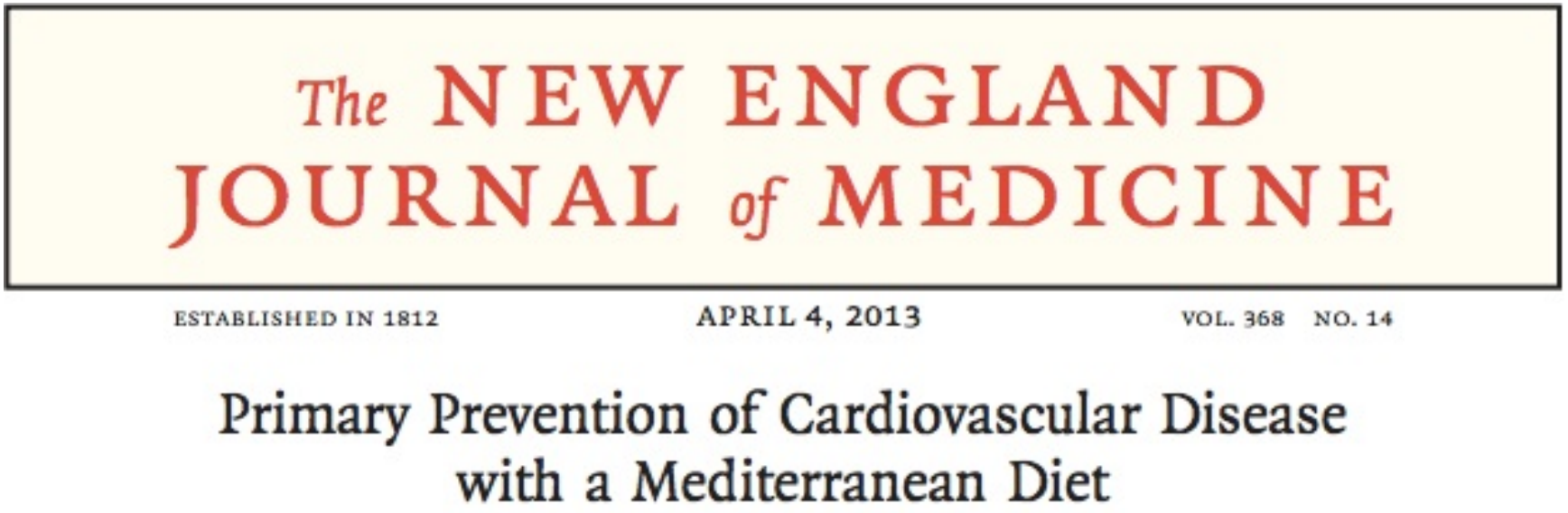
Can you prevent CVD with diet?



The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 APRIL 4, 2013 VOL. 368 NO. 14

Primary Prevention of Cardiovascular Disease with a Mediterranean Diet

Predimed

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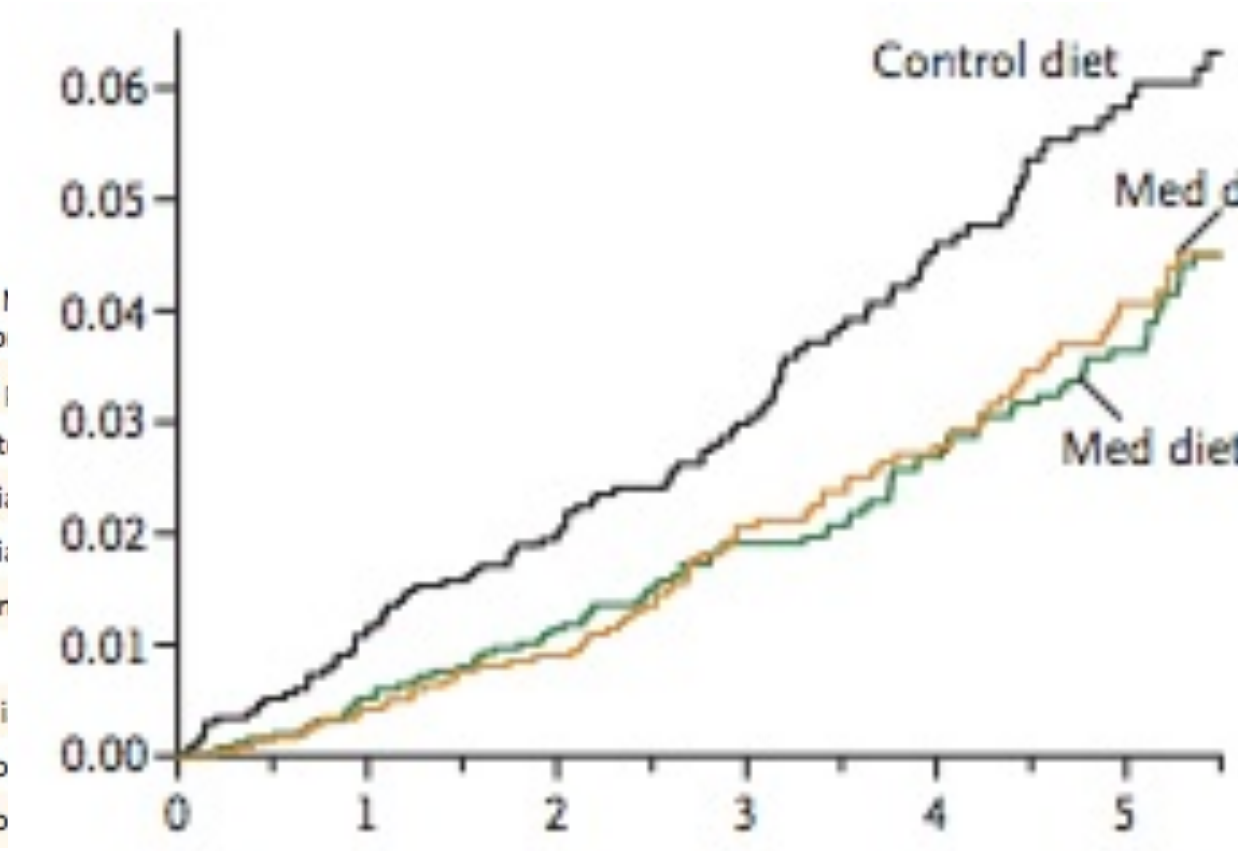
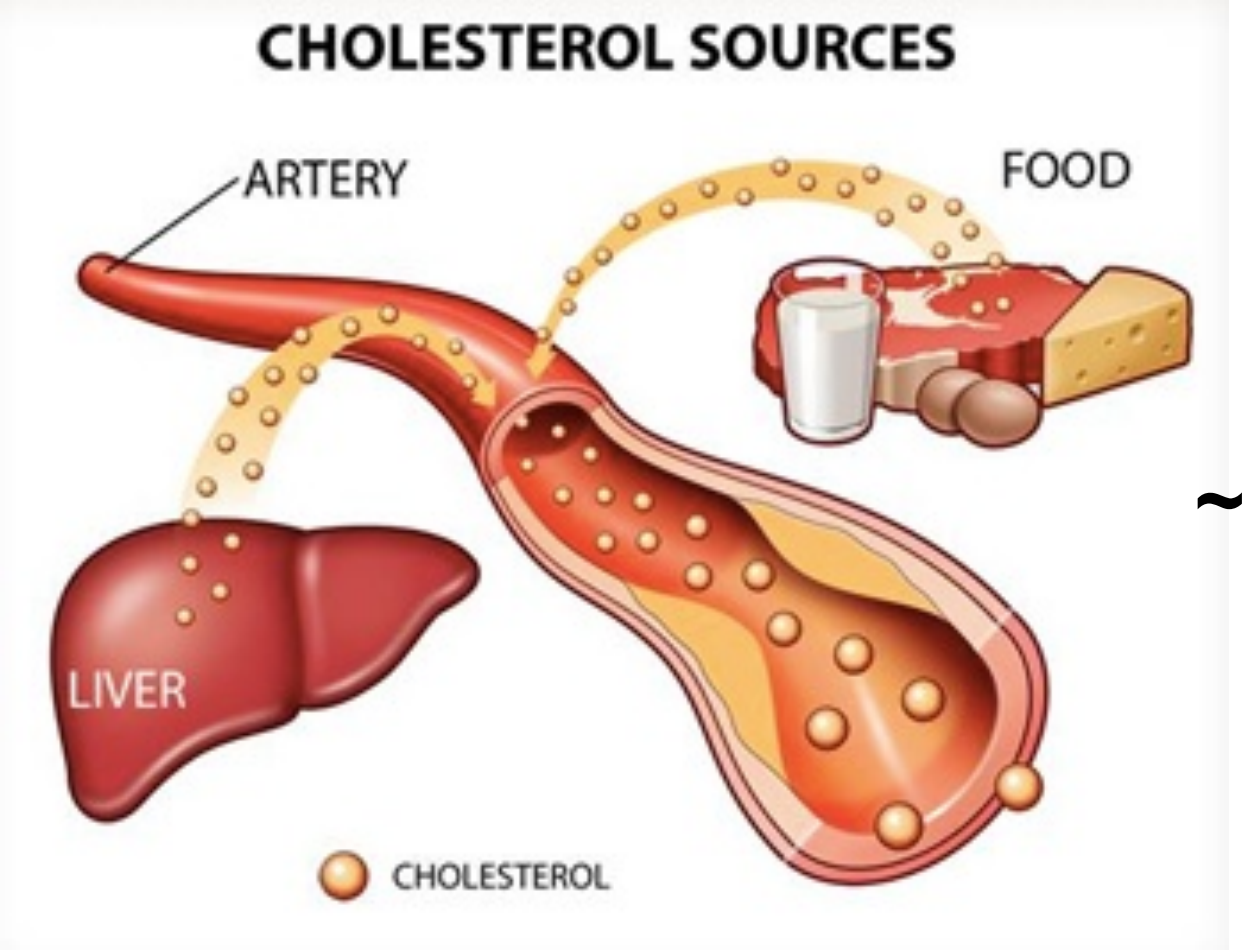


Referral to a dietitician is associated with improved lipid profile
Holmes. Journal of the American Dietetic Association. 2005.

What % of your cholesterol comes from your diet?



~25%

~75%

What % of your cholesterol comes from your diet?

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Intervention (minimal dose for effect)	Expected Outcome
Dietary cholesterol intake[10] < 300 mg/day (NCEP step I diet) < 200 mg/day (NCEP step II diet)	↓ LDL-C 10-12% 12-16%
Saturated fats <7% of daily caloric intake[8]	↓ LDL-C 5-10%; ↓ CVD mortality 14%
Phytosterols 1-2 gm/day[1]	↓ LDL-C 5-8%
Soy proteins with isoflavones 25g/day[2]	↓ LDL-C 3-5%
Viscous fibre 10 g/day[3]	↓ LDL-C 3-5%


diabetes
gluc
insul
level
healthy
deficiency
beta
cells
suga
type
sensitivity
resistance
cardiovascular
pancreas
produce
medical
dm
mellitus
implications
ketoacidosis
hormone
replacement
thus
stages
turn
respond
hyperosmolar
acute
adults
long-term
well
due
simply
requires
measures
patients
tried
production
pressure
surgery
often
inject
defect
common

Is BAD!

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Evolution of Physical Activity

Does physical inactivity kill bus drivers?

CORONARY HEART-DISEASE AND PHYSICAL ACTIVITY OF WORK

J. N. MORRIS
M.A. Glasg., M.R.C.P., D.P.H.

J. A. HEADY
M.A. Oxfd

OF THE SOCIAL MEDICINE RESEARCH UNIT, MEDICAL RESEARCH COUNCIL

- Examined the onset of CAD in 31 000 male transport workers aged 35 to 65 years
- Their main objective, however, was to “seek for relations between the kind of work men do and the incidence among them of CAD.”
- They chose to examine the bus conductors, who climbed 500 to 750 steps per working day on average, and the drivers who sat 90% of the day

Does physical inactivity kill bus drivers?

YES!!!!

CORONARY HEART-DISEASE AND PHYSICAL ACTIVITY OF WORK

J. N. MORRIS M.A. Glasg., M.R.C.P., D.P.H.
J. A. HEADY M.A. Oxfd
OF THE SOCIAL MEDICINE RESEARCH UNIT, MEDICAL RESEARCH COUNCIL

The conductors who climbed stairs all day…
-less incidence of CAD
-developed CAD later on
-first presentation of CAD less likely to be fatal

They postulated that physically active work was protective… in 1953

Does physical inactivity kill longshoremen?

OF COURSE!!!!

- Paffenbarger et al followed 3263 longshoremen for 16 years
- The most active group of cargo handlers, who expended over 1000 kcal more than other longshoremen, had CAD death rates significantly lower than their sedentary colleagues
- Benefits persisted when smoking, BMI and SBP were taken into account

Exercise-based cardiac rehabilitation for coronary heart disease

Balraj S Heran[2], **Jenny MH Chen**[2], **Shah Ebrahim**[3], **Tiffany Moxham**[4], **Neil Oldridge**[5], **Karen Rees**[6], **David R Thompson**[7], and **Rod S Taylor**[1]

- All-cause mortality decreased by 13%
- Cardiovascular mortality decreased by 26%
- Hospital admissions decreased by 31%

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Cardiac Risk Factors and Athletes

Athletes are special

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Athletes are special

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T/F– Risk factor modification is not as important in athletes as the general population

- TRUE!!!
- FALSE!!!
- We don't really know

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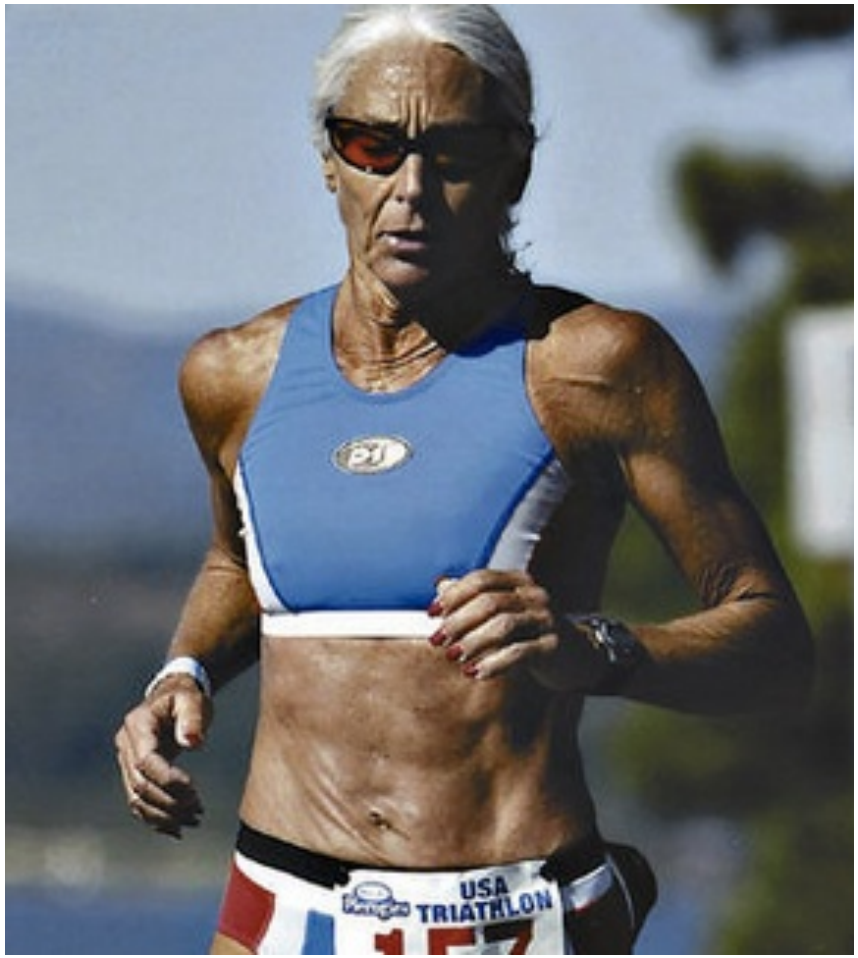
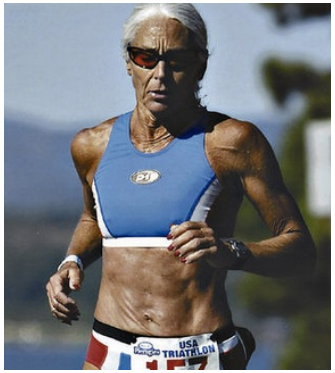
Who would you treat aggressively?

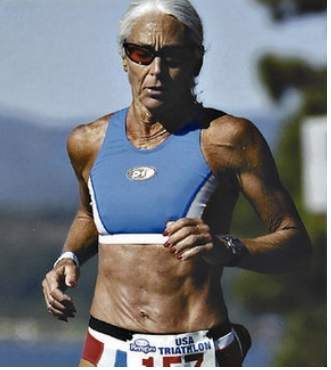


Who would you treat aggressively?



- 67F
- TC – 6; LDL – 4; HDL – 1.5
- Non-smoker
- SBP 156
- Vegan
- Runs 150km/wk
- Marathon 2:45:33
- Wealthy widow

- 45M
- TC – 5; LDL – 3.4; HDL – 1.2
- Smoker
- SBP 150
- Orders extra pickles at McD's
- Last exercised in high school
- Recently lost his job as bus driver



Framingham Risk Score

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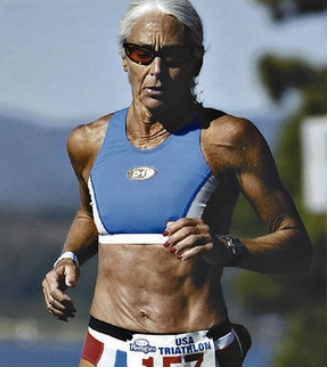
Framingham Risk Score[1]

Risk assessment tool for estimating a patient's 10-year risk of developing cardiovascular disease

Age:	67 Years
Gender:	(•) Female ( ) Male
Total cholesterol:	6 mmol/L
HDL cholesterol:	1.5 mmol/L
Smoker:	( ) Yes (•) No
Diabetes:	( ) Yes (•) No
Systolic blood pressure:	156 mm Hg
Is the patient being treated for high blood pressure?	( ) Yes (•) No

Calculate risk

This online assessment tool is intended as a clinical practice aid for use by experienced healthcare professionals. Results obtained from this tool should not be used alone as a guide for patient care.



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Framingham Risk Score

Framingham Risk Score - RESULTS[1,4]

Your patient's Framingham Risk Score is 15.9%

2009 CCS Canadian Cholesterol Guidelines Recommendation[1]

Risk Level	Initiate/consider treatment if any of the following:	Primary LDL-C targets
Moderate† (FRS 10-19%)	• LDL-C > 3.5 mmol/L • T C:HDL-C ratio of > 5.0 • hsCRP > 2 mg/L (in men > 50 and women > 60)‡	Either: • < 2.0 mmol/L or • ≥ 50% reduction

Adapted from Genest et al. *Can J Cardiol*. 2009.[1]

† The assessment of moderate risk is further modulated by family history and hsCRP risk factors (RRS).

In moderate risk patients, lifestyle changes should be implemented first followed by medications if the targets are not reached. Please consult guidelines for complete recommendations

Print results

Framingham Risk Score

SPORTSCARDIOLOGYBC

Framingham Risk Score[1]

Risk assessment tool for estimating a patient's 10-year risk of developing cardiovascular disease

Age:	45 Years
Gender:	(•) Female ( ) Male
Total cholesterol:	5 mmol/L
HDL cholesterol:	1.2 mmol/L
Smoker:	(•) Yes ( ) No
Diabetes:	( ) Yes (•) No
Systolic blood pressure:	150 mm Hg
Is the patient being treated for high blood pressure?	( ) Yes (•) No

Calculate risk

This online assessment tool is intended as a clinical practice aid for use by experienced healthcare professionals. Results obtained from this tool should not be used alone as a guide for patient care.

Framingham Risk Score

SPORTSCARDIOLOGYBC

Framingham Risk Score - RESULTS[1,4]

Your patient's Framingham Risk Score is 11.7%

2009 CCS Canadian Cholesterol Guidelines Recommendation[1]

Risk Level	Initiate/consider treatment if any of the following:	Primary LDL-C targets
Moderate† (FRS 10-19%)	• LDL-C > 3.5 mmol/L • T C:HDL-C ratio of > 5.0 • hsCRP > 2 mg/L (in men > 50 and women > 60)‡	Either: • < 2.0 mmol/L or • ≥ 50% reduction

Adapted from Genest et al. *Can J Cardiol*. 2009.[1]

Who would put on a statin?

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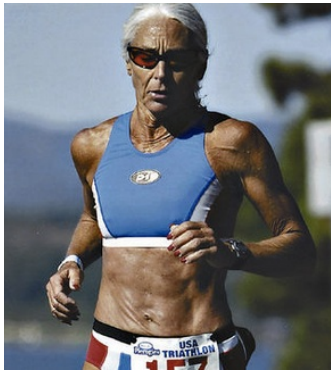
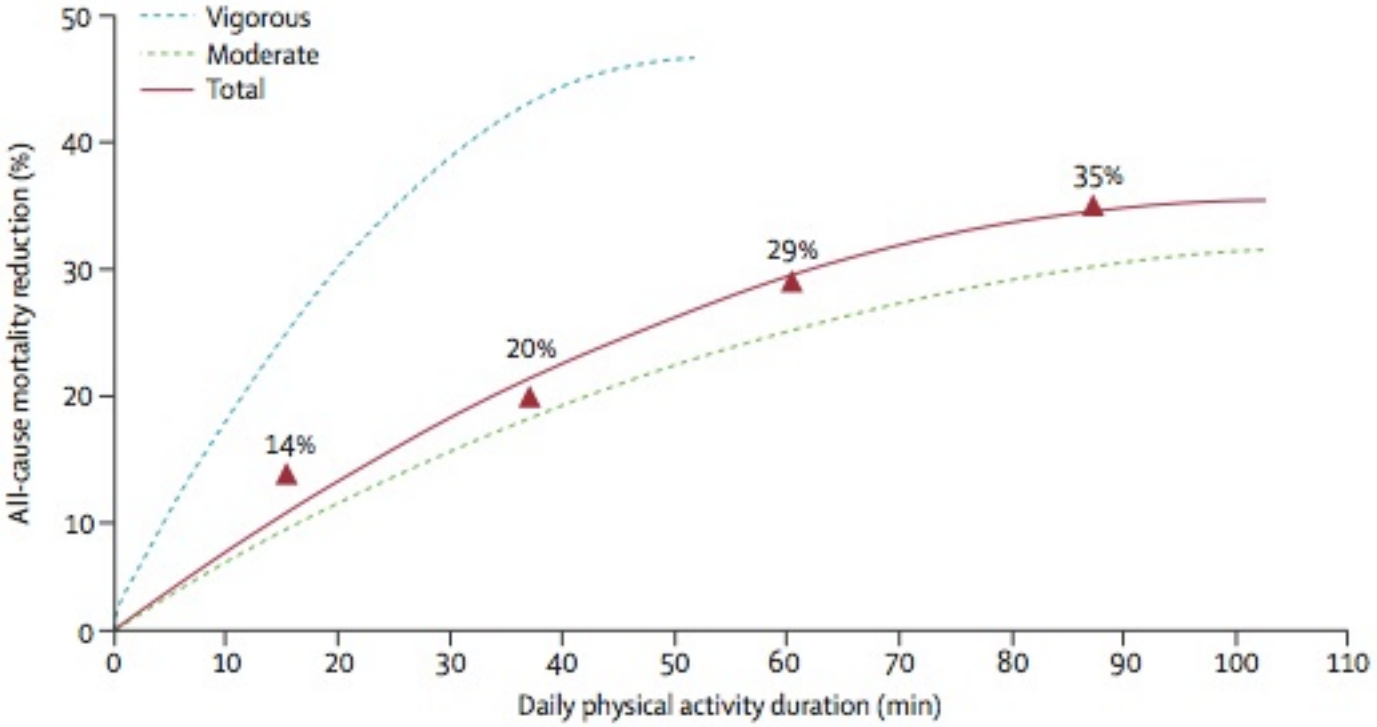


- **How can we treat her?**
- More exercise?
- Better diet?
- Lipitor 20mg
- Norvasc 5mg

- **How can we treat him?**
- Stop smoking
- Stop smoking
- Exercise (how much?)
- Mediterranean diet
- Employment
- Stop smoking

Minimum amount of physical activity for reduced mortality and extended life expectancy: a prospective cohort study

Chi Pang Wen, Jackson Pui Man Wai*, Min Kuang Tsai, Yi Chen Yang, Ting Yuan David Cheng, Meng-Chih Lee, Hui Ting Chan, Chwen Keng Tsao, Shan Pou Tsai, Xifeng Wu*



- 15 minutes a day experienced a 14% reduced risk of all-cause mortality, and had a 3-year longer life expectancy.
- For every additional 15 minutes of daily further reduced all-cause mortality by 4% and all-cancer mortality by 1%

Coronary Calcium Scan

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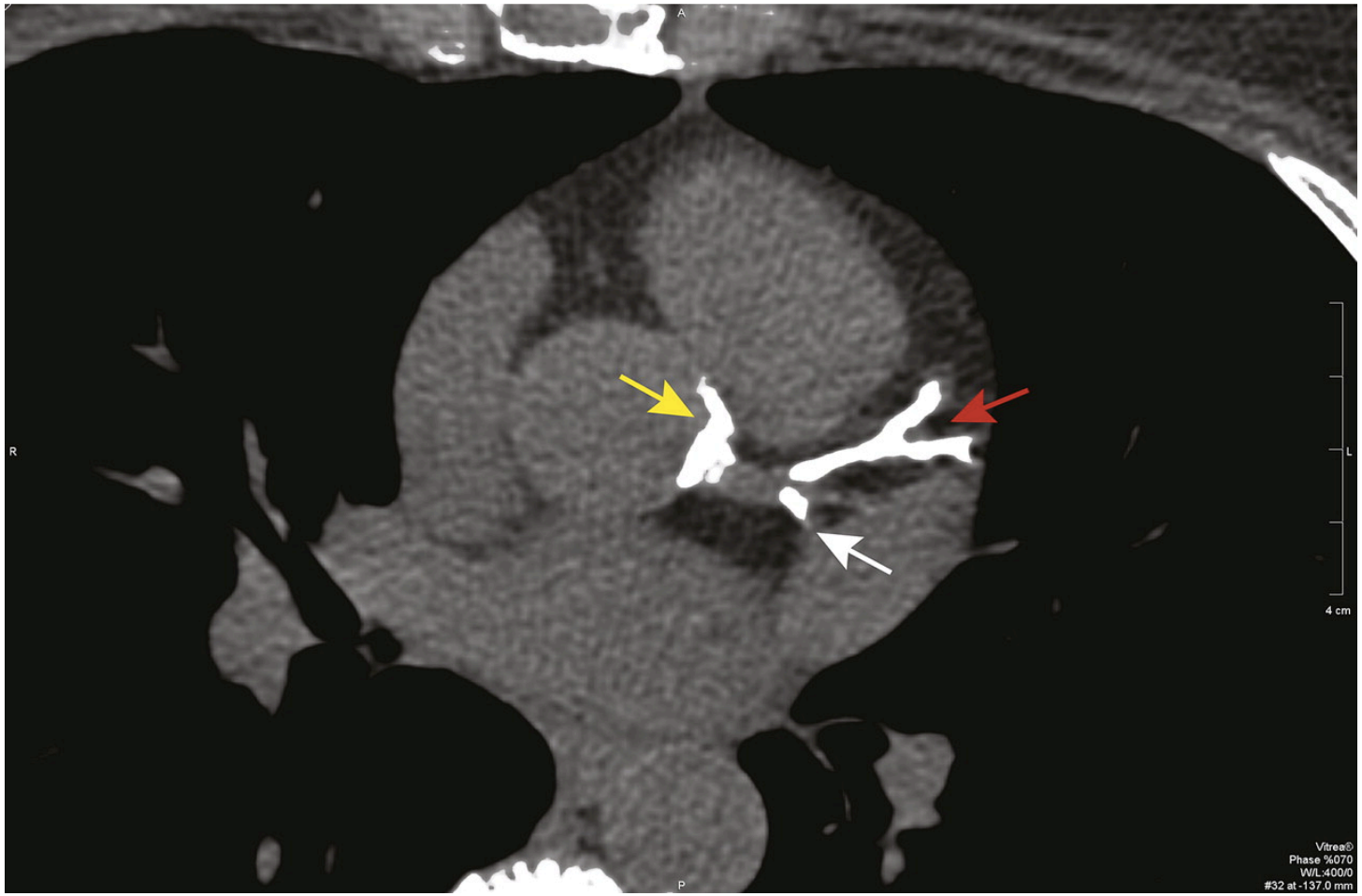

Who has more calcium in their coronary arteries?

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Running: the risk of coronary events†

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Prevalence and prognostic relevance of coronary atherosclerosis in marathon runners

Stefan Möhlenkamp[1]*, Nils Lehmann[2], Frank Breuckmann[1],

- 108 apparently healthy male marathon runners aged >50 years, with >5 marathon were compared to age and cardiovascular risk matched controls
- Marathon runners had more calcium in their arteries compared with controls (36 vs. 21%)

Prevalence of Subclinical Coronary Artery Disease in Middle-Aged, Male Marathon Runners Detected by Cardiac CT

Prävalenz subklinischer koronarer Herzkrankheit bei männlichen Marathonläufern mittleren Alters: Detektion mittels koronarer CT-Angiografie

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- 50 Male marathon runners (mean age 52.7)
- Avg 13.7 marathons completed
- CAD was detected in 24/50 runners:
  - 1 had significant CAD (>75%)
  - 3 had moderate CAD (50-75%)
  - 20 had mild CAD (<50%)

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Possible Mechanisms

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- Shearing forces within coronary arteries during high heart rates
- Elevated circulating interleukins due to inflammation
- Production of free radicals were implicated as possible factors
- Increased sustained levels of catecholamines

Another explanation?

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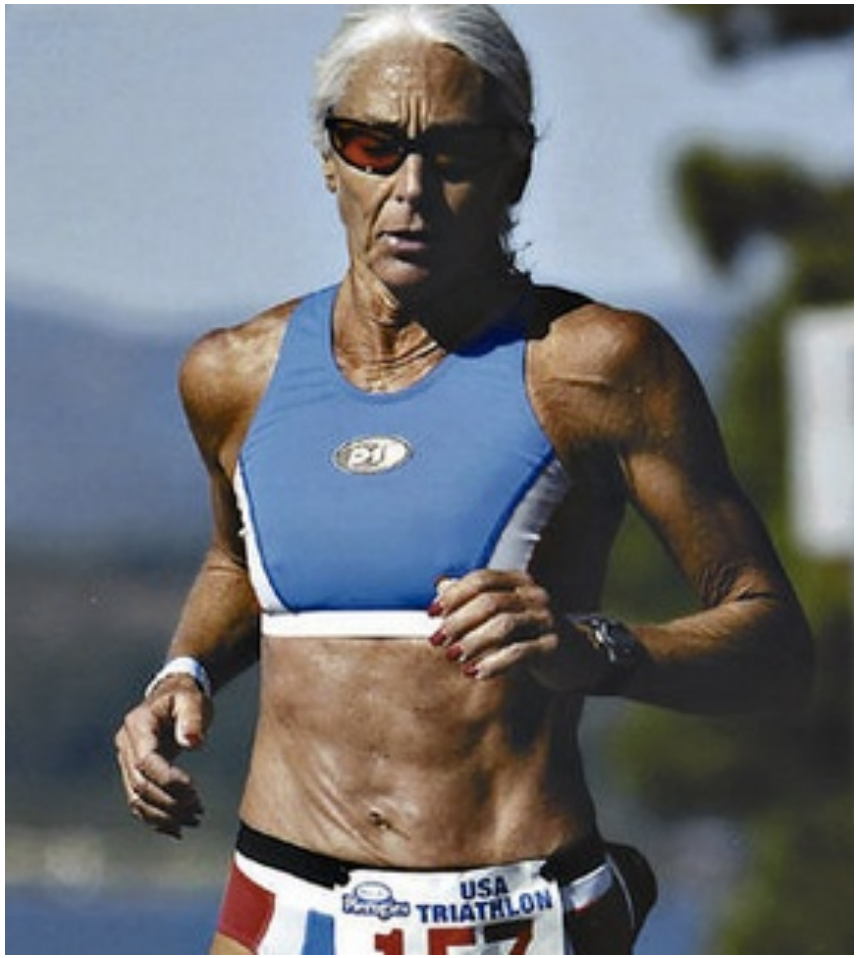

Exercise and bad habits

T/F – NCAA football players have a low incidence (<5%) of HTN

Original Article

High Prevalence of Hypertension Among Collegiate Football Athletes

Ashley Rowatt Karpinos, MD, MPH; Christianne L. Roumie, MD, MPH; Hui Nian, PhD, MS; Alex B. Diamond, DO, MPH; Russell L. Rothman, MD, MPP

- NCAA athletes seen at pre-participation screening
  - 19.2% of football athletes had hypertension and 61.9% had prehypertension
  - 7% of non-football athletes

Even these type of footballers have hypertension

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What is Masked HTN?

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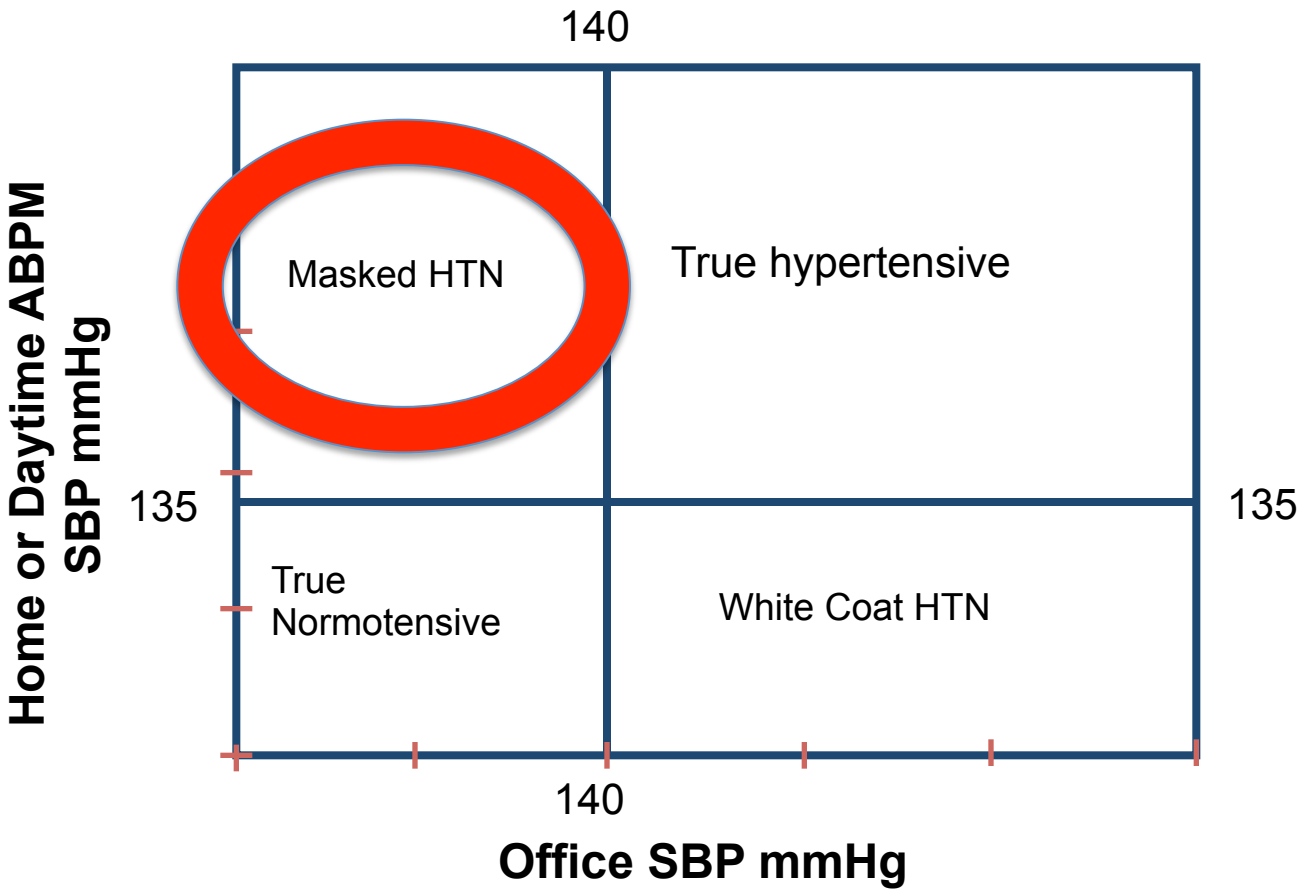
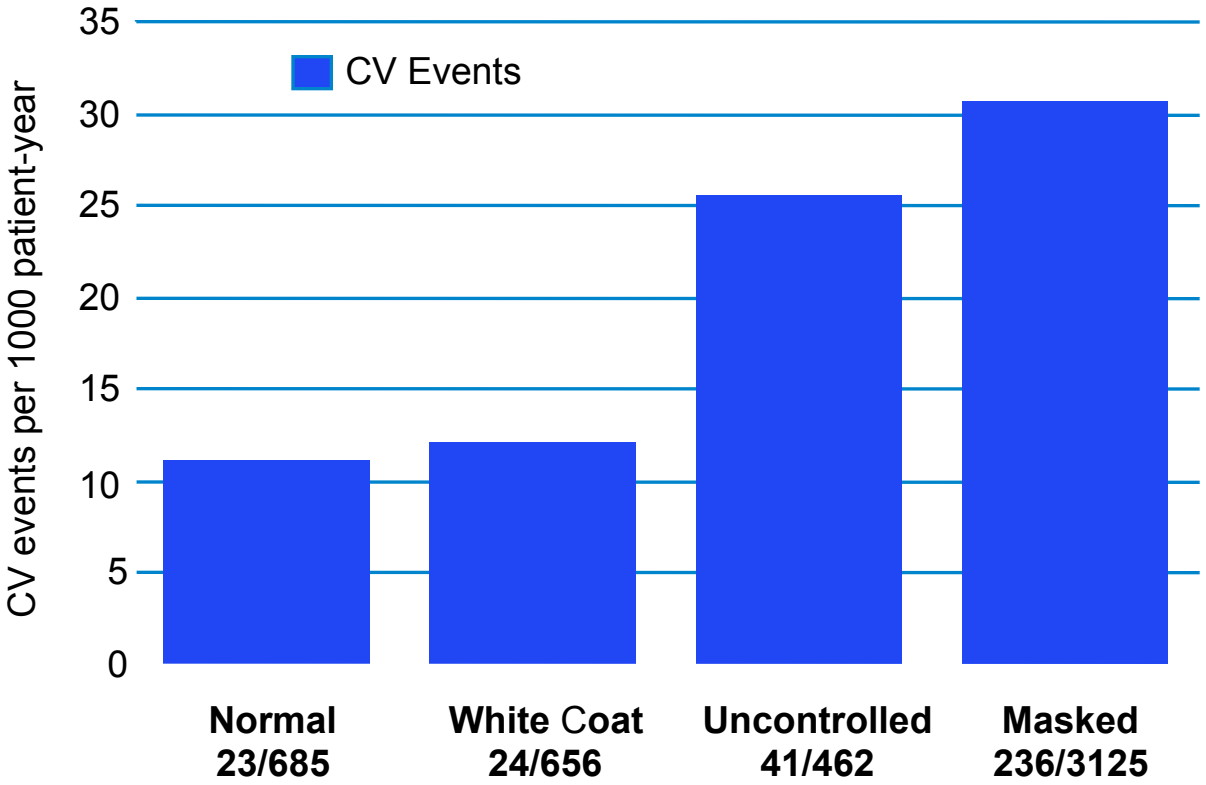
What is Masked HTN?



Derived from Pickering et al. *Hypertension* 2002:40:795-796

The Prognosis of Masked Hypertension

Prevalence is approximately 10% in hypertensive patients.



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Okhubo et al. *J. Am. Coll. Cardiol.* 2005;46;508-515

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Endurance Athletes and Masked HTN

- Male participants of a 10-mile race were recruited and included if office blood pressure was normal (<140/90 mmHg)
- Given ambulatory BP monitor
- mean age was 42 ± 8
- 38% had masked hypertension
- Those with masked hypertension had worse diastolic function and more LVH

Taschsel J Hypertens. 2015

Athletes are not special?

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Position Paper

ESC Study Group of Sports Cardiology Recommendations for participation in leisure-time physical activities and competitive sports for patients with hypertension

Robert H. Fagard[a], Hans H. Björnstad[b], Mats Børjesson[c], François Carré[d], Asterios Deligiannis[e] and Luc Vanhees[a,f]

Recommendations

General recommendations

Athletes with hypertension should be treated according to the general guidelines for the management of

Sports and Anti-HTN drugs

- **Beta-blockers** – lower HR, ↓MV02 by ~7%, banned in some sports
- **Diuretics** – risk of dehydration, electrolyte abnormalities, ↓MV02, banned by most sporting agencies (masking agent)
- **ACEi/ARB + DHP CCB** (amlodipine) are preferred anti-HTN in athletes – can cause excessive BP lowering post exercise

WADA banned substances

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Table 1. Categories of prohibited substances and methods (WADA 2012).[9]

I. Substances and methods prohibited at all times (in- and out-of-competition)
- A. Prohibited substances
  - S0. Non-approved substances[1]
  - S1. Anabolic agents:
    - Anabolic androgenic steroids
    - Other anabolic agents
  - S2. Peptide hormones, growth factors, and related substances[2]
  - S3. Beta-2 agonists
  - S4. Hormone and metabolic modulators[3]
  - S5. Diuretics and other masking agents
- B. Prohibited methods
  - M1. Manipulation of blood and blood components
  - M2. Chemical and physical manipulation
  - M3. Gene doping

II. Substances and methods prohibited in-competition
- S6. Stimulants
- S7. Narcotics
- S8. Cannabinoids
- S9. Glucocorticosteroids

III. Substances prohibited in particular sports
- P1. Alcohol[4]
- P2. Beta-blockers[5]

HTN Guidelines for athletes

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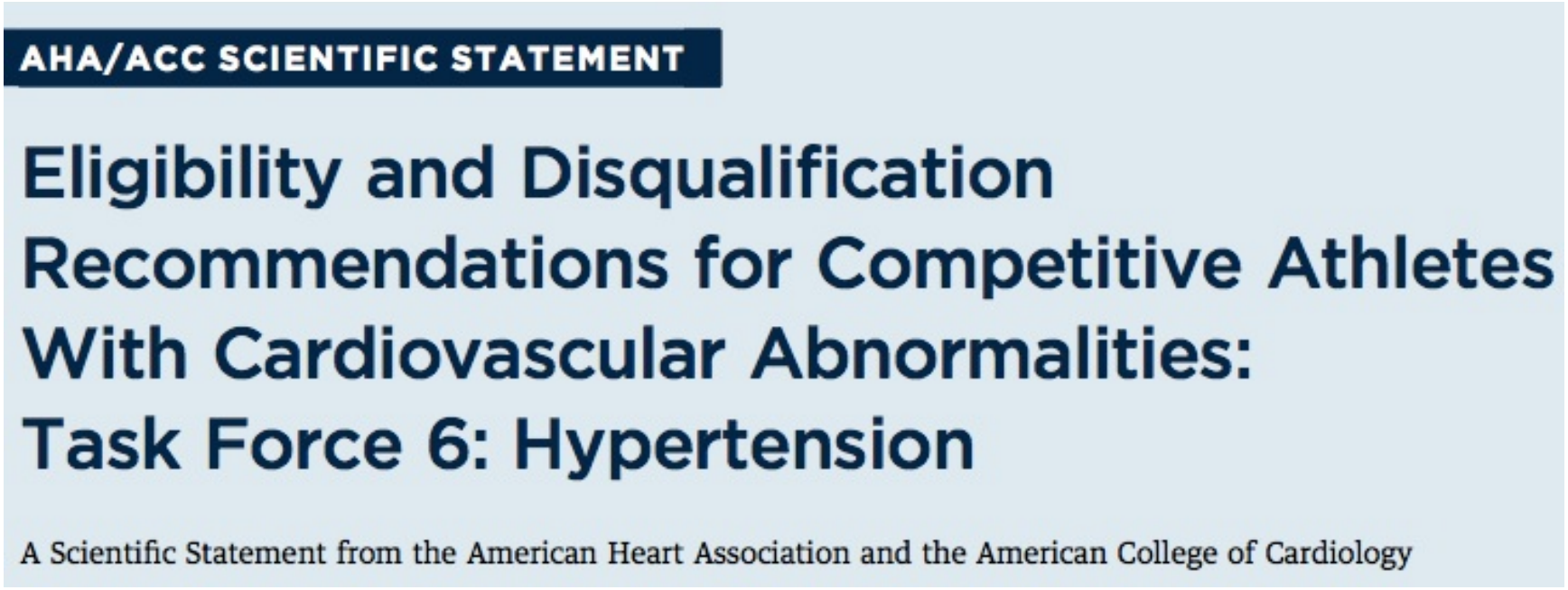

HTN Guidelines

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3. Those with prehypertension (BP of 120/80 mm Hg-139/89 mm Hg) should be encouraged to modify their lifestyles but should not be restricted from physical activity. Those with sustained hypertension should have screening echocardiography performed. Athletes with LVH beyond that seen with "athlete's heart" should limit participation until BP is normalized by appropriate antihypertensive drug therapy *(Class IIa; Level of Evidence B)*.

HTN Guidelines

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4. **It is reasonable that athletes with stage 2 hypertension (a systolic BP >160 mm Hg or a diastolic BP >100 mm Hg), even without evidence of target-organ damage, should be restricted, particularly from high static sports, such as weight lifting, boxing, and wrestling, until hypertension is controlled by either lifestyle modification or drug therapy *(Class IIa; Level of Evidence B)*.**

Guideline recommendations of athletes with KNOWN CAD

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AHA/ACC SCIENTIFIC STATEMENT

Eligibility and Disqualification Recommendations for Competitive Athletes With Cardiovascular Abnormalities: Task Force 8: Coronary Artery Disease

A Scientific Statement from the American Heart Association and American College of Cardiology

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Known CAD Recommendations

Recommendations

1. **Athletes with ASCAD should undergo maximal exercise testing to evaluate exercise tolerance, the presence of inducible ischemia, and the presence of exercise-induced electrical instability. Testing should be performed on the subject's standard medical regimen, including β-adrenergic blocking medications *(Class I; Level of Evidence C)*.**
2. **Athletes with ASCAD should undergo an evaluation of left ventricular function *(Class I; Level of Evidence C)*.**

Known CAD Recommendations

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4. **Athletes with ASCAD should undergo aggressive risk factor reduction with high-intensity statin therapy to reduce the chance of plaque disruption (6) *(Class I; Level of Evidence A).***

Known CAD Recommendations

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6. It is reasonable for patients with clinically manifest ASCAD to participate in all competitive activities if their resting left ventricular ejection fraction is >50%, they are asymptomatic, and they have no inducible ischemia or electrical instability *(Class IIb; Level of Evidence C)*.

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Known CAD Recommendations

8. **It is reasonable to prohibit patients with clinically manifest ASCAD from competitive sport participation:**
   a. **For at least 3 months after an AMI or coronary revascularization procedure *(Class IIb; Level of Evidence C)*;**
   b. **If they have increasing frequency or worsening symptoms of myocardial ischemia *(Class IIb; Level of Evidence C)*.**

U-Shaped Curve?

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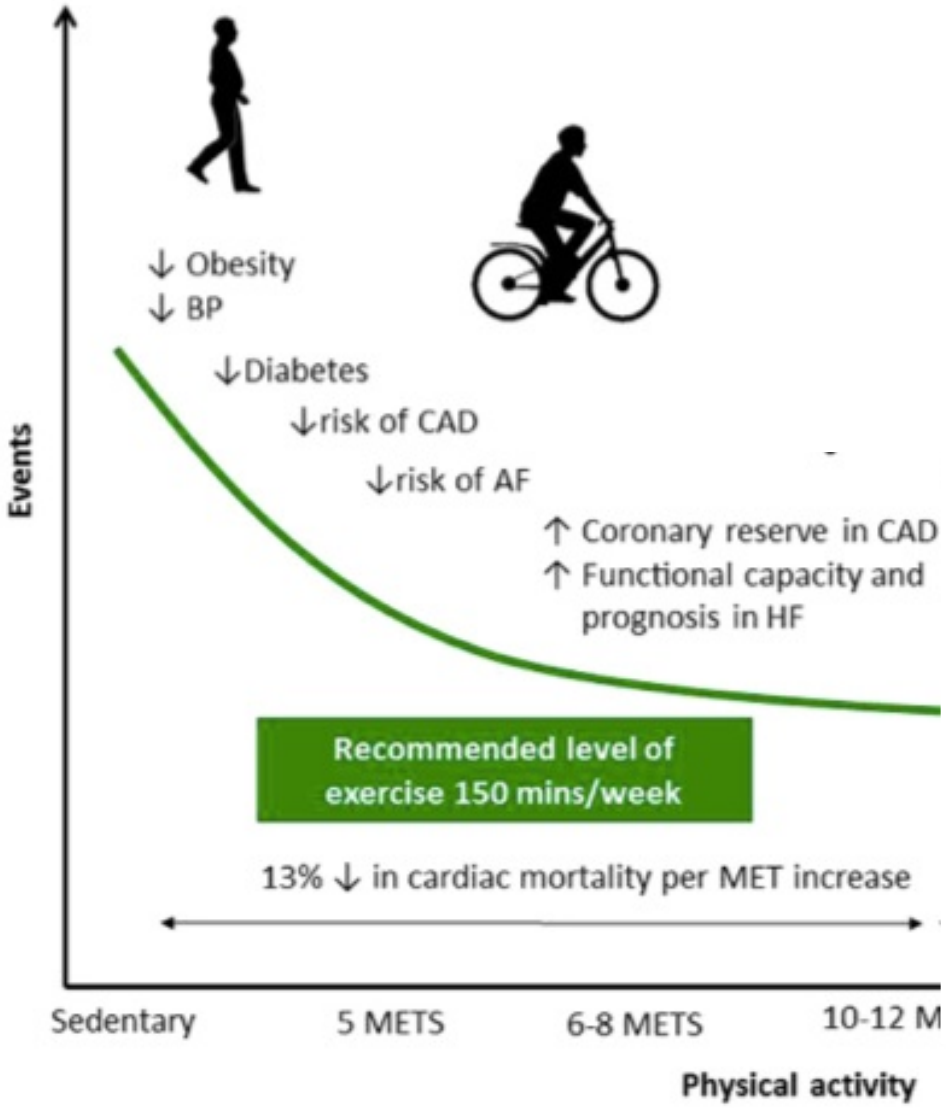

Elite athletes

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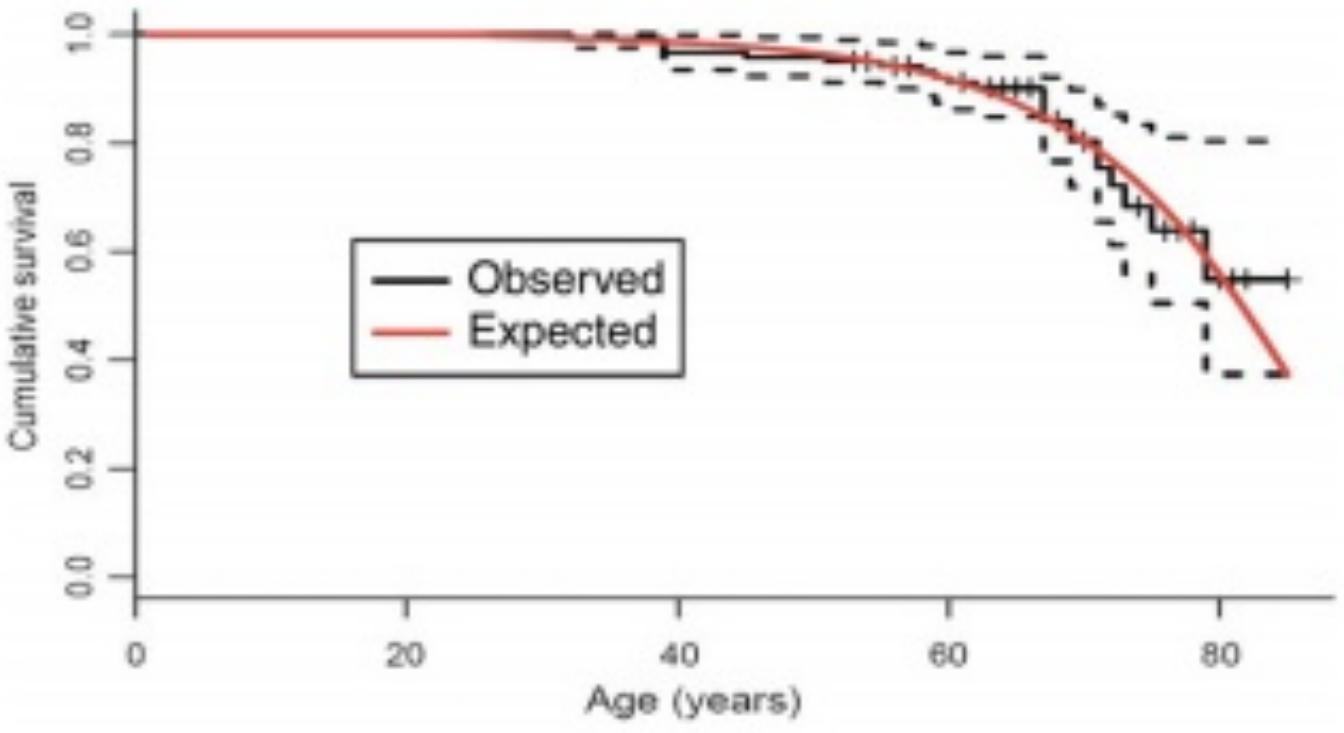
- Elite athletes compared to controls:
  - LOWER rates of smoking
  - LOWER rates of CAD
  - LOWER rates of diabetes
  - LOWER rates of depression + anxiety
  - HIGHER rates of OA (but more likely to remain physically active)

Survival of professional cyclists



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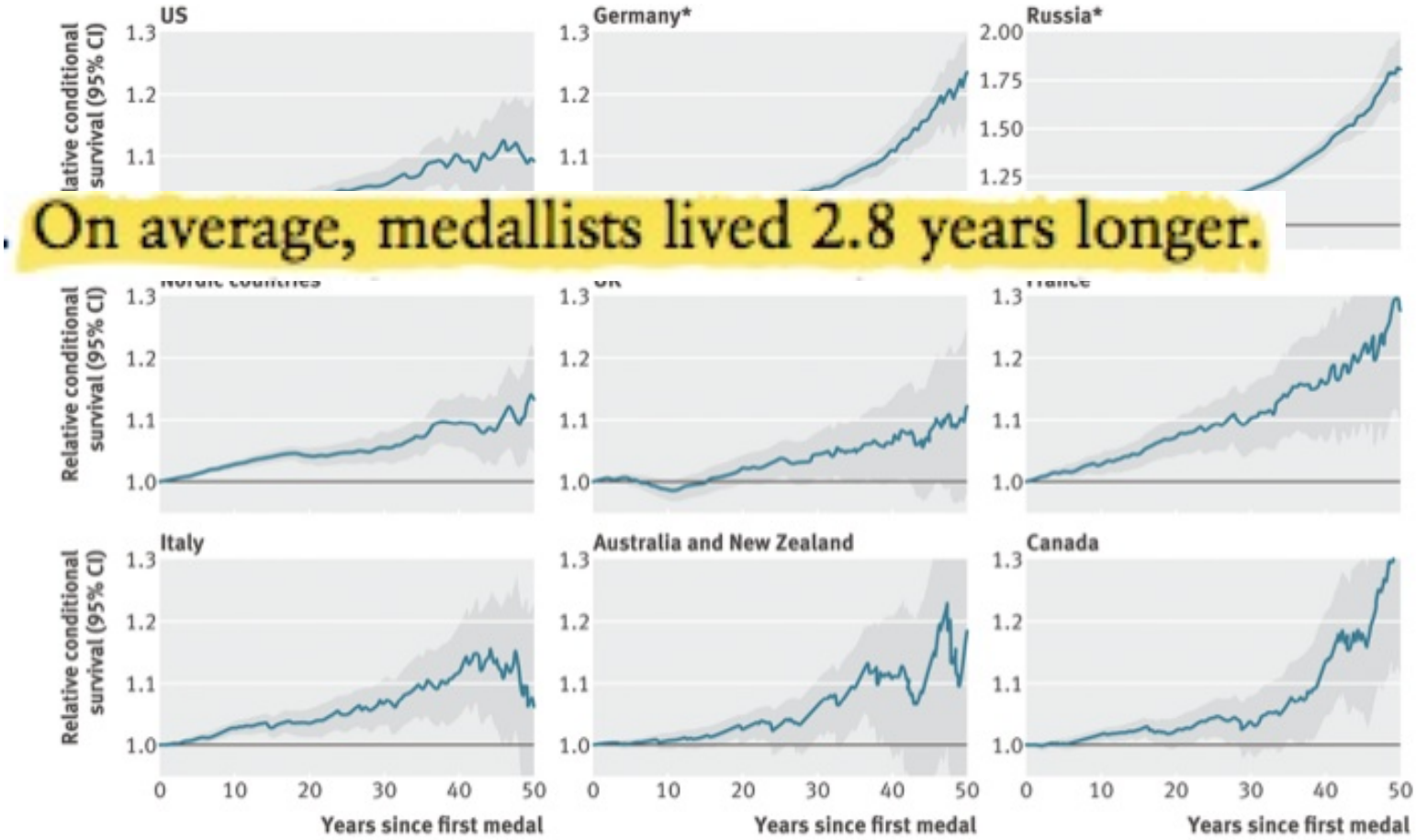
Do Olympians enjoy longer life?



On average, medallists lived 2.8 years longer.

Figure 2 Survival of Olympic medallists, by country group. *Excludes medallists from Olympic Games before 1950.

Clarke BMJ 2015

Canadian Olympians and Mortality

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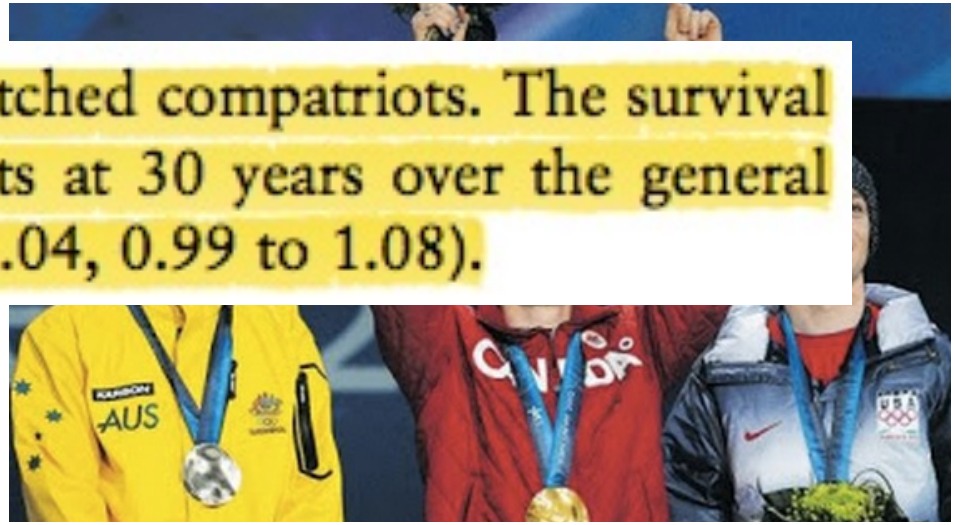
survival advantage over their matched compatriots. The survival advantage of Canadian medallists at 30 years over the general population was not significant (1.04, 0.99 to 1.08).



Type of sport and disease specific mortality

All-cause and disease-specific mortality among male, former elite athletes: an average 50-year follow-up

Jyrki A Kettunen,[1] Urho M Kujala,[2] Jaakko Kaprio,[3,4,5] Heli Bäckmand,[6]

Table 3 Disease-specific mortality HRs and their 95% CI in different sport groups compared to controls

	Mortality HR† (95% CI)		
Sports	**Ischaemic heart disease (n=815)**	**Cancer (n=578)**	**Stroke (n=207)**
Endurance sports	0.68 (0.54 to 0.86)*	0.62 (0.47 to 0.82)*	0.52 (0.33 to 0.83)*
Team sports	0.73 (0.60 to 0.89)*	0.72 (0.58 to 0.90)*	0.59 (0.40 to 0.88)*
Power sports	0.99 (0.83 to 1.18)	0.80 (0.64 to 1.00)	0.73 (0.51 to 1.05)
Controls	1	1	1

Elite athletes have 5–6 years additional life expectancy when compared to men who were healthy as young adults

SCBC Masters Athlete Screening Study

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- **Primary Objective:**
  - Prevent adverse cardiac events and sudden cardiac death in Masters athletes

- **Outcomes:**
  - Prevalence of cardiovascular disease (i.e. CAD)
  - Prevalence of risk factors (i.e. hypertension, dyslipidemia)
  - Prevalence of atrial fibrillation in the masters athlete and its association with intensity of sport and volume of physical activity

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N = 800+ Recreationally Competitive and High Performance Masters Athletes

Initial Screen:

History and Personal Symptoms Questionnaire, Physical Exam, Framingham Risk Score, Resting 12-lead ECG

- Negative
  - No Further Testing → Follow-up (5 Years): ECG, FRS, Questionnaire
- Positive
  - Exercise Treadmill Test
    - Negative: Follow-Up (5 years): ECG, FRS, Questionnaire
    - Positive
      - Further Examinations (i.e. echo, 24 h holter, CMR, CCT/CACS)
        - No Cardiovascular Disease
          - Follow-up (5 years): ECG, FRS, Questionnaire
        - CVD→ q1yr Follow-up
        - Other → Clinical Care

Masters Study – Interim Results

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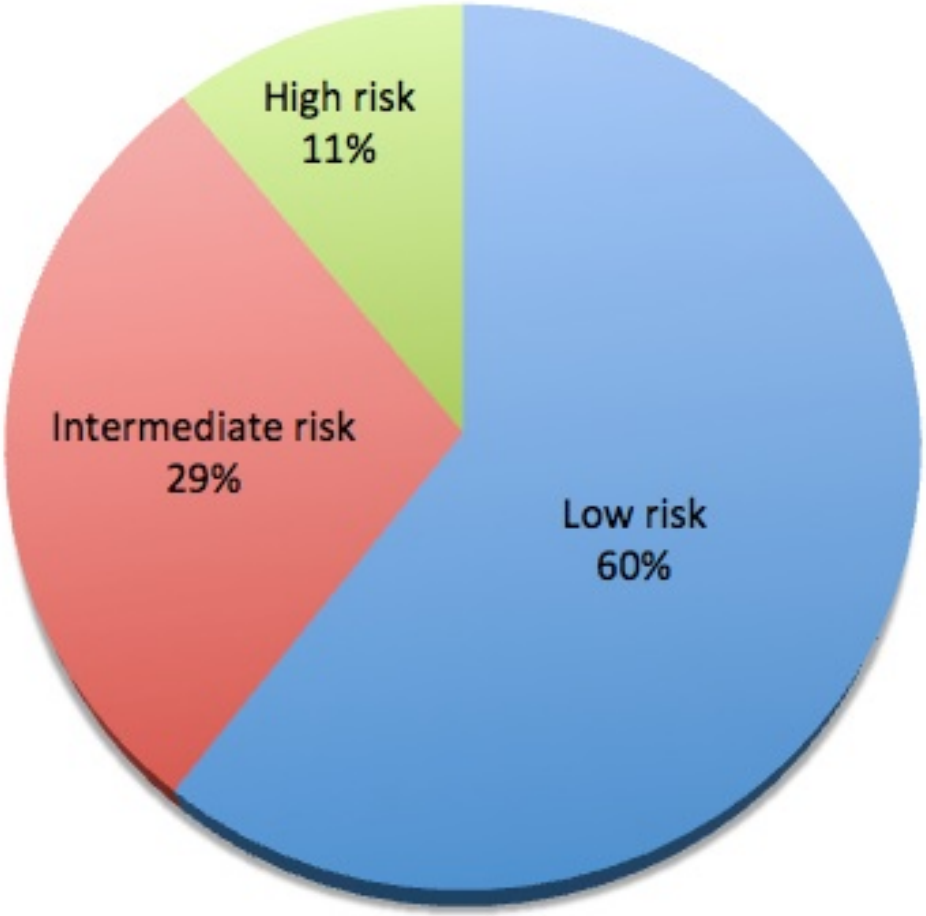
Framingham Risk Score



185
Patients

Masters Study – Interim Results

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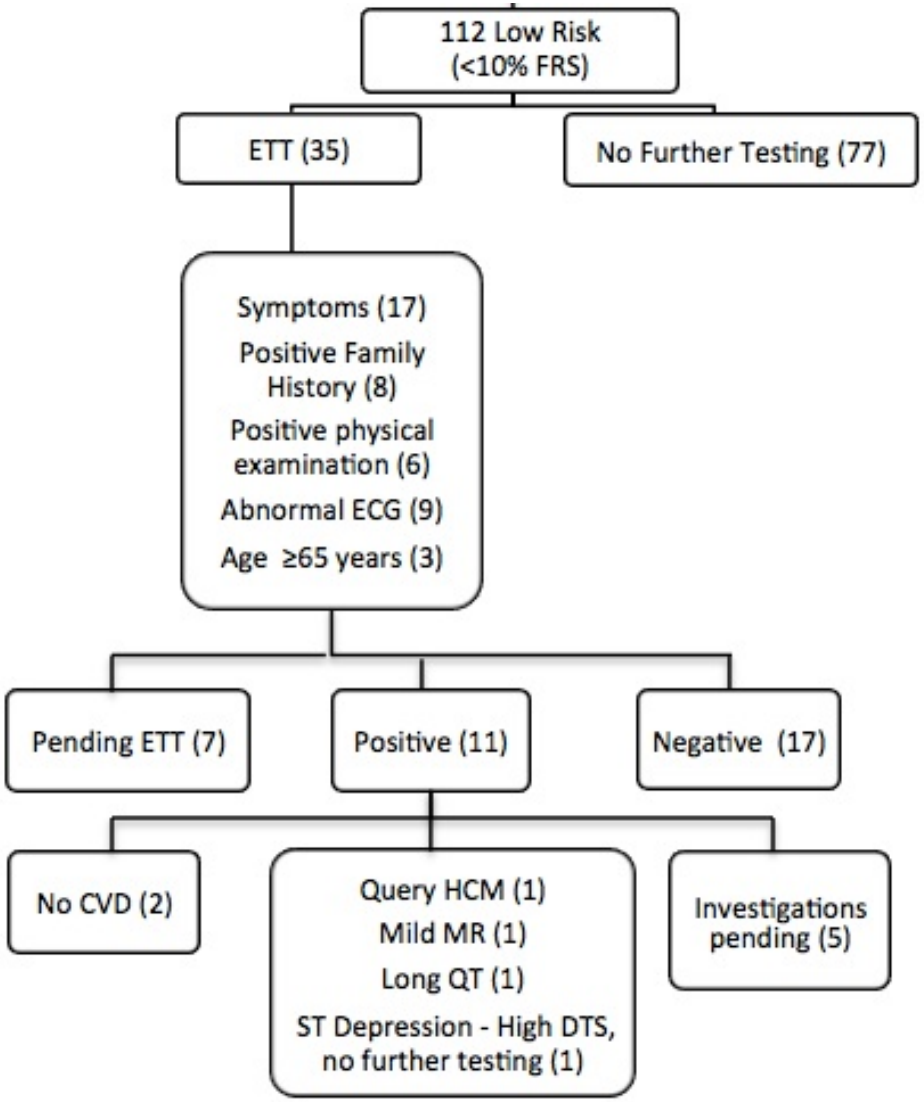

Masters Study – Interim Results

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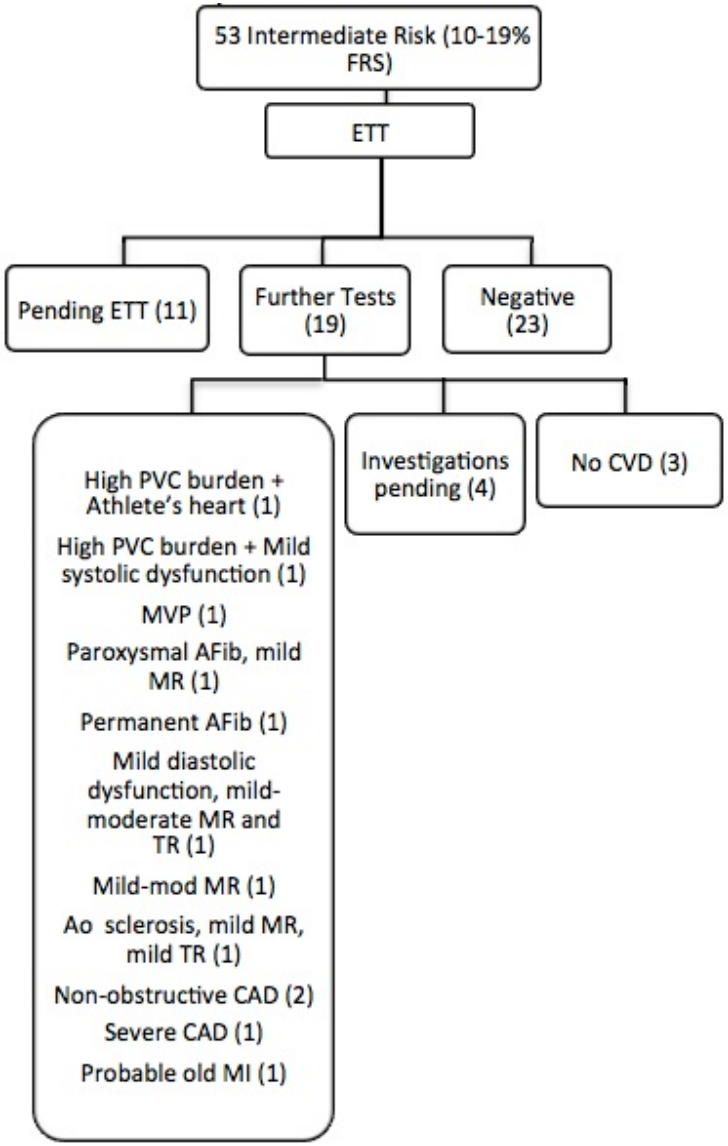

Masters Study – Interim Results

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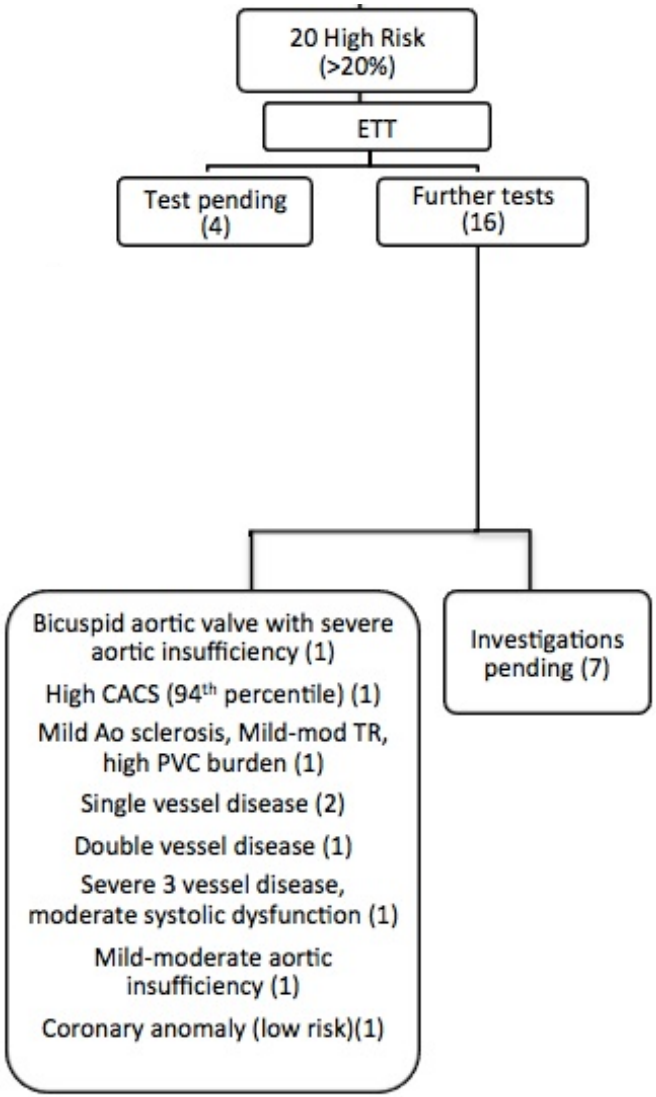

Masters Study – Interim Conclusions

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- Masters athletes are not immune to elevated cardiovascular risk
- Significant CV disease exists amongst asymptomatic physically fit Masters athletes
- Systematic screening amongst Masters athletes may worthwhile in select cases
- To evaluate the incidence of symptomatic and asymptomatic cardiovascular disease over 5 years

Conclusions

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- Athletes are special
  - in *most cases* athletes live longer than their sedentary counterparts
- However, athletes can still have elevated cardiovascular risk and risk factors that should be treated as per general guideline recommendations

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