

# CT Angiography vs Nuclear Stress Which is the Better Test?

*For What?*

Norman E. Lepor, MD FACC

Clinical Professor of Medicine

Geffen School of Medicine/UCLA

Smidt Cedars-Sinai Heart Institute

Westside Medical Associates of Los Angeles

# Next Years Debate Topic: Worst Job in the World



# What Does A Nuclear Stress Test Report

- \* Exercise performance if treadmill performed
- \* Regional perfusion abnormalities
  - \* Reversible vs Fixed
    - \* Perfusion abnormalities represent regions of decreased blood flow and not ischemia
- \* Does have predictive abilities to determine risk of cardiovascular events

# What Does A CTA Report? A Lot More Than Pretty Pictures

- \* The presence or absence of coronary plaque
- \* The severity (stenosis) of coronary plaque
- \* Plaque morphology
  - \* High risk features such as fatty plaque, negative remodeling
- \* Coronary artery anomalies
- \* Cardiac function/infarct detection
- \* Assessing other causes of cardiac symptoms such as pulmonary emboli, thoracic aortic aneurysm

# What Decisions Can This Effect?

- \* Intensity of lipid lowering therapy
- \* Need for anti-platelet therapy
- \* Need for revascularization and avoiding the oculo-stenotic reflex when disease is discovered in the cardiac catheterization laboratory

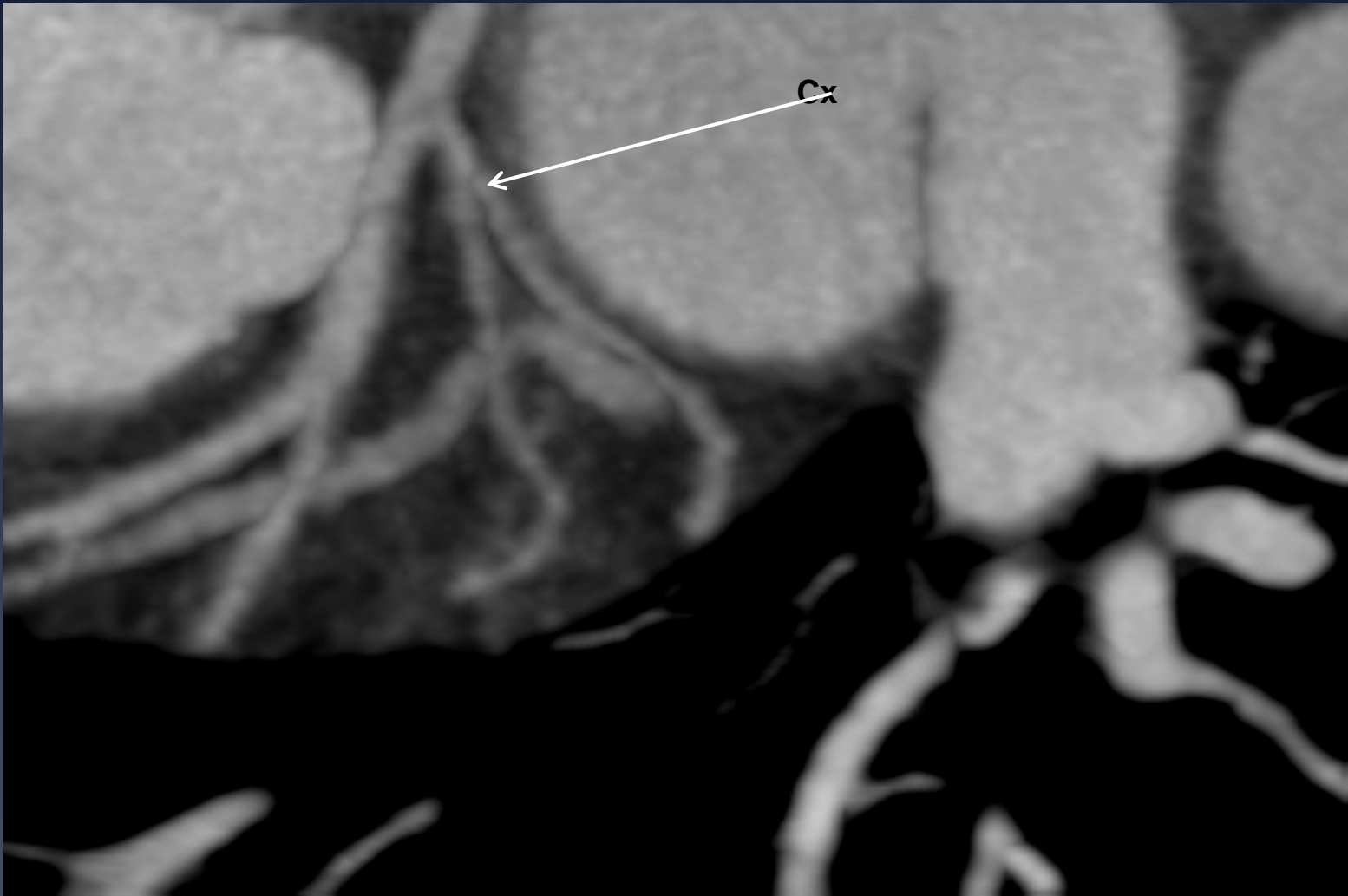
# So What Kind of Questions Do We Ask?

- \* Does this patient have coronary artery disease?
- \* Is my patient high risk?
- \* Should the patient be on a statin and/or aspirin?
- \* Can I personalize lipid lowering goals?
- \* What is the cause of the patients chest discomfort?

72yo F

LM/LAD





72yo F

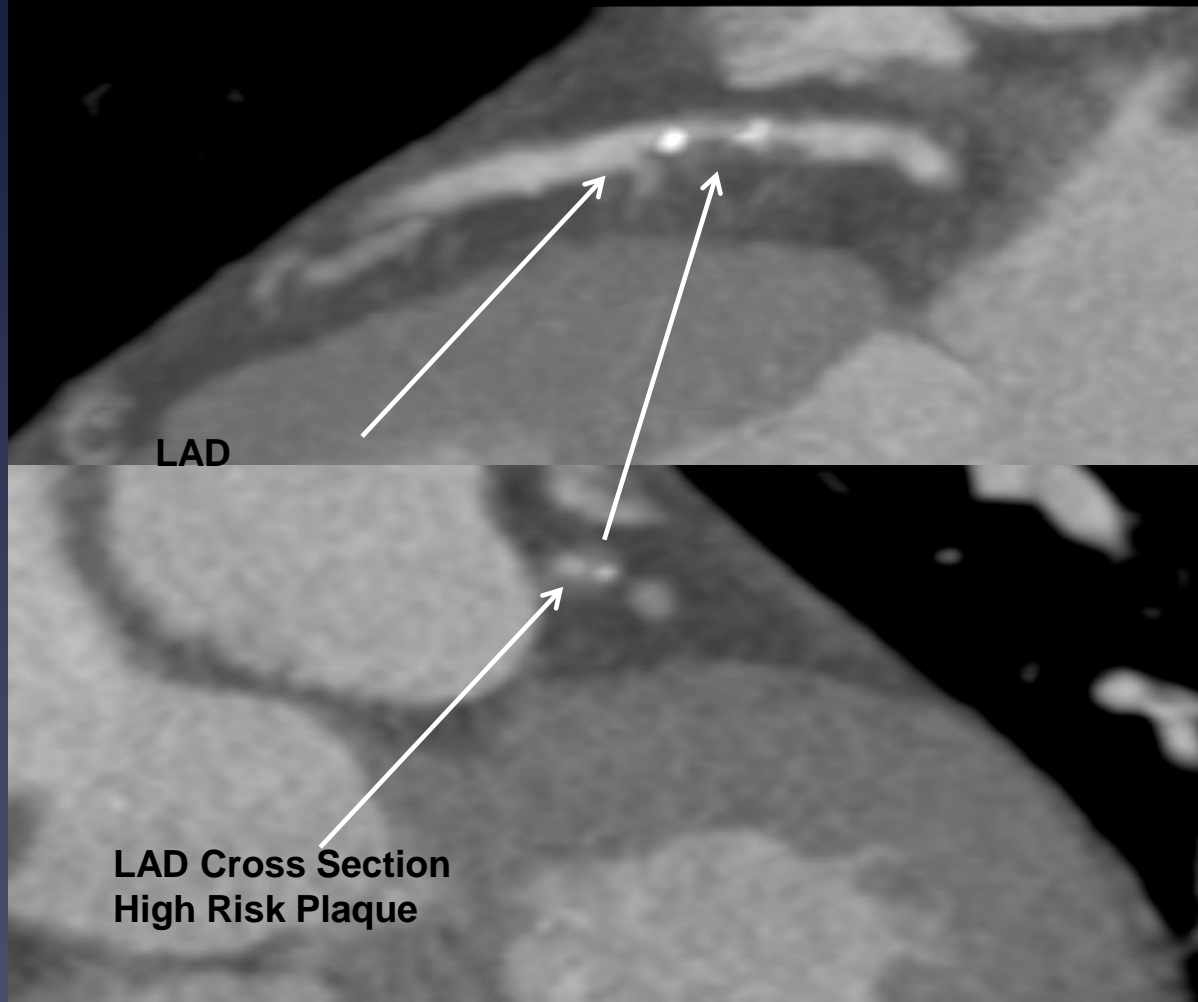


2yo M



LAD

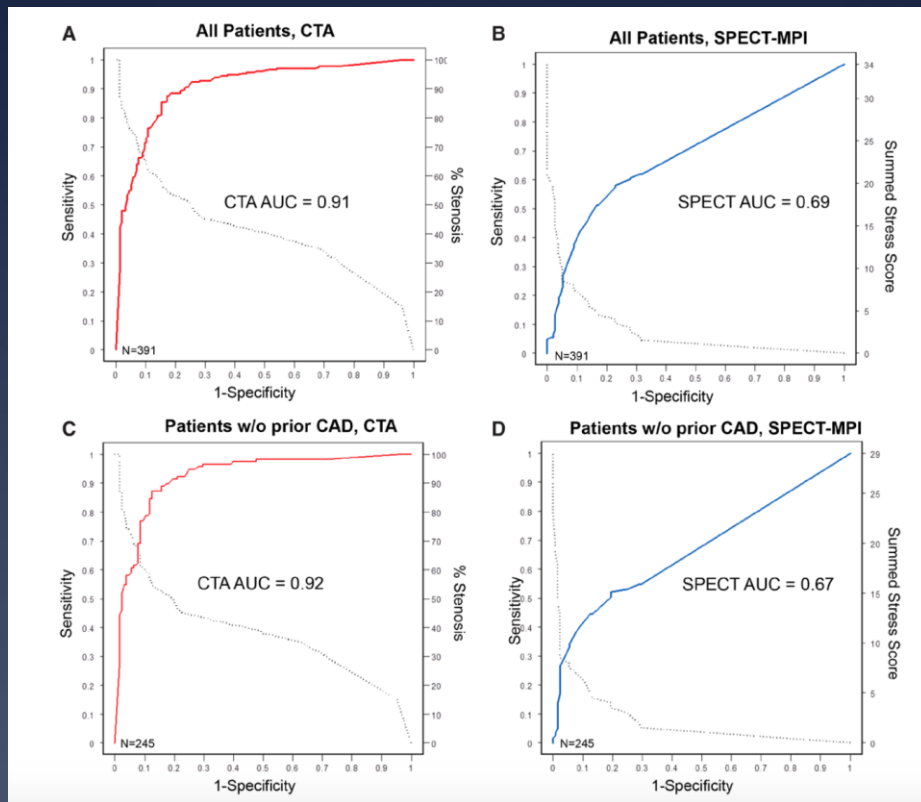
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LAD

LAD Cross Section  
High Risk Plaque

# Sensitivity and Specificity of CCT vs SPECT



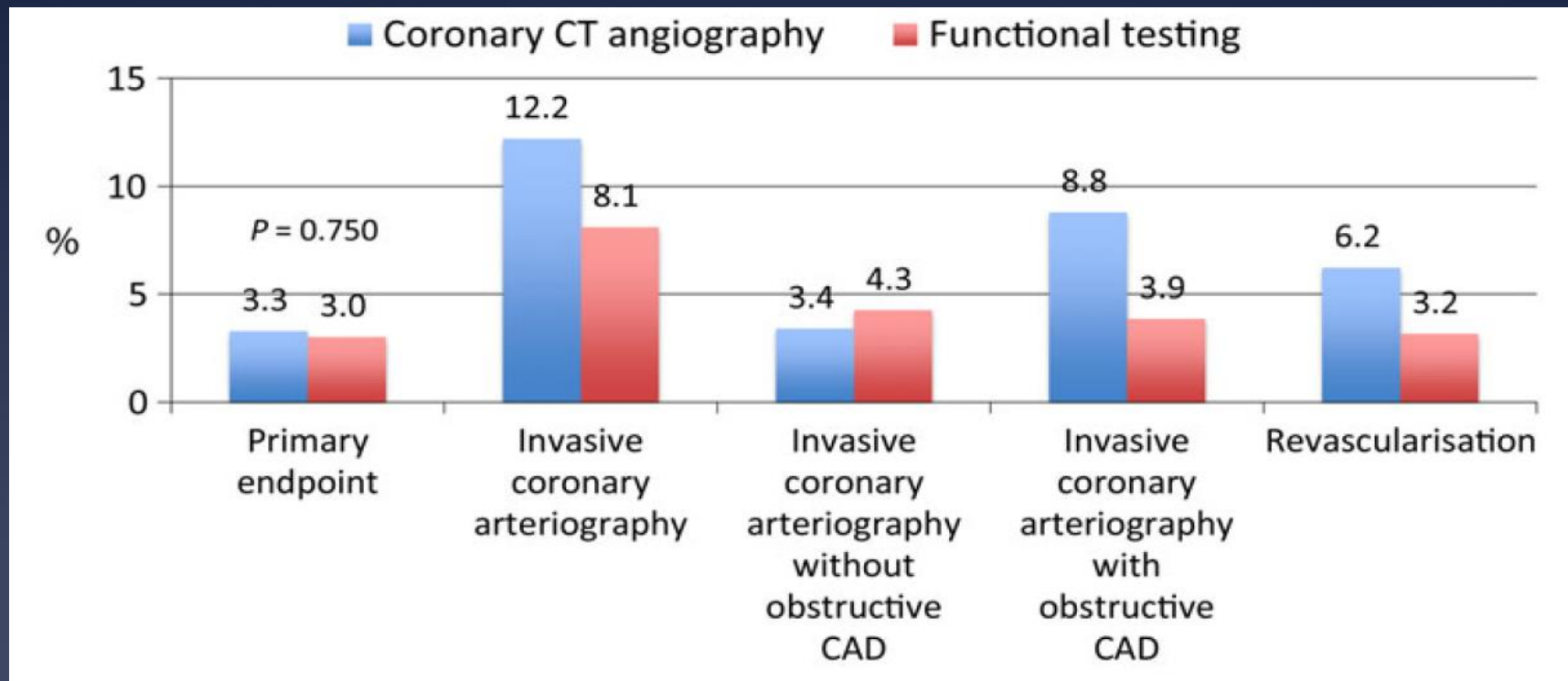
# Overall Diagnostic Accuracy

|                    | All (n=391)      |                  |                | No Previous CAD (n=245) |                  |                |
|--------------------|------------------|------------------|----------------|-------------------------|------------------|----------------|
|                    | CTA              | SPECT            | <i>P</i> Value | CTA                     | SPECT            | <i>P</i> Value |
| AUC                | 0.91 (0.88–0.94) | 0.69 (0.64–0.74) | <0.001         | 0.92 (0.89–0.96)        | 0.67 (0.61–0.73) | <0.001         |
| Sensitivity        | 216/234          | 145/234          | <0.001         | 107/117                 | 64/117           | <0.001         |
| Specificity        | 0.92 (0.88–0.95) | 0.62 (0.55–0.68) | 0.23           | 0.91 (0.85–0.96)        | 0.55 (0.45–0.64) | 0.08           |
|                    | 117/157          | 107/157          |                | 103/128                 | 90/128           |                |
| PPV                | 0.75 (0.67–0.81) | 0.68 (0.60–0.75) | 0.001          | 0.80 (0.73–0.87)        |                  | <0.001         |
|                    | 216/256          | 145/195          |                | 107/132                 | 64/102           |                |
| NPV                | 0.84 (0.79–0.89) | 0.74 (0.68–0.80) | <0.0001        | 0.81 (0.73–0.87)        | 0.63 (0.53–0.72) | <0.001         |
|                    | 117/135          | 107/196          |                | 103/113                 | 90/143           |                |
| Disease prevalence | 0.87 (0.80–0.92) | 0.55 (0.47–0.62) |                | 0.91 (0.84–0.96)        | 0.63 (0.54–0.71) |                |
|                    | 0.60             |                  |                | 0.48                    |                  |                |

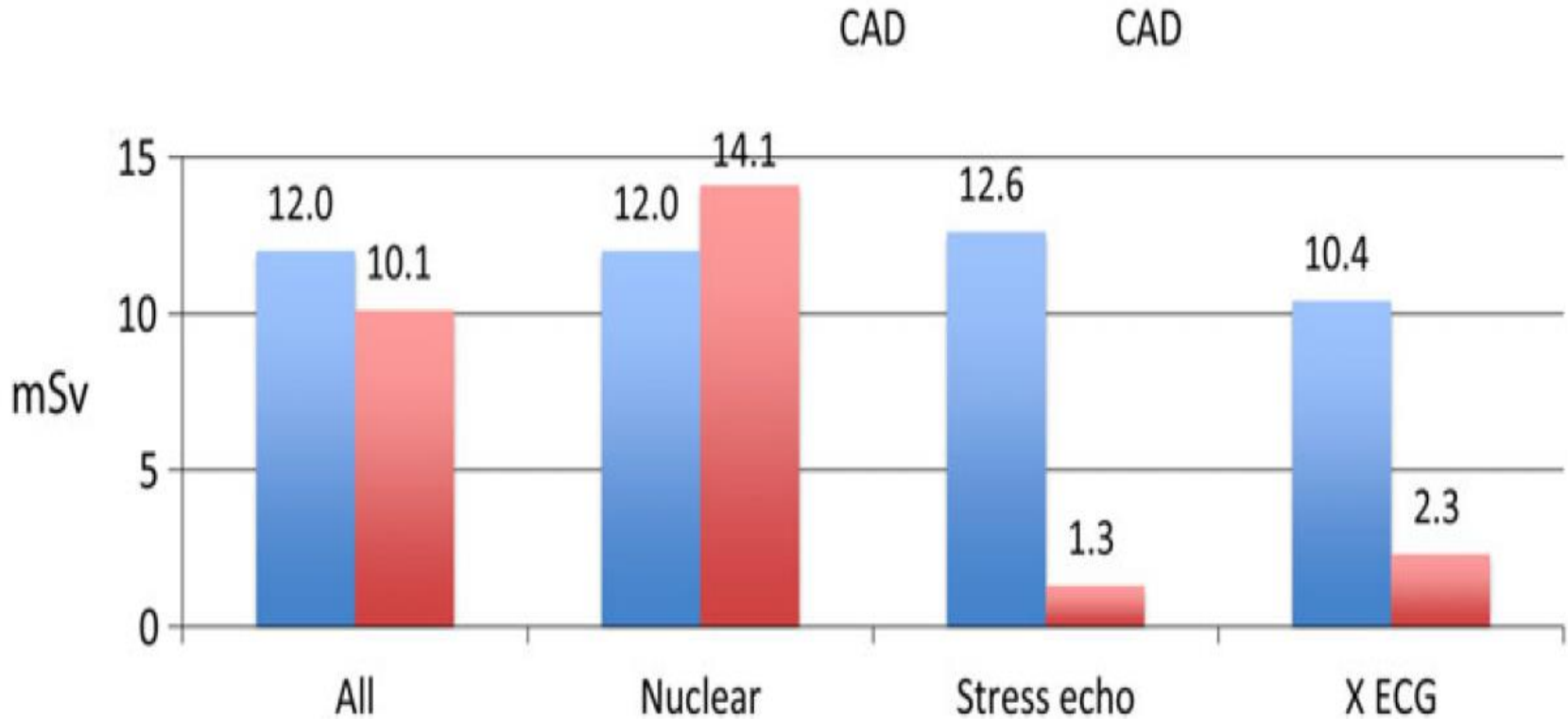
# Diagnostic Accuracy CCTA vs Spect in Subgroups

| Groups n (All, No Previous CAD)    | All Patients     |                  |        | Patients Without Previous CAD |                  |        |
|------------------------------------|------------------|------------------|--------|-------------------------------|------------------|--------|
|                                    | CTA              | SPECT            | PValue | CTA                           | SPECT            | PValue |
| Obese patients (n=100, 72)         | 0.95 (0.91–0.99) | 0.65 (0.55–0.76) | <0.001 | 0.95 (0.91–1.00)              | 0.62 (0.49–0.75) | <0.001 |
| Nonobese patients (n=291, 173)     | 0.89 (0.85–0.93) | 0.71 (0.65–0.76) | <0.001 | 0.91 (0.87–0.96)              | 0.69 (0.62–0.76) | <0.001 |
| Calcium score, ≥400 (n=125, 66)    | 0.76 (0.61–0.91) | 0.65 (0.51–0.79) | 0.33   | 0.70 (0.49–0.92)              | 0.71 (0.58–0.83) | 0.96   |
| Calcium score, <400 (n=265, 178)   | 0.89 (0.85–0.93) | 0.67 (0.61–0.73) | <0.001 | 0.91 (0.86–0.96)              | 0.60 (0.52–0.68) | <0.001 |
| Exercise SPECT (n=126, 82)         | 0.90 (0.85–0.96) | 0.60 (0.52–0.69) | <0.001 | 0.91 (0.84–0.98)              | 0.61 (0.50–0.72) | <0.001 |
| Pharmacological SPECT (n=264, 162) | 0.91 (0.87–0.94) | 0.73 (0.67–0.78) | <0.001 | 0.93 (0.89–0.97)              | 0.69 (0.62–0.77) | <0.001 |
| Research SPECT (n=231, 137)        | 0.90 (0.86–0.94) | 0.72 (0.66–0.78) | <0.001 | 0.92 (0.87–0.98)              | 0.66 (0.60–0.78) | <0.001 |
| Clinical SPECT (n=160, 108)        | 0.92 (0.88–0.97) | 0.65 (0.58–0.73) | <0.001 | 0.92 (0.87–0.98)              | 0.69 (0.60–0.78) | <0.001 |

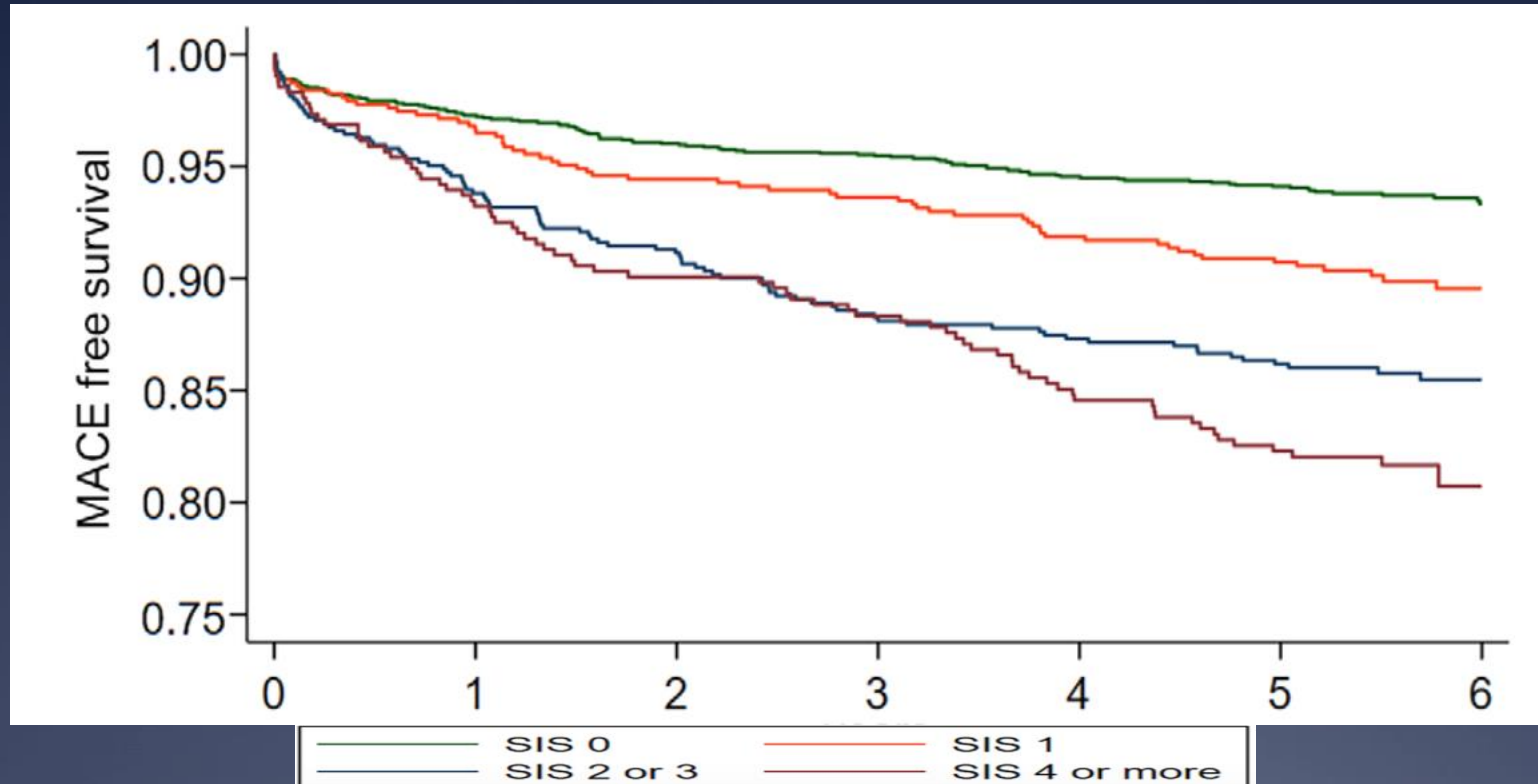
# Assessing Suspected Angina CTA vs Stress Testing



# X-Ray Exposure and Modality

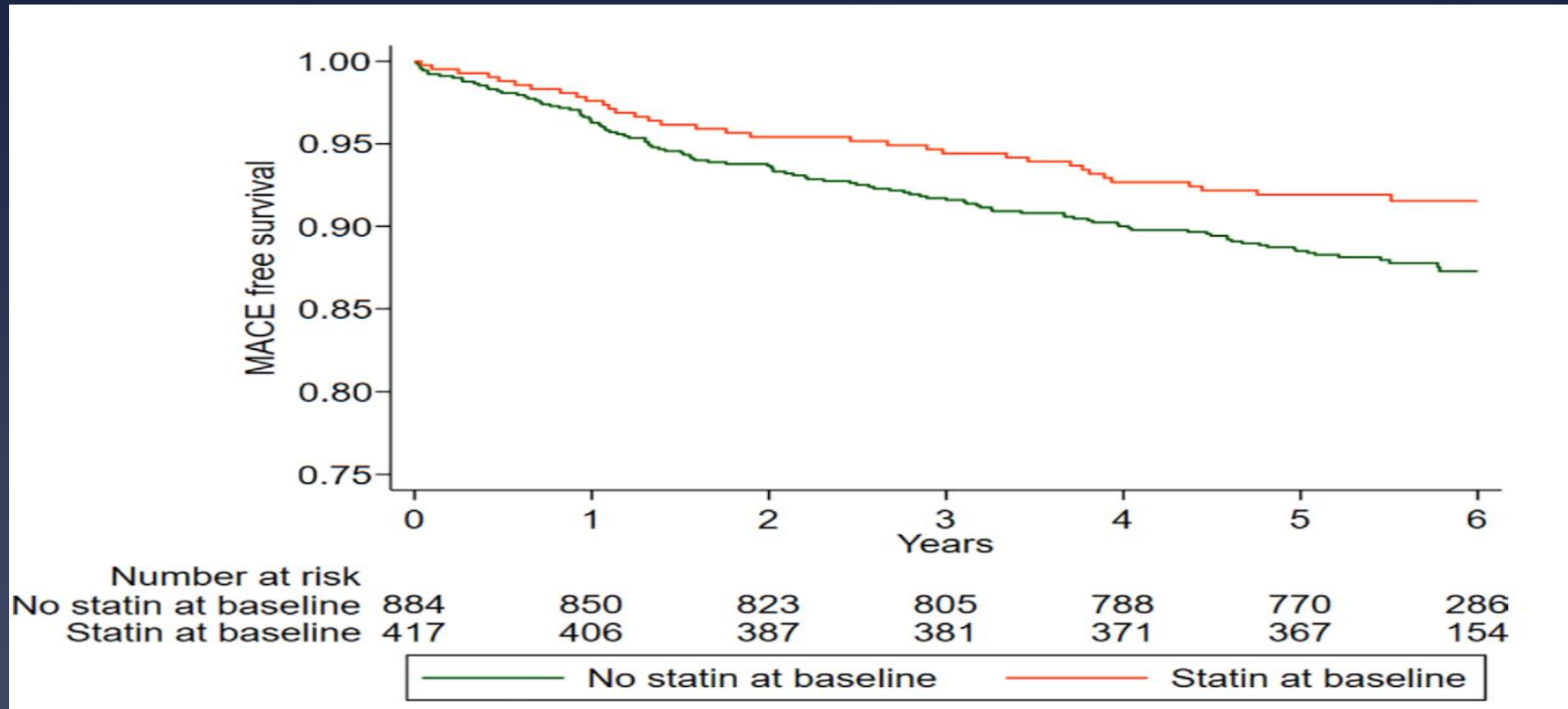


# MACE Free Survival Stratified By CAD Severity (CONFIRM)



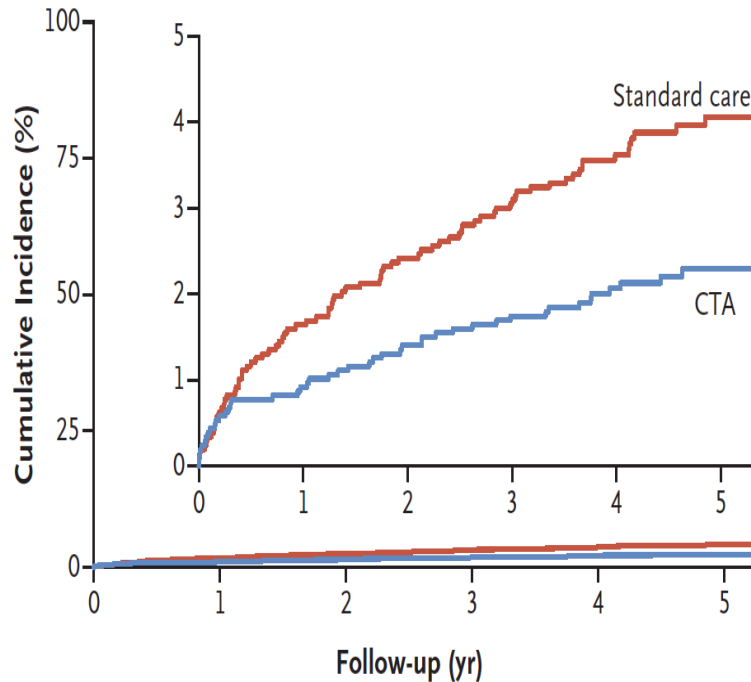


# MACE Free Survival Non-Obstructive Plaque and Statin Use (CONFIRM)

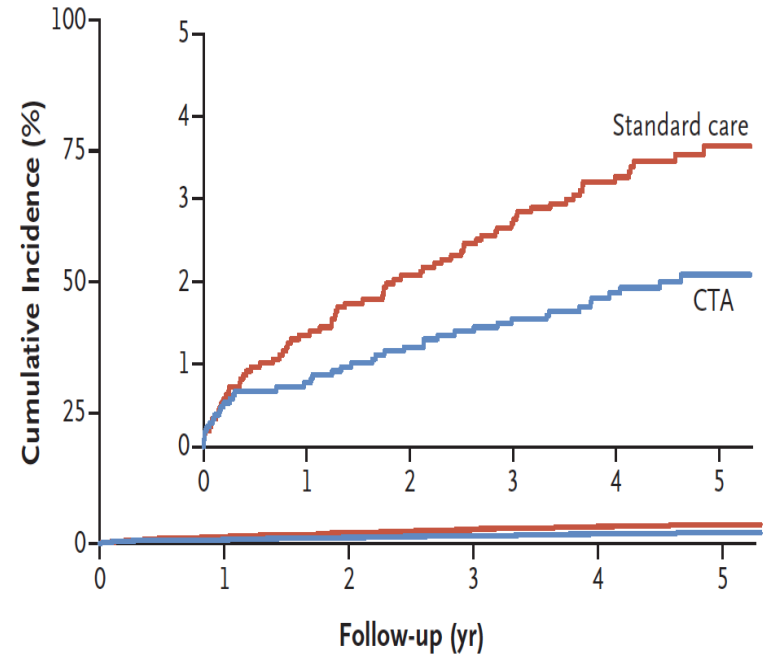


# SCOT-HEART Study Stable Chest Pain Open Label Randomization

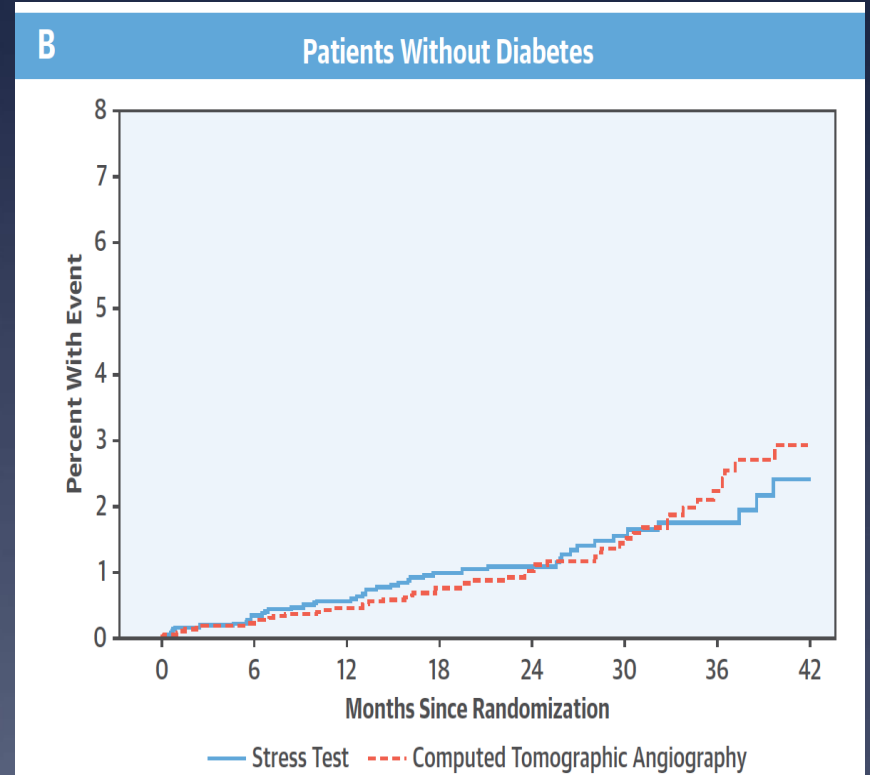
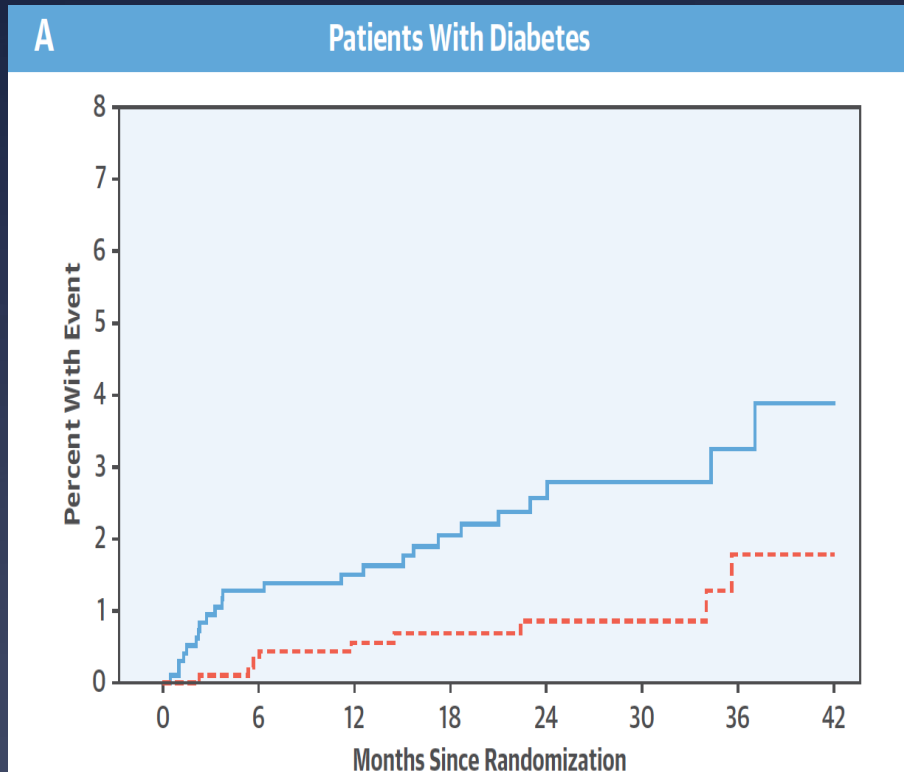
A Death from Coronary Heart Disease or Nonfatal Myocardial Infarction



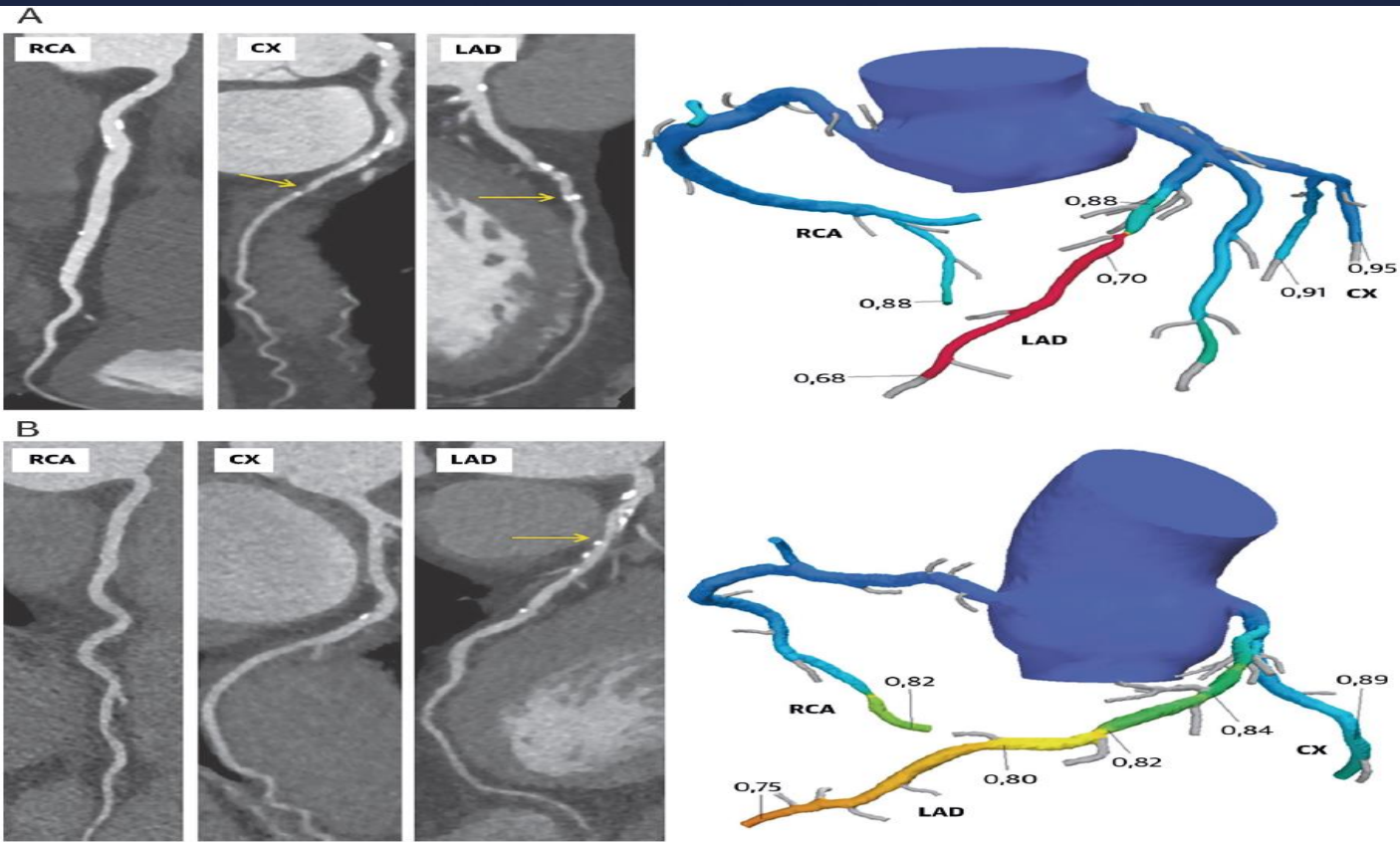
B Nonfatal Myocardial Infarction



# Stress Testing vs CTCA in Diabetics PROMISE Trial Composite of CV Death/MI In Stable Chest Pain



# CT-FFR In Practice



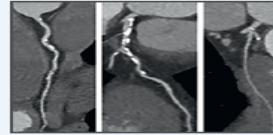
# Clinical Implications Of FFR-CT

**CENTRAL ILLUSTRATION** Diagnostic and Management Strategy With Clinical Outcomes in Patients Undergoing First-Line Coronary Computed Tomography Angiography With Selective FFR<sub>CT</sub> Testing

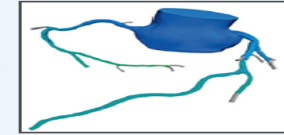
## I. Diagnostic Strategy

Clinical Presentation

+



+  
(CTA stenosis  
30%-70%)



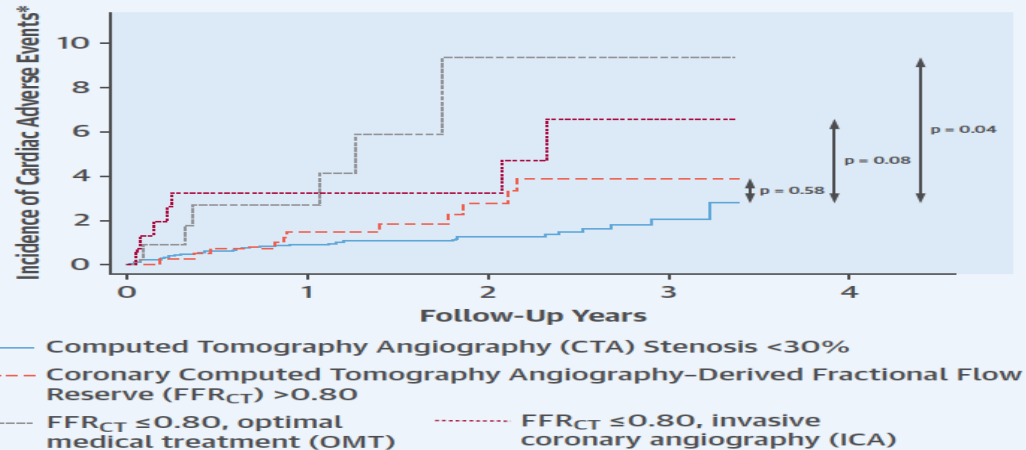
## II. Post-test Management

CTA stenosis <30%:  
No additional testing, OMT

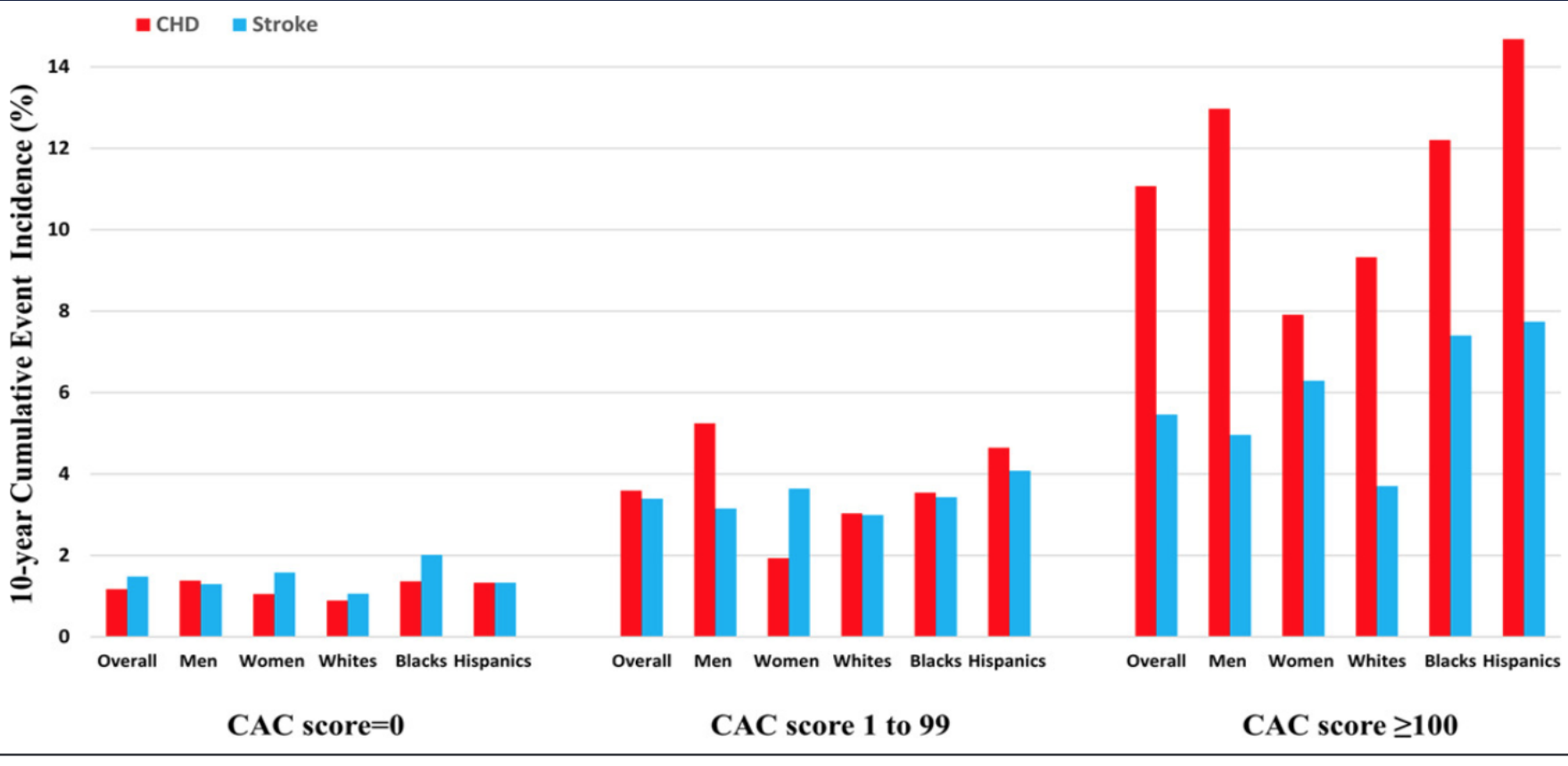
FFR<sub>CT</sub> >0.80:  
OMT

FFR<sub>CT</sub> ≤0.80:  
OMT, or OMT + ICA

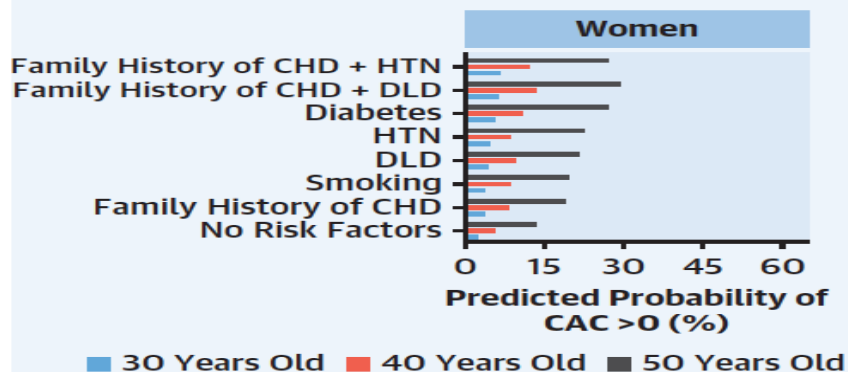
## III. Clinical Outcomes



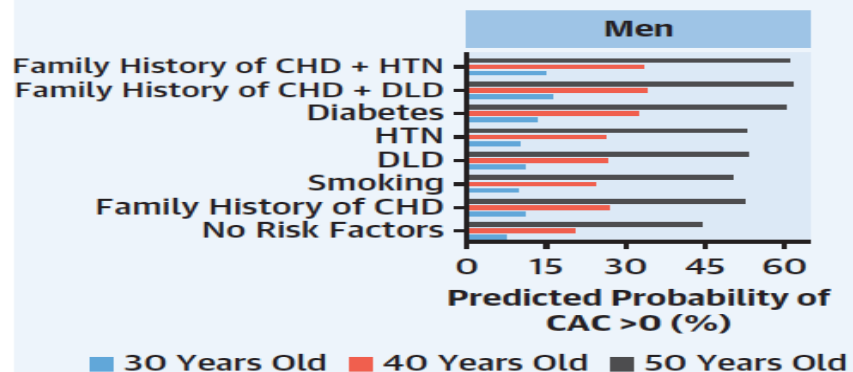
# Ten Year Incidence of CHD and Stroke by CAC



**Predicted Probability of CAC >0 in Women**



**Predicted Probability of CAC >0 in Men**



**Predicted Age of CAC >0 Conversion According to ASCVD Risk Factor Status**

| Risk Factor                          | Women<br>Age to CAC >0<br>Conversion (Years)* | Men<br>Age to CAC >0<br>Conversion (Years)* | All<br>Average Years Earlier<br>to CAC >0* |
|--------------------------------------|---|---|--|
| None                                 | 58 (56-60)                                    | 42 (41-44)                                  | Reference                                  |
| Family History of CHD                | 53 (52-55)                                    | 39 (38-41)                                  | -3.5                                       |
| Current Cigarette Smoking            | 53 (51-55)                                    | 40 (39-42)                                  | -3.5                                       |
| Dyslipidemia                         | 52 (51-54)                                    | 39 (38-41)                                  | -4.5                                       |
| Hypertension                         | 53 (52-55)                                    | 39 (38-41)                                  | -4   |
| Diabetes                             | 50 (49-52)                                    | 37 (36-38)                                  | -6.5                                       |
| Family History of CHD + Dyslipidemia | 48 (46-50)                                    | 36 (35-38)                                  | -8   |
| Family History of CHD + Hypertension | 49 (47-51)                                    | 36 (35-38)                                  | -7.5                                       |

\*Using a 25% testing yield for CAC >0

# Compare CV Risk By CAC: Me and My Cousin Vinnie



The Multi-Ethnic Study of Atherosclerosis

## MESA 10-Year CHD Risk with Coronary Artery Calcification

[Back to CAC Tools](#)

1. Gender Male  Female
2. Age (45-85 years)  Years
3. Coronary Artery Calcification  Agatston
4. Race/Ethnicity **Choose One**
- Caucasian
- Chinese
- African American
- Hispanic
5. Diabetes Yes  No
6. Currently Smoke Yes  No
7. Family History of Heart Attack (History in parents, siblings, or children) Yes  No
8. Total Cholesterol  mg/dL or  mmol/L
9. HDL Cholesterol  mg/dL or  mmol/L
10. Systolic Blood Pressure  mmHg or  kPa
11. Lipid Lowering Medication Yes  No
12. Hypertension Medication Yes  No

Calculate 10-year CHD risk

The estimated 10-year risk of a CHD event for a person with this risk factor profile including coronary calcium is 2.9%. The estimated 10-year risk of a CHD event for a person with this risk factor profile if we did not factor in their coronary calcium score would be 9.1%.



The Multi-Ethnic Study of Atherosclerosis

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# Bottom Line

- \* Use the technology that best answers the question asked
- \* It's not the diagnostic test that prevents cardiovascular events, it's the action taken with as a result of the diagnostic test
- \* And if one does not plan on acting on the diagnostic test result, do not order the test

# DEBATE TEAM TOURNAMENT



"SCOTT, YOU'LL BE DISQUALIFIED THE NEXT TIME YOU SAY, 'WE'LL JUST HAVE TO AGREE TO DISAGREE!'"

