Are We Ready for a Paradigm Shift From Risk Factors to Detection of Subclinical Coronary Atherosclerosis?

Lessons From MESA

Khurram Nasir, MD MPH

Disclosures

- No disclosures.

Burden of Cardiovascular Disease

- Cardiovascular disease accounts for nearly 1/3 of all deaths worldwide.
- In USA 800,000 have an first acute myocardial infarction.
- Cardiovascular disease estimated to have cost the U.S. health care system more than $400 billion in 2008.
- First manifestation of CHD in 40-60% is a myocardial infarction or sudden death.

AHA Statistics 2009
Ches J et al. Circulation 2010
Mauribito J et al. Circulation 1993
What are the Current CHD Risk Assessment Strategies?

- Office-based assessment of Framingham Risk Score
- <10% (or <5%): Low Risk
  - Reassurance
  - Avoid further risk assessments for 5 years.
- >20%: High Risk
  - Candidates for aggressive management with LDL goals of <100 mg/dl and aspirin
- 10-20%: Intermediate Risk
  - Do not qualify for the most intensive risk factor interventions
  - Candidate for pharmacotherapy if LDL>160 mg/dl

How Good are Traditional Strategies in Estimating CHD risk??

222 patients with 1st acute MI, no prior CAD
men <55 y/o (75%), women <65 (25%), no DM

<table>
<thead>
<tr>
<th>High Risk</th>
<th>Intermediate Risk</th>
<th>Low Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>18%</td>
<td>10%</td>
<td>72%</td>
</tr>
</tbody>
</table>

Women less likely to be considered for therapy compared to men!!

Reynolds Risk Score

http://www.reynoldsriskscore.org/
Reclassification with Reynolds Risk Score

- Two new variables—parental family history of premature CHD and CRP—added to the variables in the ATP-III risk score appeared to improve reclassification.

- Among 100,000 intermediate-risk women (5%-20% CHD risk) and initial LDL-C goal of <130 mg/dL:
  
  1. 5,400 (5.4%) women reclassified to high-risk (LDL-C goals of <100 mg/dL and an optional goal of <70 mg/dL).
  
  2. 13,400 (13.4%) women reclassified as very low-risk (<5% CHD risk) with an LDL-C goal of <160 mg/dL.

Ridker P, JAMA 2007

Reynolds Risk Score: Improvement by an inch or a mile?

- Table 1: Clinical features associated with risk for CHD in men and women, according to the ATP-III cholesterol levels and the Reynolds Risk Score.

Ridker P, JAMA 2007
Why not Focus Where the Money Is??

Identification of Those Harboring Subclinical Atherosclerosis Will Supplement Current Risk Stratification Strategies.

Computed Tomography for Non-Invasive Imaging of Subclinical Coronary Atherosclerosis

Meta-Analysis of Relationship of CAC Scores with CHD outcomes.

<table>
<thead>
<tr>
<th>Event(s)</th>
<th>RR</th>
<th>CAC Score</th>
<th>95% CI</th>
<th>Higher Risk</th>
<th>Lower Risk</th>
<th>HR</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Risk</td>
<td>1.12</td>
<td>1.9</td>
<td>1.5-2.4</td>
<td>67</td>
<td>67</td>
<td>43</td>
<td>0.001</td>
</tr>
<tr>
<td>Moderate Risk</td>
<td>1.45</td>
<td>4.3</td>
<td>3.5-5.1</td>
<td>110</td>
<td>110</td>
<td>40</td>
<td>0.01</td>
</tr>
<tr>
<td>High Risk</td>
<td>4.3</td>
<td>7.2</td>
<td>5.2-9.8</td>
<td>52</td>
<td>52</td>
<td>22</td>
<td>0.08</td>
</tr>
<tr>
<td>Very High Risk</td>
<td>1.00</td>
<td>10.0</td>
<td>8.0-12.7</td>
<td>14</td>
<td>14</td>
<td>6</td>
<td>0.005</td>
</tr>
</tbody>
</table>


Multi-ethnic Study of Atherosclerosis

MESA: CAC and CHD events

- 6814 individuals
- Mean Age: 62 years
- 51% Females
- Median FU: 3.9 years
- HR as compared to CAC=0
  - 1-100: 3.61 (1.99-6.66)
  - 101-300: 7.72 (4.13-14.47)
  - >300: 9.67 (5.20-17.98)
- Same prognostic value across all ethnic groups

<table>
<thead>
<tr>
<th>Study Type</th>
<th>Population (n)</th>
<th>CAC=0 (%)</th>
<th>FU (Years)</th>
<th>Number of events (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meta-Analysis **</td>
<td>71,595</td>
<td>29,312 (41%)</td>
<td>4.3</td>
<td>154 (0.47%) CVD events</td>
</tr>
<tr>
<td>Retrospective **</td>
<td>44,052</td>
<td>19,898 (45%)</td>
<td>5.6</td>
<td>104 (0.52%) Deaths</td>
</tr>
<tr>
<td>Prospective (MESA) ***</td>
<td>6,809</td>
<td>3,414 (50%)</td>
<td>4.1</td>
<td>17 (0.52%) CHD events</td>
</tr>
</tbody>
</table>

Which one test or risk factor can reassure your patient?

**FRS-Adjusted Negative Likelihood Ratio**

<table>
<thead>
<tr>
<th>MESA</th>
<th>No family history CHD</th>
<th>hsCRP &gt;1</th>
<th>No microalbuminuria</th>
<th>No metabolic syndrome</th>
<th>No family history CHD</th>
<th>Low ABI (&lt;0.9 – 1.3)</th>
<th>No carotid plaque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Blaha M, Budoff M, Blankstein R, Blumenthal RS, Nasir K. (AHA 2011)

“Time for Paradigm Shift......

Risk factors or CAC??”

Interplay of Coronary Artery Calcification and Traditional Risk Factors for the Prediction of All-Cause Mortality in Asymptomatic Individuals

Khurram Naqvi, MD, MPH; Jonathan Rehm, MD; Michael J. Blaha, MD, MPH; Lecker J. Shov, PhD; Ron Blankstein, MD; Juan J. Reina, MD, MPH; Ade N. Khan, MD; Daniel Berman, MD; Paolo Reggi, MD; Tracy Califf, MD; John A. Rumberger, MD, PhD; James Min, MD; Steve B. Jones, MD; Roger S. Blumenthal, MD; Matthew J. Budoff, MD

Cath Cardiol Imaging  July 2012

Prevalence and extent of coronary artery calcium in asymptomatic patients according to Burden of traditional risk factors (N=44,052)
Interplay of Coronary Artery Calcification and Traditional Risk Factors for the Prediction of All-Cause Mortality in Asymptomatic Individuals

Kherouns Nour, MD, MPH; Jonathan Rabin, MD; Michael J. Blaha, MD, MPH; Leslie J. Shaw, MD; Ron Blankstein, MD; Juan J. Rios, MD, MPH; Afif N. Khan, MD; Daniel Berman, MD; Paolo Raggi, MD; Tracy Cullinan, MD; John A. Blumberg, MD, PhD; James M. Mia, MD; Steve R. Jones, MD; Roger S. Blumenthal, MD, Mathew J. Budoff, MD

Indices of Coronary Calcium increase with aging.

Is CAC Really a Function of Aging?

MESA

Indices of Coronary Calcium increase with aging.

CHD Event Rate per 1000 person-years (Median 7.6 yr FU): Stratified by CAC within Age groups: MESA
How Do We Put it Together?

Statins in Primary Prevention

• In last 2 ½ decades, the threshold for lipid lowering medication has progressively decreased

• From 1988–1994 to 2005–2008, statin use by adults ≥45 years increased 10-fold, from 2% to 25%.

• As scope for therapy extend to lower risk populations, absolute risk reduction becomes modest

• Need for improved individualized risk assessment?
  • JUPITER
  • NCEP
  • Dyslipidemia
  • Diabetes

Association between hsCRP≥2, Coronary Artery Calcium, and Adverse Events – Implications for the JUPITER Population
Multi-Ethnic Study of Atherosclerosis (MESA) (Lancet 2011)

Michael J. Blaha, Matthew J. Budoff, Andrew P. Dellipps, Juan J. Rivera, Ron Blankstein, Arthur Agatston, Dan O’Leary, Joao Lima, Roger S. Blumenthal, Khurram Nasir
Distribution of CAC in JUPITER Population: MESA

75% of all CHD events & 60% of all CVD occurred in 25% with CAC>100

Event-Free Survival by CAC Burden in MESA JUPITER Population

75% of all CHD events & 60% of all CVD occurred in 25% with CAC>100

CHD and CVD Event Rates by CAC Burden, Stratified by hsCRP in JUPITER “eligible” population
Estimated 5-Year Number Needed to Treat (NNT5) to Prevent One CHD or CVD Event, by Coronary Artery Calcium (CAC) Burden

<table>
<thead>
<tr>
<th>Estimated CHD event rate at 5.8 years</th>
<th>5-year NNT for CHD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>JUPITER population</strong></td>
<td></td>
</tr>
<tr>
<td>Zero CAC</td>
<td>0.48%</td>
</tr>
<tr>
<td>CAC present</td>
<td>6.22%</td>
</tr>
<tr>
<td>CAC 1-100</td>
<td>2.79%</td>
</tr>
<tr>
<td>CAC &gt;100</td>
<td>10.76%</td>
</tr>
</tbody>
</table>


DO we Need to Show “Withholding” LLM in CAC=0 is Safe?

- JUPITER has clearly shown benefit of rosvastatin even among normal LDL but elevated hsCRP to reduce risk for future CVD events in 2.5 years.
- In MESA, those meeting JUPITER criteria, 47% had no CAC and the event was minimal over the next 5.8 years.
- “Highly unlikely” those with CAC=0 will benefit from LLM, even if assume a event reduction as high as 54% with statin (much greater than reported within JUPITER)
- It’s very simple, you need events to eventually intervene and reduce them.

This finding naturally then leads us to ask
- If those with absent CAC within the JUPITER population are not the one likely benefiting, then which subgroup is achieving the maximum risk reduction with statin therapy as shown by Ridker et al?
- An educated guess is that reduction in events seen within the JUPITER was very likely in those with presence and increasing degrees of CAC
“Do we need to Test for CAC if your LDL is normal?”

Predictors of Coronary Heart Disease Events
Among Asymptomatic Persons With Low
Low-Density Lipoprotein Cholesterol

MESA (Multi-Ethnic Study of Atherosclerosis)

Ross Blanche, M.D., Matthew J. Budoff, M.D., Linda J. Stone, Ph.D.,
David C. Goed, Jr., M.D., Ph.D., Joseph P. Polak, M.D., MPH, Lew Issac, M.D.,
Roger S. Blumenfeld, M.D., Karen Nor, M.D., MPH

No difference in outcome if LDL <100 vs 101-130 mg/dl

Study Population:
3,734 MESA Participants

1,234 participants with
LDL < 100 mg/dl

1,331 participants with
LDL 100-130 mg/dl

49 (3.7%) CHD Events

71 (5.4%) CHD Events

No difference in outcome if LDL <100 vs 101-130 mg/dl

Predictors of CHD Event among those with Low LDL

<table>
<thead>
<tr>
<th>Variable</th>
<th>Standardized</th>
<th>Adjusted to Total Risk Score</th>
<th>Adjusted to All Risk Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>2.4 (0.01)</td>
<td>2.33 (0.01, 2.40)</td>
<td>2.39 (2.36, 2.40)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>2.6 (0.00)</td>
<td>2.70 (2.69, 2.71)</td>
<td>2.72 (2.71, 2.73)</td>
</tr>
<tr>
<td>Smoking</td>
<td>2.5 (0.00)</td>
<td>2.52 (2.51, 2.54)</td>
<td>2.54 (2.53, 2.55)</td>
</tr>
<tr>
<td>HDL</td>
<td>0.5 (0.02)</td>
<td>0.50 (0.50, 0.50)</td>
<td>0.50 (0.50, 0.50)</td>
</tr>
<tr>
<td>Family history</td>
<td>2.3 (0.00)</td>
<td>2.31 (2.30, 2.32)</td>
<td>2.32 (2.31, 2.33)</td>
</tr>
<tr>
<td>Antiplatelet therapy</td>
<td>2.5 (0.00)</td>
<td>2.52 (2.51, 2.54)</td>
<td>2.54 (2.53, 2.55)</td>
</tr>
<tr>
<td>Antihypertensive drugs</td>
<td>2.4 (0.01)</td>
<td>2.33 (2.30, 2.36)</td>
<td>2.34 (2.31, 2.37)</td>
</tr>
<tr>
<td>Antihypertensive drugs, ≥2 classes</td>
<td>2.5 (0.00)</td>
<td>2.51 (2.50, 2.52)</td>
<td>2.52 (2.51, 2.53)</td>
</tr>
<tr>
<td>Age ≥ 75 years</td>
<td>2.5 (0.00)</td>
<td>2.51 (2.50, 2.52)</td>
<td>2.52 (2.51, 2.53)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>2.6 (0.00)</td>
<td>2.68 (2.67, 2.69)</td>
<td>2.69 (2.68, 2.69)</td>
</tr>
<tr>
<td>Family history</td>
<td>2.3 (0.00)</td>
<td>2.30 (2.30, 2.31)</td>
<td>2.31 (2.31, 2.32)</td>
</tr>
<tr>
<td>Antiplatelet therapy</td>
<td>2.5 (0.00)</td>
<td>2.51 (2.50, 2.52)</td>
<td>2.52 (2.51, 2.53)</td>
</tr>
<tr>
<td>Antihypertensive drugs</td>
<td>2.4 (0.01)</td>
<td>2.33 (2.30, 2.36)</td>
<td>2.34 (2.31, 2.37)</td>
</tr>
<tr>
<td>Antihypertensive drugs, ≥2 classes</td>
<td>2.5 (0.00)</td>
<td>2.51 (2.50, 2.52)</td>
<td>2.52 (2.51, 2.53)</td>
</tr>
<tr>
<td>Age ≥ 75 years</td>
<td>2.5 (0.00)</td>
<td>2.50 (2.49, 2.51)</td>
<td>2.51 (2.50, 2.52)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>2.6 (0.00)</td>
<td>2.67 (2.66, 2.68)</td>
<td>2.68 (2.67, 2.68)</td>
</tr>
<tr>
<td>Family history</td>
<td>2.3 (0.00)</td>
<td>2.29 (2.29, 2.30)</td>
<td>2.30 (2.30, 2.31)</td>
</tr>
<tr>
<td>Antiplatelet therapy</td>
<td>2.5 (0.00)</td>
<td>2.50 (2.49, 2.51)</td>
<td>2.51 (2.50, 2.52)</td>
</tr>
<tr>
<td>Antihypertensive drugs</td>
<td>2.4 (0.01)</td>
<td>2.33 (2.30, 2.36)</td>
<td>2.34 (2.31, 2.37)</td>
</tr>
<tr>
<td>Antihypertensive drugs, ≥2 classes</td>
<td>2.5 (0.00)</td>
<td>2.50 (2.49, 2.51)</td>
<td>2.51 (2.50, 2.52)</td>
</tr>
<tr>
<td>Age ≥ 75 years</td>
<td>2.5 (0.00)</td>
<td>2.49 (2.48, 2.50)</td>
<td>2.50 (2.49, 2.50)</td>
</tr>
</tbody>
</table>
CVD Events With Increasing CAC Scores according Non HDL Levels (7.6 Yr Median FU)


CVD Events With Increasing CAC Scores according Total LDL Particles Number (7.6 Yr Median FU)


Meeting Eligibility Criteria for LLM by NCEP: Does it Make Any Sense? Evidence from MESA

LLM Eligibility Criteria (+)
N=1,367

N=468 34%
N=131 32%
N=468 34%

Event Rates (1000 Person Years) Stratified by LLM Criteria & CAC

Estimated 5-year NNT by LLM Criteria & CAC

<table>
<thead>
<tr>
<th>LLM Eligibility Criteria</th>
<th>LLM Eligibility Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>(+)</td>
<td>(-)</td>
</tr>
<tr>
<td>CHD</td>
<td>CVD</td>
</tr>
<tr>
<td>CAC = 0</td>
<td>204</td>
</tr>
<tr>
<td>CAC 1-100</td>
<td>51</td>
</tr>
<tr>
<td>CAC &gt;100</td>
<td>25</td>
</tr>
</tbody>
</table>

Should we treat all Diabetics Equally?
Distribution of CAC According to MS and DM Status: MESA

<table>
<thead>
<tr>
<th>CAC Score Groups</th>
<th>No MetS/DM (n=4036)</th>
<th>MetS without DM (n=1687)</th>
<th>DM (n=882)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAC=0</td>
<td>56%</td>
<td>46%</td>
<td>38%</td>
</tr>
<tr>
<td>CAC 1-99</td>
<td>24%</td>
<td>28%</td>
<td>27%</td>
</tr>
<tr>
<td>CAC 100-399</td>
<td>10%</td>
<td>13%</td>
<td>14%</td>
</tr>
<tr>
<td>CAC &gt;400</td>
<td>10%</td>
<td>13%</td>
<td>21%</td>
</tr>
</tbody>
</table>


Diabetes & no CAC ➔ Is Rx indicated?

<table>
<thead>
<tr>
<th>CAC Score Groups</th>
<th>No MetS/DM (n=4036)</th>
<th>MetS without DM (n=1687)</th>
<th>DM (n=882)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAC Score Groups</td>
<td>CHD Event rate per 1000 Person Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAC=0</td>
<td>0.7 (0.3-1.4)</td>
<td>1.2 (0.5-2.8)</td>
<td>1.8 (0.5-5.1)</td>
</tr>
<tr>
<td>CAC 1-99</td>
<td>3.3 (2.1-5.2)</td>
<td>6.1 (3.7-9.9)</td>
<td>9.1 (5.0-16.4)</td>
</tr>
<tr>
<td>CAC 100-399</td>
<td>6.0 (3.7-9.9)</td>
<td>12.6 (7.9-20.0)</td>
<td>13.4 (7.4-24.2)</td>
</tr>
<tr>
<td>CAC &gt;400</td>
<td>12.0 (7.7-18.0)</td>
<td>15.3 (9.1-25.8)</td>
<td>18.3 (10.9-30.9)</td>
</tr>
</tbody>
</table>


What Does MESA Teaches Us?

- NCEP, JUPITER, dyslipidemia, DM: Treatment Strategies?
- MESA clearly demonstrate CHD/CHD meeting LLM eligibility criteria based on above heterogeneous on
  - 33-50% of these individuals have CAC = 0 ➔ Very Low Event ➔ Very High NNT.
  - Number needed to scan (NNS) for 1 individual with CAC=0 is 2-3
- 20-25% of individuals not meeting these “eligibility criteria” but elevated CAC
  - Very High Event ➔ Very Low NNT.
  - NNS for 1 individual with CAC>100 is 4-5
In the current environment of rising health care costs and shrinking resources we

cannot afford to treat a large number of individuals to prevent few events

have to prioritize allocation of our limited resources to reduce the overall economic health care burden in a cost effective manner

When Would You Be More Reassured?

1. FRS <10%
2. hsCRP <2 mg/dl
3. LDL-P (lowest quartile)
4. CAC=0
How Long would it take us to evolve?
Screen, Guess & Treat
Paradigm Shift
Screen, Diagnose & Treat

Myths & Criticisms!!
EISNER STUDY: Down Stream Test and Costs among those undergoing No CAC vs CAC Screening in 4 year Follow-up

<table>
<thead>
<tr>
<th></th>
<th>No-CAC Testing (n = 623)</th>
<th>CAC Testing (n = 1,311)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Downstream Tests</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stress Test</td>
<td>33.9%</td>
<td>34.6%</td>
<td>0.74</td>
</tr>
<tr>
<td>Cardiac CT</td>
<td>7.1%</td>
<td>7.7%</td>
<td>0.62</td>
</tr>
<tr>
<td>Cardiac Catheterization</td>
<td>2.9%</td>
<td>3.3%</td>
<td>0.71</td>
</tr>
<tr>
<td>Coronary Revascularization</td>
<td>1.8%</td>
<td>2.3%</td>
<td>0.46</td>
</tr>
<tr>
<td><strong>Downstream Costs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median Procedure costs*</td>
<td>$721</td>
<td>$904</td>
<td>0.56</td>
</tr>
<tr>
<td>Median Medication costs</td>
<td>$2,937</td>
<td>$3,149</td>
<td>0.09</td>
</tr>
</tbody>
</table>

*Include $150 for CAC testing. Rozanski et al, J Am Coll Cardiol. 2011;57:1622-1632

Behavioral & Medication Changes According to CAC Scores

<table>
<thead>
<tr>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral change*</td>
</tr>
<tr>
<td>Medication Adherence**</td>
</tr>
<tr>
<td>Medication Initiation ***</td>
</tr>
</tbody>
</table>

**Kali NK, Miller LG, Naar K, Blumenthal RS, Agrawal N, Budoff MJ. Atherosclerosis. 2006
***Naar K, McClelland RL, Blumenthal RS, Golf CC, Jr, Hoffmann U, Patsy BM, Greenland P, Kommal RA, Budoff MJ. Chin Cardiovase Qual Outcomes 2010

Radiation dose

- "dose [EBT dose 0.7 mSv, MDCT dose 1.5 mSv]"
- AHA Scientific Statement Circulation 2005
- CAC Dose = 1 mSv (Gerber AHA Scient Statement on Ionizing Radiation 2009)
- Similar to Mammogram
- Similar to long distance air flight
- 1/3 annual background radiation
**Same Costs**

- Medicare payments
- Standard lipid profile with calculated LDL-C: $35.67
- ApoB: $28.16
- Liposcience NMR: $93.87
- CPT 77571 Coronary artery calcium $96.45

---

**What is the value of CAC = 0?**

<table>
<thead>
<tr>
<th>Study Type</th>
<th>Population (n)</th>
<th>CAC=0 (%)</th>
<th>FU (Years)</th>
<th>Number of events (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meta-Analysis</td>
<td>71,595</td>
<td>29,312 (41%)</td>
<td>4.3</td>
<td>154 (0.47%)</td>
</tr>
<tr>
<td>Retrospective</td>
<td>44,052</td>
<td>19,898 (45%)</td>
<td>5.6</td>
<td>104 (0.52%)</td>
</tr>
<tr>
<td>Prospective</td>
<td>6,809</td>
<td>3,414 (50%)</td>
<td>4.1</td>
<td>17 (0.52%)</td>
</tr>
</tbody>
</table>

**Thank you!**
How to Select Patients for CAC screening?

AHA guidelines for utilizing CAC detection in CAD risk stratifications in asymptomatic patients (2006)

It may be reasonable to measure atherosclerosis burden using cardiac CT in clinically selected intermediate–CAD risk patients (e.g. those with a 10-20% Framingham 10-year risk estimate) to refine risk prediction and to select patients for more aggressive target values for lipid-lowering Rx.

AHA guidelines for utilizing CAC detection in CAD risk stratifications in asymptomatic patients (2006)

Low-risk (<10% 10-year risk) and high-risk (20% 10-year risk) patients do not benefit from CAC measurement.
Is there a Gender Bias?

Men

Women

Are Individuals with same atherosclerotic burden equally considered for pharmacotherapy by current guidelines according to age & gender?

CAC Predict CVD in Low-Risk Women: MESA

Lakoski and Blumenthal. Arch Intern Med. 2007;167(22):2437-2442
Family History of CHD is not Considered in Framingham Risk Stratification!!!!

Relationship of Premature FH of CHD with Advanced CAC Scores Across Risk Factors

8549 asymptomatic individuals (69% men; mean age: 52 ± 9 years).

FamHx of Premature CHD among all ethnic groups considered “Low risk” by current guidelines (FRS): MESA
What about high risk groups?

Any Changes in Guidelines?

ROC Curve Analyses for CHD Events: FRS alone, FRS plus CIMT, or FRS plus CAC in DM

- ROC area FRS+CAC (0.7833) vs. FRS alone (0.6802), p = 0.0000
- ROC area FRS + CIMT (0.6866) vs. FRS alone (0.6802), p =0.7540
- ROC area FRS+CAC (0.7833) vs. FRS + CIMT (0.6866), p = 0.0000

2010 ACCF/AHA Guideline for Assessment of Cardiovascular Risk in Asymptomatic Adults

2.5.10. Computed Tomography for Coronary Calcium

2.5.10.1. RECOMMENDATIONS FOR CALCIUM SCORING METHODS

CLASS IIa
1. Measurement of CAC is reasonable for cardiovascular risk assessment in asymptomatic adults at intermediate risk (10% to 20% 10-year risk) (Grade B). (Level of Evidence: B)

CLASS IIa
1. In asymptomatic adults with diabetes, 40 years of age and older, measurement of CAC is reasonable for cardiovascular risk assessment (344,397–399). (Level of Evidence: B)

CLASS IIa
1. Measurement of CAC may be reasonable for cardiovascular risk assessment in persons at low to intermediate risk (0% to 10% 10-year risk) (348–350). (Level of Evidence: B)

ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 appropriate use criteria for cardiac computed tomography

Noncontrast CT calcium scoring was judged as appropriate for intermediate CHD risk patients, and for the specific subset of low-risk patients in whom a family history of premature CHD was present. Intermediate