Using Coronary Artery Calcium (CAC) scoring in underwriting to reduce hidden CAD risk

Dr David Lu

Chief Medical Officer Asia Pacific

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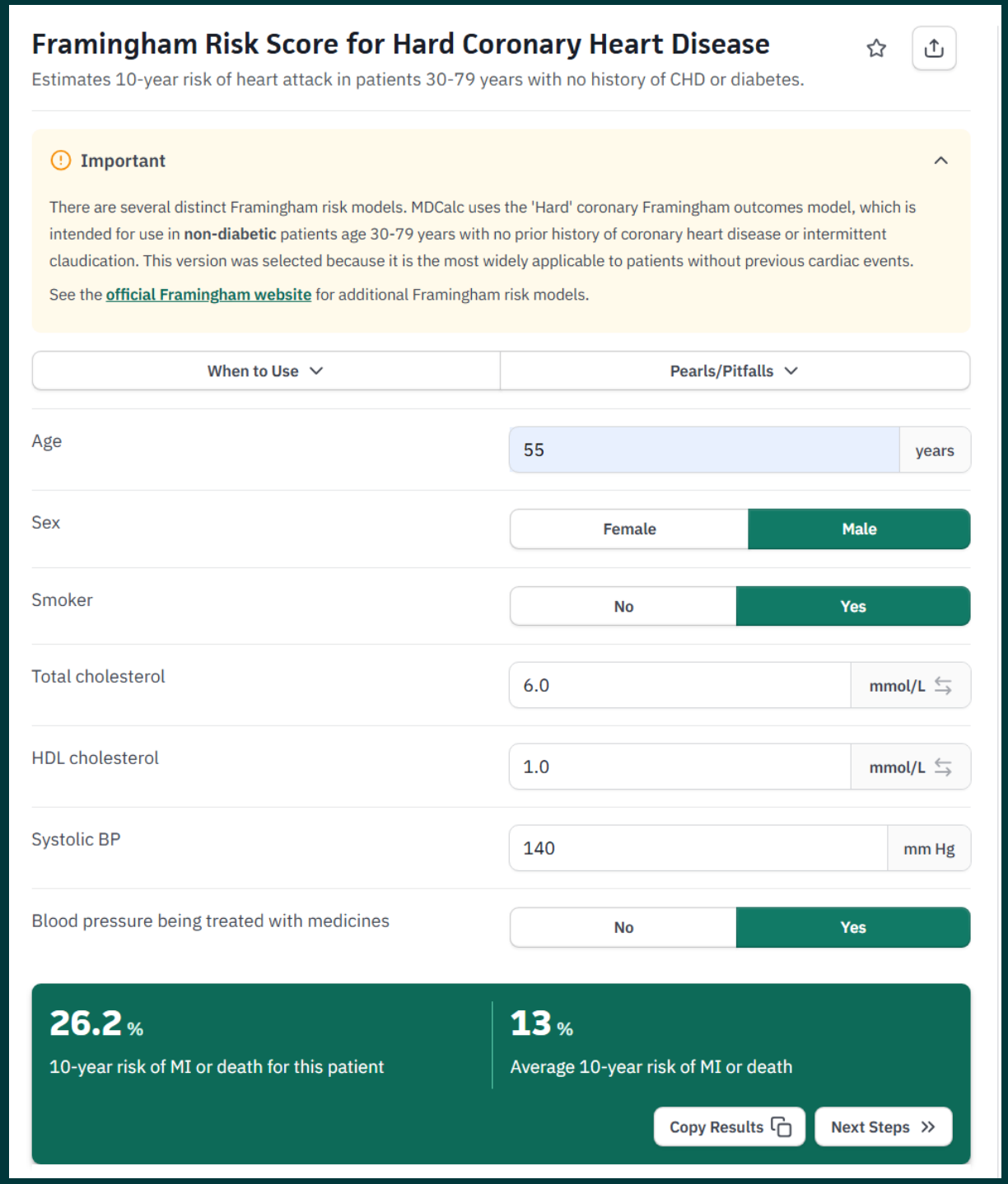
Coronary artery calcium (CAC) scoring helps insurers reduce information gaps that are inherent in conventional underwriting.

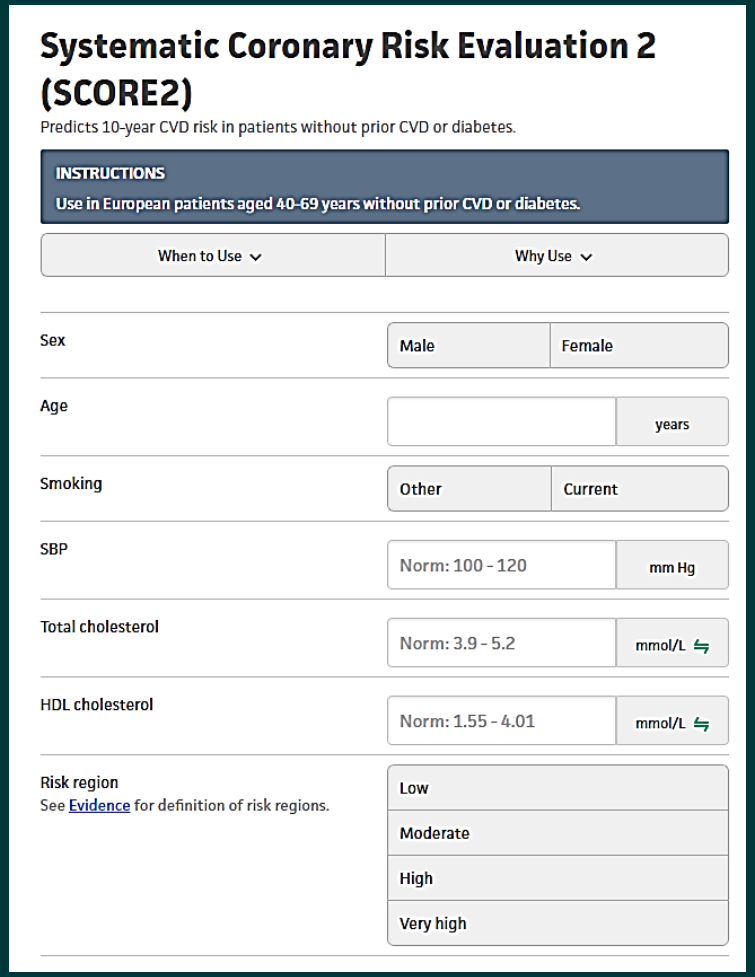
Current Risk-Factor Based CAD Risk Assessment Approach



Risk-factor based Coronary Heart Disease risk assessment tool

https://www.mdcalc.com/calc/38/framingham-risk-score-hard-coronary-heart-disease

Other risk-factor based CAD risk assessment tools



Systematic Coronary Risk Evaluation 2 (SCORE2)

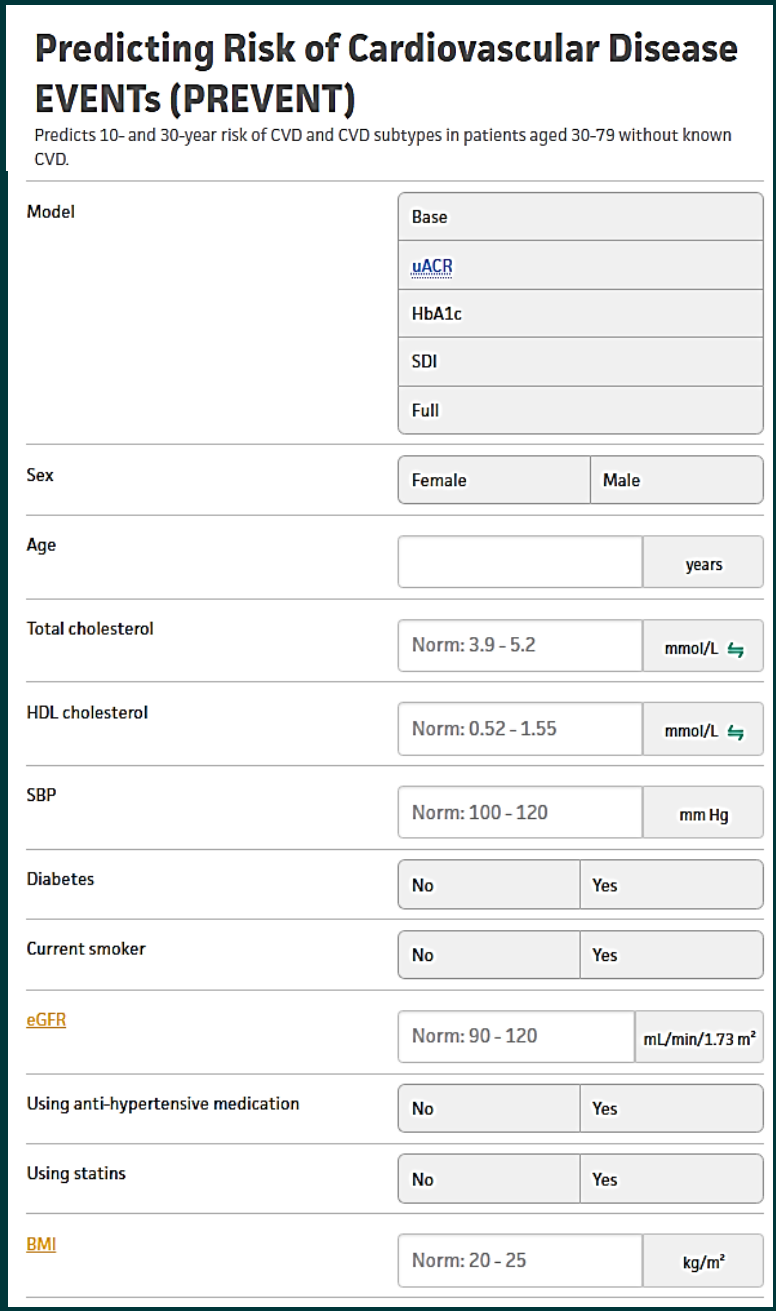
Predicts 10-year CVD risk in patients without prior CVD or diabetes.

INSTRUCTIONS

Use in European patients aged 40-69 years without prior CVD or diabetes.

When to Use ⌄ | Why Use ⌄

Sex	Male	Female
Age		years
Smoking	Other	Current
SBP	Norm: 100 - 120	mm Hg
Total cholesterol	Norm: 3.9 - 5.2	mmol/L ⇆
HDL cholesterol	Norm: 1.55 - 4.01	mmol/L ⇆
Risk region See Evidence for definition of risk regions.	Low Moderate High Very high	



Predicting Risk of Cardiovascular Disease EVENTs (PREVENT)

Predicts 10- and 30-year risk of CVD and CVD subtypes in patients aged 30-79 without known CVD.

Model	Base uACR HbA1c SDI Full	
Sex	Female	Male
Age		years
Total cholesterol	Norm: 3.9 - 5.2	mmol/L ⇆
HDL cholesterol	Norm: 0.52 - 1.55	mmol/L ⇆
SBP	Norm: 100 - 120	mm Hg
Diabetes	No	Yes
Current smoker	No	Yes
eGFR	Norm: 90 - 120	mL/min/1.73 m²
Using anti-hypertensive medication	No	Yes
Using statins	No	Yes
BMI	Norm: 20 - 25	kg/m²

- These models **estimate an individual's probability** of experiencing a cardiovascular event or death over a defined time horizon **relative to others with similar risk-factor profiles**.

- However, they **do not directly assess** the presence or burden of coronary atherosclerosis in a specific individual.

JACC: ADVANCES VOL. 4, NO. 12, 2025

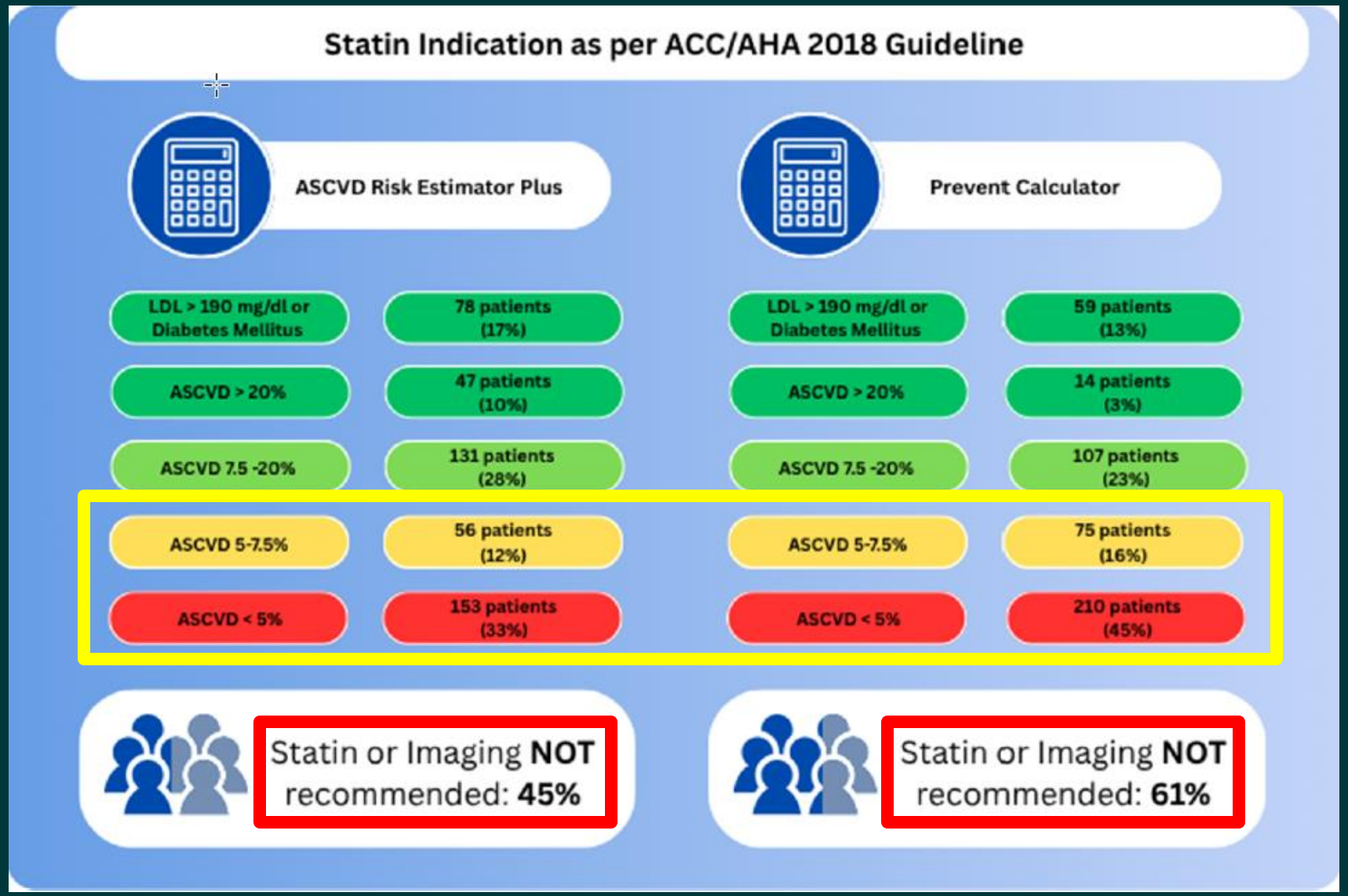
BRIEF REPORT

Limitations of Risk- and Symptom-Based Screening in Predicting First Myocardial Infarction

Anna S. Mueller, MD,[a] Jonathon Leipsic, M,[b] Matthew Tomey, MD,[c] Edgar Argulian, MD,[c] Jagat Narula, MD,[d] Amir Ahmadi, MD[c]

- Real-world data (Mount Sinai West/Morningside, NY)
- 465 myocardial infarction patients (≤65 years), no known CAD at baseline

- CAD risk assessment using risk factor–based models
- Simulated **2 days before the first myocardial infarction**



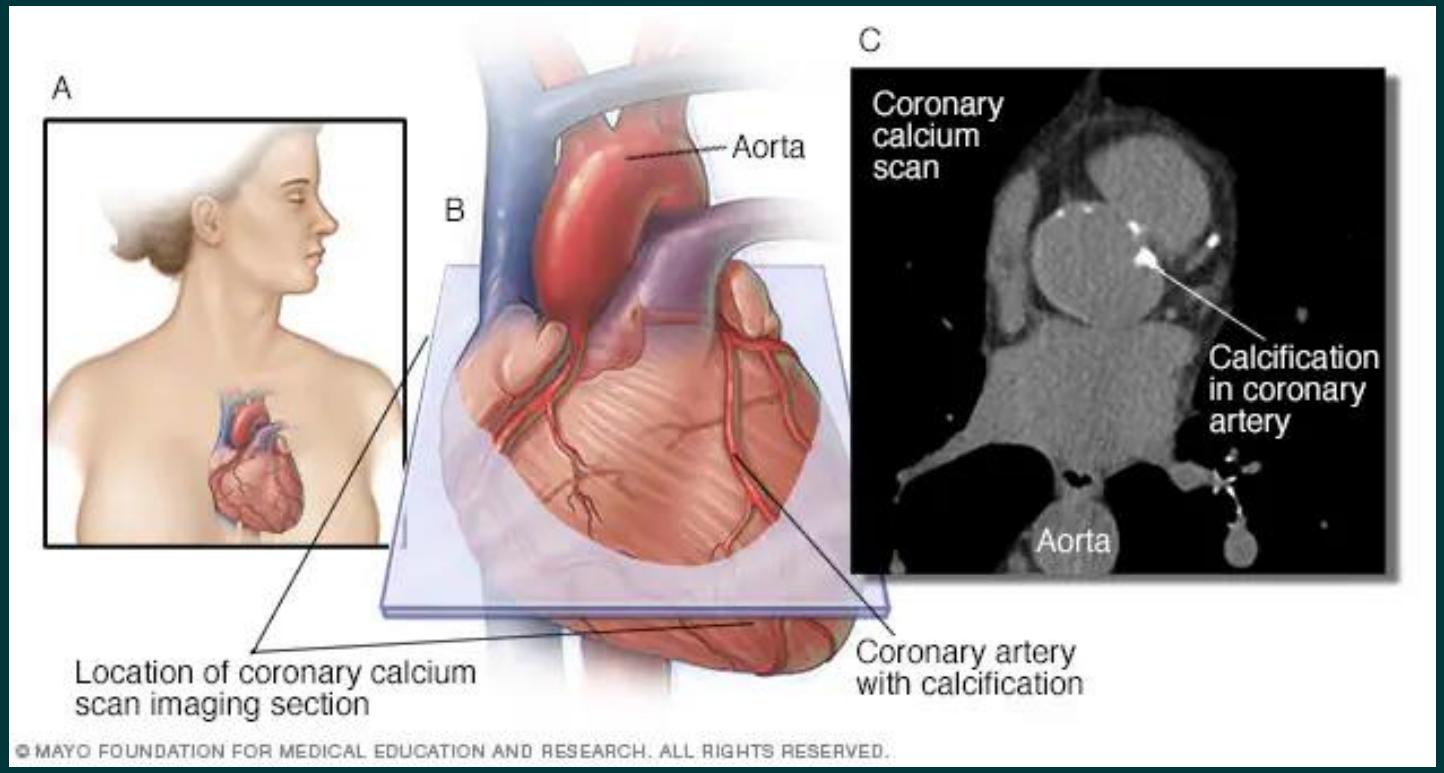
45–61%

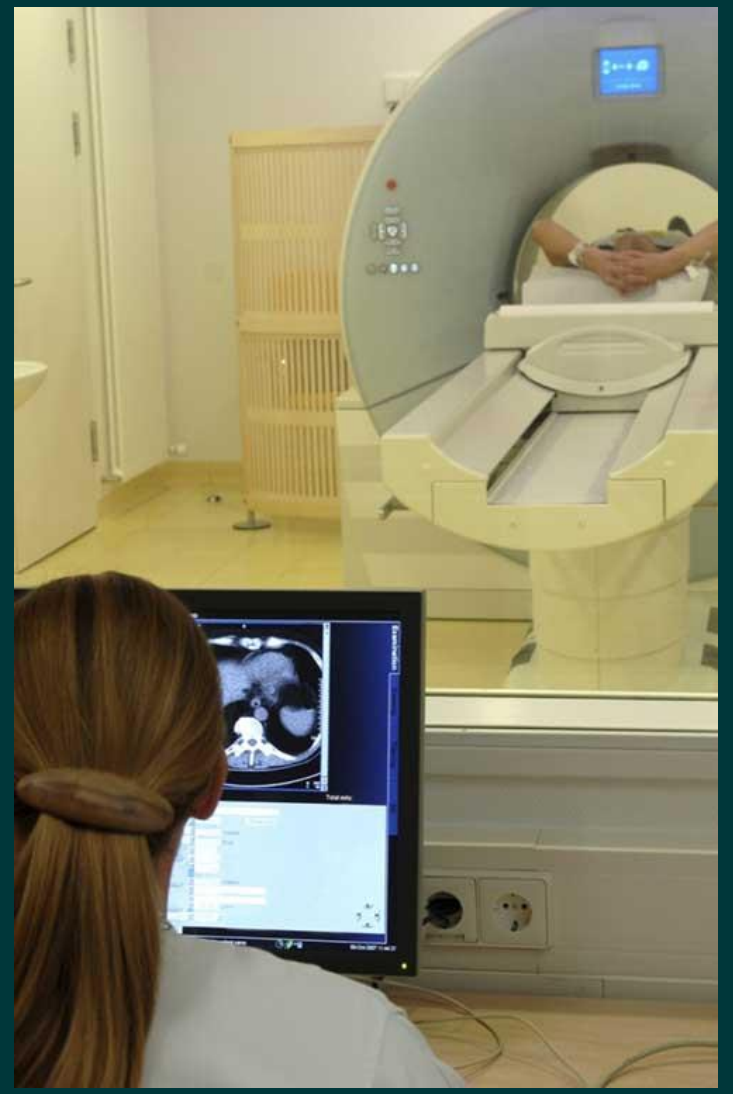
low to borderline risk

Coronary Artery Calcium (CAC) Score

Coronary calcium scan

Cost in Asia US$ 30-550

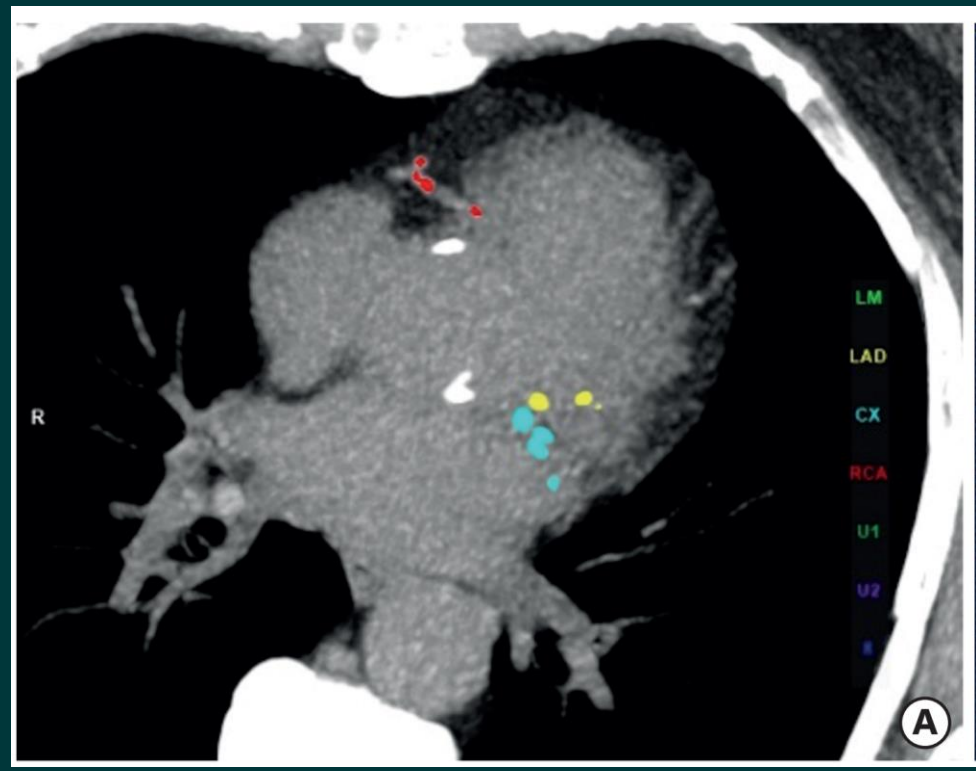




Source: Mayo Clinic

Source: https://www.radiologyinfo.org/en/info/ct_calscoring

Coronary artery calcium scoring



Artery	Lesions	Volume / mm³	Equiv. Mass / mg	Score
LM	0	0.0	0.00	0.0
LAD	3	45.5	9.88	54.1
CX	7	184.0	41.64	216.6
RCA	3	27.0	4.73	24.1
Total	**13**	**256.5**	**56.25**	**294.8**
U1	0	0.0	0.00	0.0
U2	0	0.0	0.00	0.0

Settings
Score Type: User defined, Threshold: 130 HU (105.3 mg/cm³ CaHA)
Mass calibration factor: 0.81

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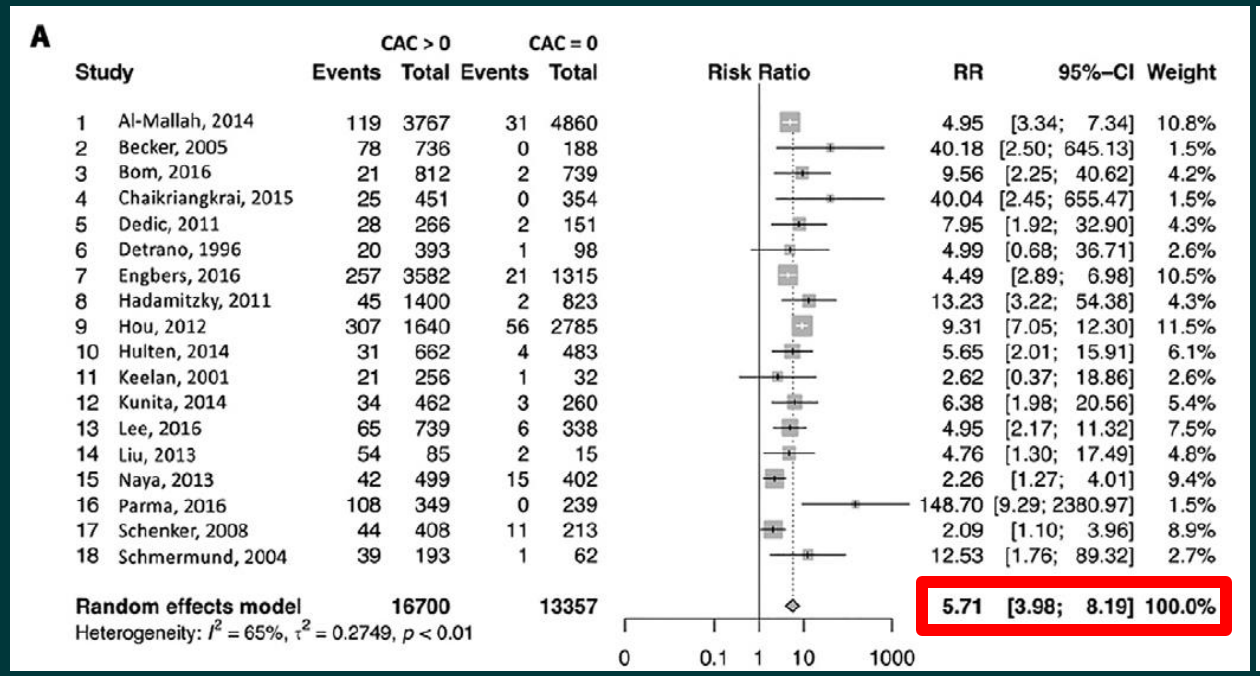
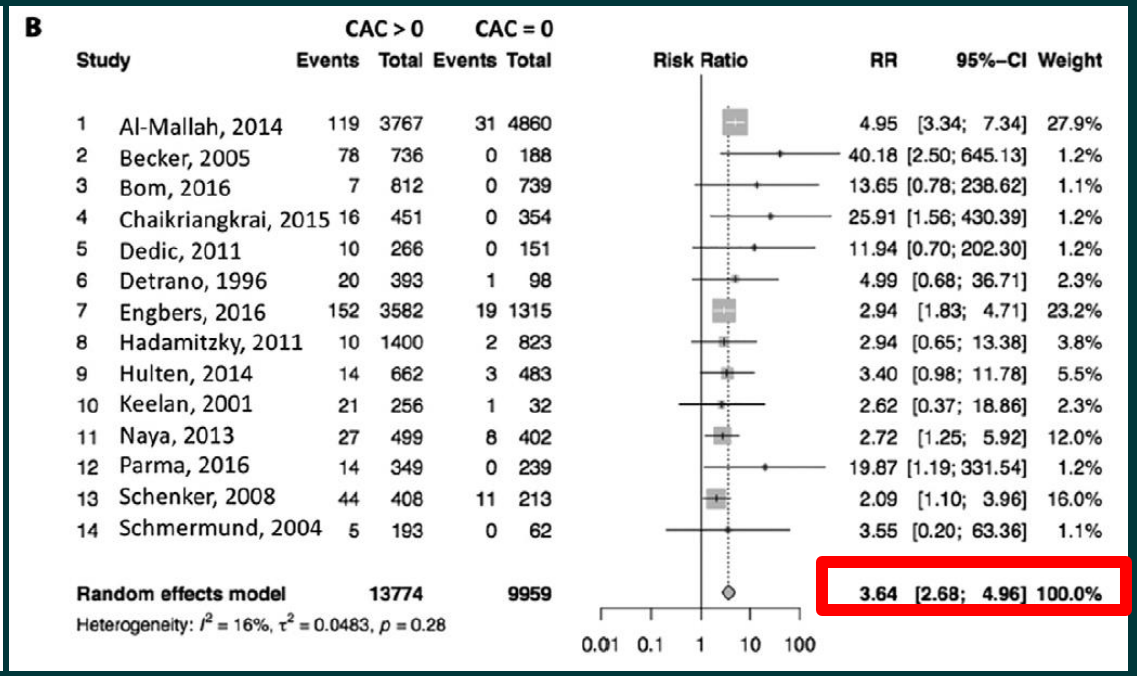
P Kumar, et al. Coronary Artery Calcium Data and Reporting System (CAC-DRS): A Primer. J Cardiovasc Imaging. 2023 Jan;31(1):1-17

CAC > 0 vs. CAC = 0

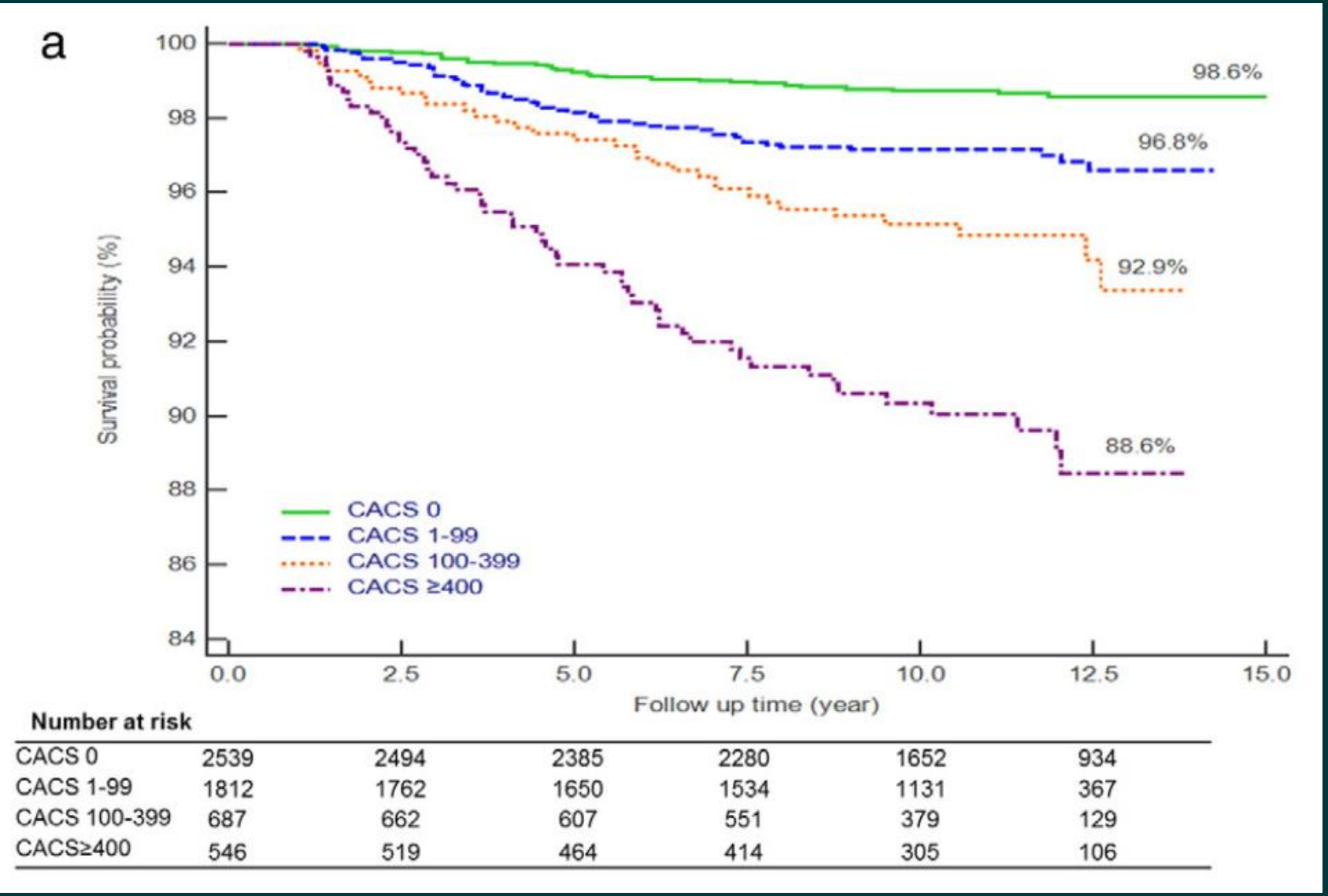




Major adverse cardiac events (MACE)
Relative risk 5.71

All-cause mortality and nonfatal MI
Relative risk 3.64

Mallory S. LKS, et al. Prognostic value of coronary artery calcium score in symptomatic individuals: A meta-analysis of 34,000 subjects. International Journal of Cardiology 299 (2020) 56–62.



Number at risk

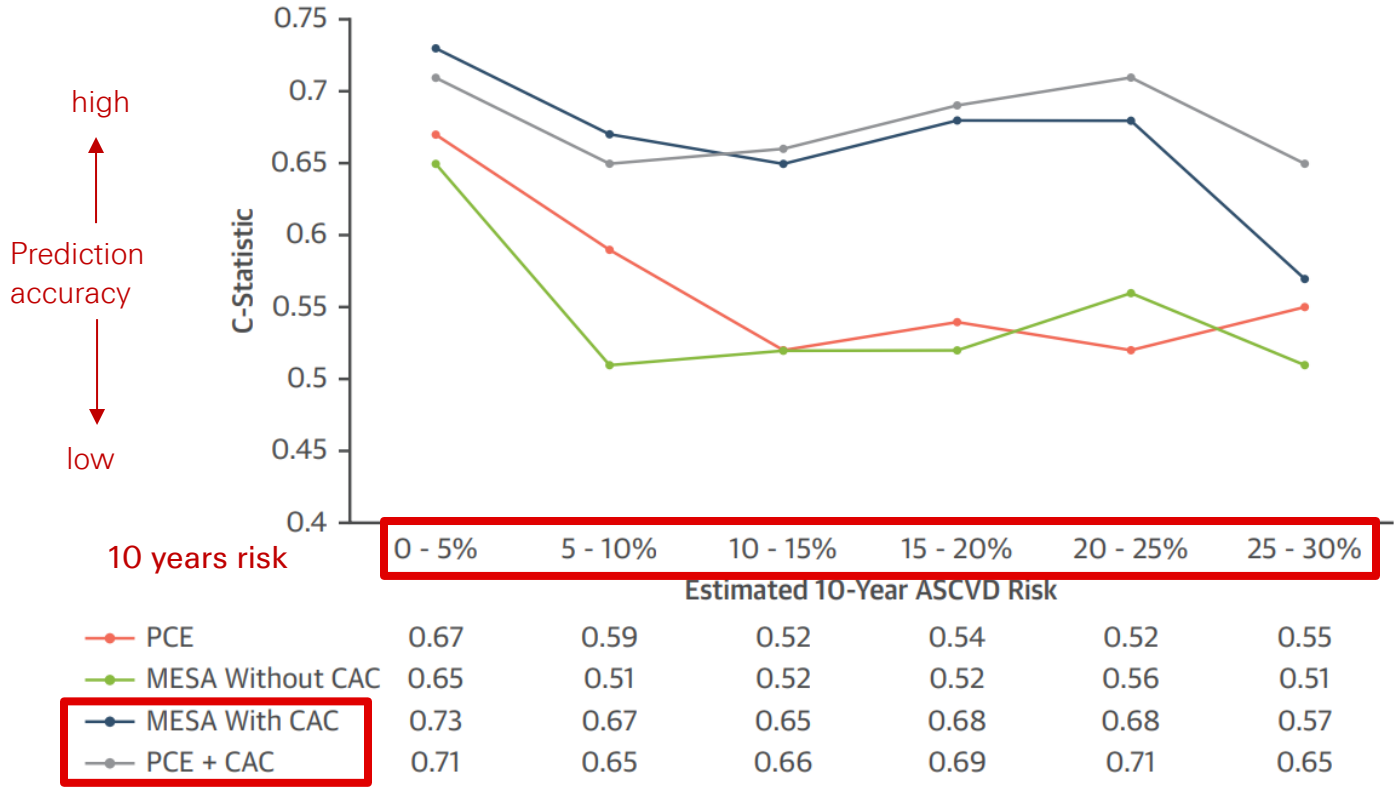
CACS 0	2539	2494	2385	2280	1652	934
CACS 1-99	1812	1762	1650	1534	1131	367
CACS 100-399	687	662	607	551	379	129
CACS≥400	546	519	464	414	305	106

Survival by CAC score

Asymptomatic individuals (mean age 56.6) with no known CVD and ≤1 risk factor

R. Nakanishi et al. The relationship between coronary artery calcium score and the long-term mortality among patients with minimal or absent coronary artery risk factors. International Journal of Cardiology 185 (2015) 275–281

FIGURE 2 Discriminative Ability for the Prediction of CHD Death Events, by 5% ASCVD Risk Strata



	0 - 5%	5 - 10%	10 - 15%	15 - 20%	20 - 25%	25 - 30%
PCE	0.67	0.59	0.52	0.54	0.52	0.55
MESA Without CAC	0.65	0.51	0.52	0.52	0.56	0.51
MESA With CAC	0.73	0.67	0.65	0.68	0.68	0.57
PCE + CAC	0.71	0.65	0.66	0.69	0.71	0.65

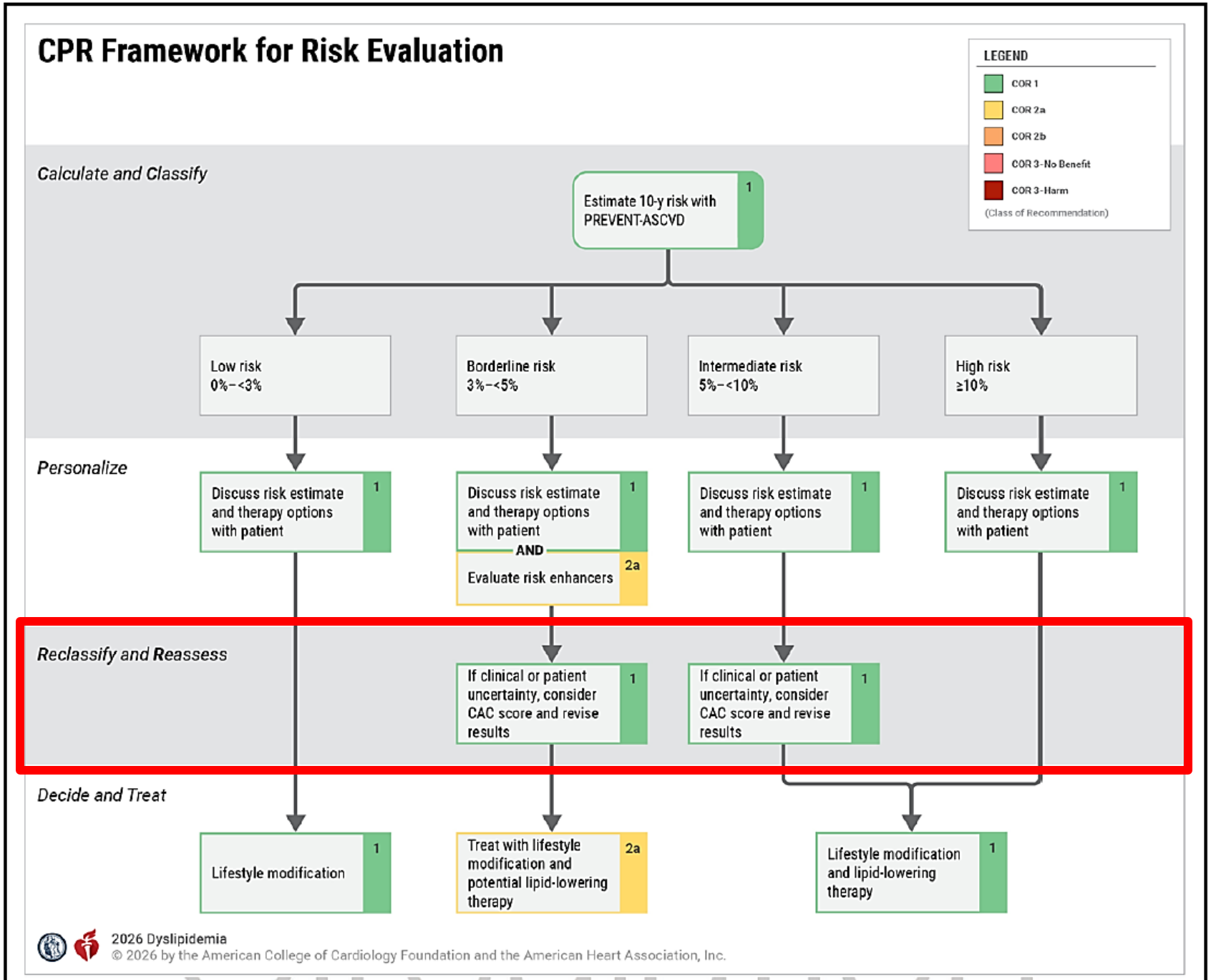
Results are presented using the C-statistic. CHD = coronary heart disease; MESA = Multi-Ethnic Study of Atherosclerosis; other abbreviations as in Figure 1.

10-year ASCVD Risk Estimator (the Pooled Cohort Equations [PCE]

Combining CAC with traditional risk model improves prediction

Asymptomatic individuals (mean age 57) referred for clinical CAC scoring

Blaha et al. Comparing Risk Scores in the Prediction of Coronary and Cardiovascular Deaths. Coronary Artery Calcium Consortium. JACC: CARDIOVASCULAR IMAGING, VOL. 14, NO. 2, 2021



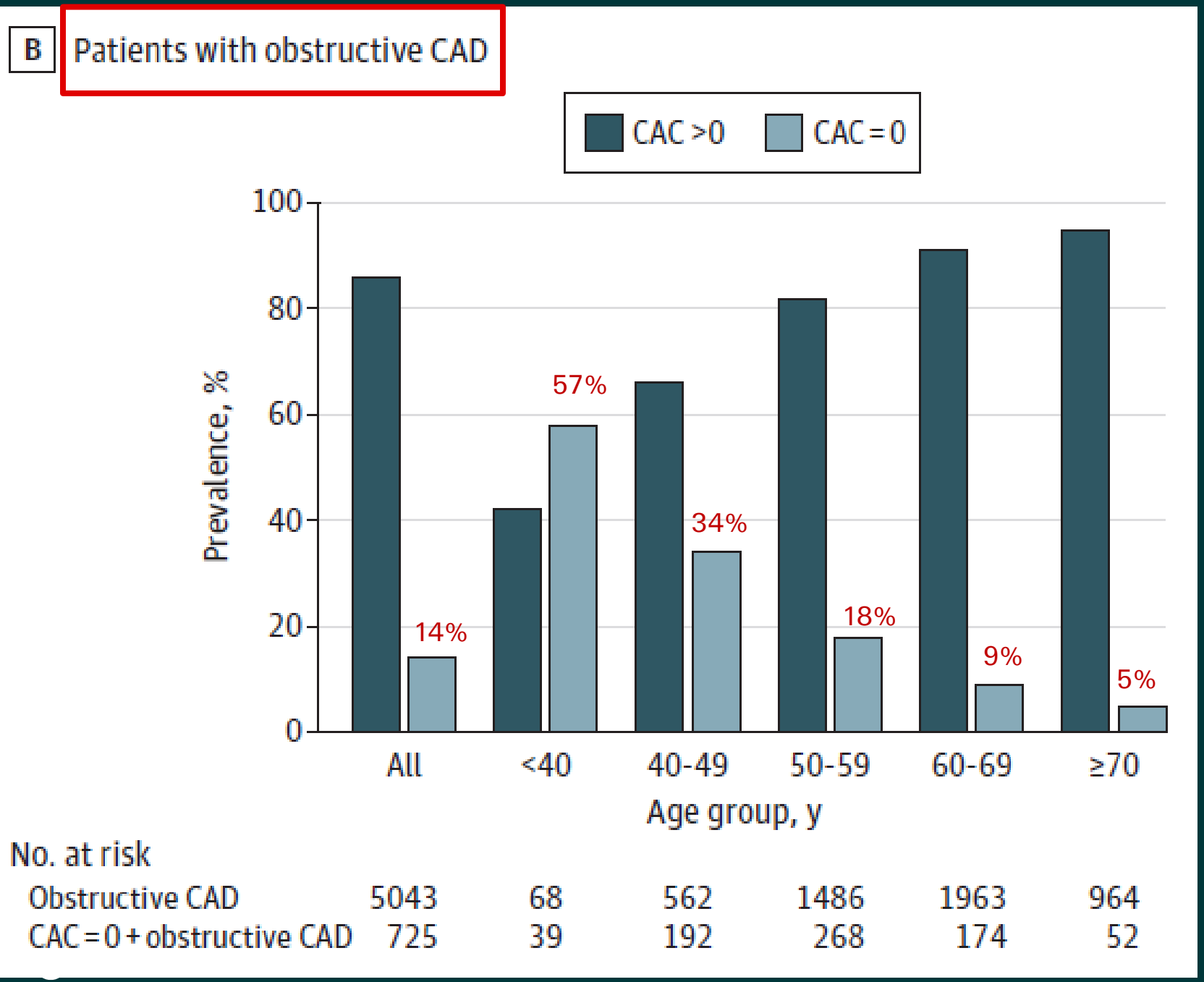
2026 Guidance

CAC **does not replace** traditional risk factor–based assessment **but enhances it** by resolving uncertainty at the individual level

Blumenthal RS, et al. 2026 ACC/AHA/Multisociety Guideline on the Management of Dyslipidemia. Journal of the American College of Cardiology (JACC). Published online 13 March 2026.

Limitation

CAC cannot identify non-calcified (soft) plaque



CAC 0 does **not** exclude high-risk CAD **in younger** symptomatic patients

Symptomatic patients, CT angiography (CTA) confirmed obstructive CAD (stenosis ≥ 50%)

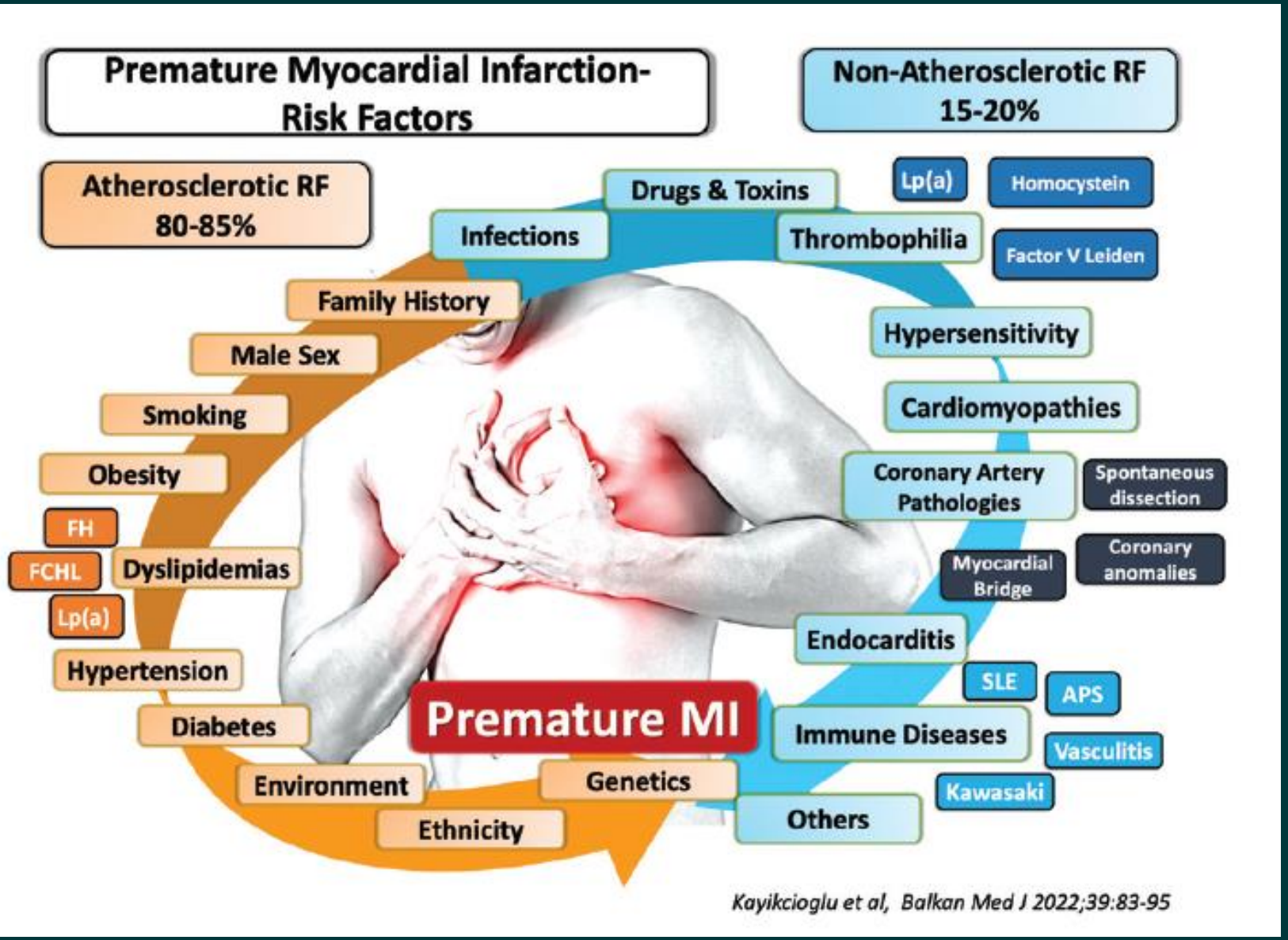
Martin BM, et al. Association of Age With the Diagnostic Value of Coronary Artery Calcium Score for Ruling Out Coronary Stenosis in Symptomatic Patients. JAMA Cardiol. 2022;7(1):36-44.

CAC = 0 does NOT rule out treatment

Do NOT defer therapy if ANY high-risk features present:

- Familial hypercholesterolaemia (FH)
- LDL-C >190 mg/dL
- Diabetes (age >40)
- Current smoking
- Strong family history of premature ASCVD

Blumenthal RS, et al. **2026 ACC/AHA/Multi-society Guideline** on the Management of Dyslipidemia. Journal of the American College of Cardiology (JACC). Published online 13 March 2026.



CAC = 0 does not exclude MI risk: up to 20% are non-atherosclerotic

Why CAC Matters for Insurance Risk Management?

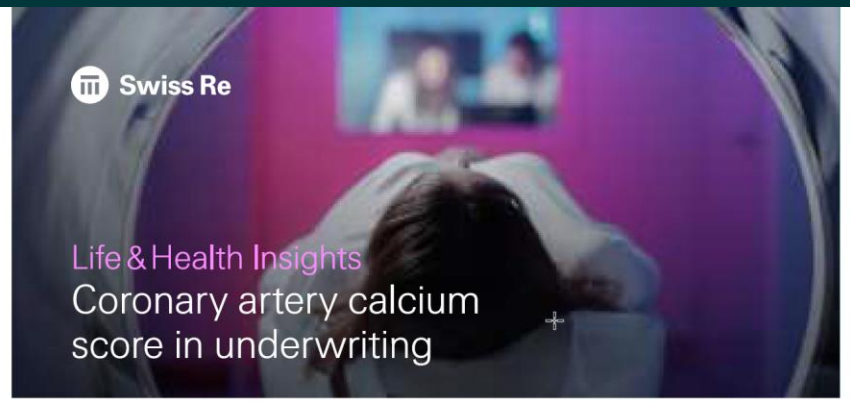
CAD remains a key driver of mortality and morbidity claims

Combining CAC with traditional risk factors may:

- Improves risk stratification
- Reveals hidden coronary risk

CAC is most valuable in high-impact segments, where:

- Claim amounts are high
- Risk concentration is greater (e.g. high sum assured segments)



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Life & Health Insights

Coronary artery calcium score in underwriting

Ischaemic heart disease is the leading cause of death worldwide, and myocardial infarction is the major driver of critical illness claims. The majority of myocardial infarctions are caused by atherosclerotic coronary artery disease.[2]

Coronary artery calcium (CAC) scoring complements traditional assessment by providing direct evidence of calcified coronary atherosclerotic burden in asymptomatic individuals above age 40, and adds incremental prognostic value beyond traditional risk factors and supports more refined individual risk differentiation. Because CAC cannot identify non-calcified (soft) plaque, it is not recommended for younger adults, people with diabetes, or those with smoking or inflammatory risk profiles.

Current risk factor–based coronary artery disease risk assessment approach

The current underwriting approach for coronary artery disease (CAD) primarily relies on risk factors-based CAD risk scoring systems that have been used in clinical settings for over five decades. Initiated in 1948, the Framingham Heart Study established the foundation for longitudinal cardiovascular risk assessment by identifying key CAD risk factors, including hypertension, cholesterol, smoking, diabetes, and age. The resulting Framingham Risk Score became the first widely adopted tool for CAD risk prediction.[4]

Other CAD risk scoring systems developed later include the European SCORE system, the ACC/AHA Pooled Cohort Equations, and, most recently, the PREVENT equations.[5, 6, 7] These CAD risk scoring systems are all derived from large, long running population cohort studies and have consistently demonstrated strong population level associations between traditional cardiovascular risk factors and clinical outcomes.

These models estimate an individual's probability of experiencing a cardiovascular event over a defined time horizon relative to others with similar risk-factor profiles. However, they do not directly assess the presence or burden of coronary atherosclerosis and therefore do not rule out underlying coronary artery disease.

In a retrospective study of 465 patients aged ≤65 years presenting with a first myocardial infarction, 45–61% were classified as low or borderline risk and would not have met guideline thresholds for statin therapy or imaging based on ASCVD or PREVENT scores when assessed two days before the event.[8] Together with prospective evidence that imaging-detected subclinical atherosclerosis adds prognostic value beyond traditional risk factors, this supports the use of CAC as a complementary risk-refinement tool[9].

Find out more

Find out more on CAC Score and other testing in underwriting in the upcoming publication, Evaluating the Predictive Value of Medical Underwriting Tests for Mortality Risk: Evidence from the Multi-Ethnic Study of Atherosclerosis

Key message

Accurately predicting the risk of heart attack is essential for underwriting, given its material impact on mortality and morbidity, particularly critical illness claims. Established risk-factor-based cardiovascular risk models, derived from large population datasets, provide a robust and well-validated foundation for risk assessment. However, as population-based tools, they may not fully capture individual variation in atherosclerotic burden or vulnerability, which can lead to differences between estimated and actual risk at the individual level. This highlights the need for complementary tools to refine individual risk stratification.[3]

when CAC data are available. Collectively, these tools offer a comprehensive and complementary assessment of cardiovascular risk.

Conclusions/Key takeaways for insurers

- Coronary artery disease remains a major driver of claims, yet early-stage disease is often clinically silent and not fully captured by traditional underwriting approaches.
- Risk factor–based cardiovascular models are essential for population risk estimation but estimate probability rather than detect disease and may lack precision at the individual level.
- Coronary artery calcium (CAC) scoring adds value by providing a direct measure of calcified coronary atherosclerosis, improving individual risk differentiation among applicants with similar apparent risk profiles.
- However, CAC should be used to complement – not replace – traditional assessment, as a zero score does not exclude non-calcified atherosclerotic plaque, particularly inyounger adults, individuals with diabetes, smoking exposure, severe hypercholesterolaemia, or strong family history.
- Recent clinical guidelines position CAC as a calibrated decision support tool, emphasising appropriate use and cautioning against over-reliance.
- For insurers, especially in high sum assured or concentrated portfolios, CAC can help reduce hidden coronary risk, mitigate the impact of large claims on portfolios and support more precise, evidence-based underwriting when applied within a robust medical and risk governance framework.

Author

David Lu
Chief Medical Officer Asia Pacific
David_Lu@swissre.com

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