

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.¹ 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 tool⁹.

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

Coronary Artery Calcium (CAC) Score: from probability to disease burden

Coronary artery calcium (CAC) refers to the deposition of calcium within atherosclerotic plaque in the coronary arteries. It is measured using a non-contrast cardiac CT scan and expressed as a CAC score. Because coronary calcification almost always reflects established atherosclerosis, the CAC score serves as a direct marker of calcified coronary artery atherosclerotic burden rather than a risk factor.

A CAC score of zero indicates the absence of detectable coronary calcification and is strongly associated with a very low short- to intermediate term risk of atherosclerotic cardiovascular disease (ASCVD) events, whereas higher CAC scores reflect increasing coronary plaque burden and future cardiovascular risk.¹⁰ Use of CAC provides significant additional insight for assessing risk of future CVD in diverse populations. In particular, the Multi-Ethnic Study of Atherosclerosis (MESA) demonstrates a <5% incidence of consequences of ASCVD in people with a CAC = 0, and over 13% for those with CAC > 300.¹¹ By directly identifying subclinical coronary atherosclerosis in asymptomatic individuals, CAC transforms cardiovascular assessment from estimating risk to providing direct evidence of calcified coronary atherosclerotic burden in asymptomatic individuals.

Importantly, CAC does not replace traditional risk factor-based assessment; rather, it enhances it by resolving uncertainty at the individual level. Individuals with similar estimated risk may exhibit markedly different CAC burdens, reflecting divergent lifetime trajectories of atherosclerotic exposure.

A recent review on CAD risk assessment reports that adding CAC to traditional risk assessment provides incremental predictive value and improves risk reclassification, particularly in borderline-to-intermediate risk individuals. In practice, CAC assessment is recommended for asymptomatic adults aged >40 years with CAD risk factors or selected symptomatic patients (e.g., stable angina), and the results can help guide whether further evaluation,

medical treatment, revascularization consideration, or routine follow-up is appropriate.¹²

Limitations of coronary artery calcium scoring

Despite its proven value in risk stratification, coronary artery calcium (CAC) scoring has important limitations that must be understood to avoid misinterpretation. CAC cannot identify non-calcified (soft) plaque, which may still be present, particularly in younger individuals, people with diabetes, or those with smoking or inflammatory risk profiles. As a result, a zero CAC score does not rule out underlying early coronary atherosclerosis or future cardiovascular events.^{13,14}

How do recent guideline interpret CAC score zero?

Based on 2026 ACC/AHA/Multisociety Guideline¹⁵, CAC scoring is recommended for asymptomatic adults aged 40–75 years with borderline or intermediate cardiovascular risk, particularly when the decision to start statin therapy is uncertain. The presence of any coronary calcium (CAC > 0) indicates higher risk and supports treatment initiation.

To address the known limitations of CAC scoring, the 2026 guidance cautions against over-reliance on a zero score and emphasises that treatment should generally not be deferred for individuals with diabetes, active smoking, severe hypercholesterolaemia, or a strong family history of premature cardiovascular disease. By embedding CAC within a broader framework that considers lifetime risk, clinical risk factors, and LDL-cholesterol targets, the guideline positions CAC as a calibrated decision-support tool, enhancing precision in risk assessment while avoiding false reassurance and delayed prevention.

Recent advances in CAC focus on artificial intelligence (AI) integration¹⁶, detection of CAC on non-cardiac chest CT¹⁷, and CAC staging to guide preventive interventions¹⁸. The use of advanced AI models to predict CAC score from retinal imaging is also being explored¹⁹. While these advanced techniques are not part of routine underwriting practice, their development highlights the rapid evolution

of cardiovascular risk assessment and reinforces the role of CAC as an established, evidence-based tool within current insurance frameworks.

Why CAC matters for insurance risk management?

From an insurance perspective, coronary artery disease (CAD) remains a leading driver of mortality and morbidity claims, yet early-stage disease is often clinically silent and may not be fully reflected in traditional underwriting approaches. Risk factor-based assessment, while necessary, relies on population-level estimates and may not fully differentiate individuals with significant subclinical atherosclerosis. Coronary artery calcium (CAC) scoring adds a direct measure of calcified coronary atherosclerotic burden, helping insurers reduce information gaps that are intrinsic to conventional underwriting.

The value of CAC becomes particularly evident in portfolios where claim amounts are high or risk concentration is greater, such as in high sum-assured segments. In these settings, undetected CAD in even a small number of insured lives may materially affect portfolio outcomes through low frequency but high amount claims.

This test is completely non-invasive, requiring no medications or preparation, and can be completed in 5–10 minutes using widely available CT scanners. By incorporating CAC alongside traditional risk factors, insurers may help improve individual risk stratification, reduce hidden coronary risk within underwriting portfolios, and mitigate low-frequency, high-amount shock losses—strengthening portfolio stability without departing from established medical practice.

Swiss Re's Life Guide incorporates both a *Cardiometabolic Calculator (CMC)* and a Coronary Artery Disease Calculator, each providing integrated risk scores to support underwriting decision-making in cardiovascular cases where applicant data are multifactorial or clinically complex. In 2024, the cardiometabolic calculator was enhanced to incorporate coronary artery calcium (CAC) scoring, resulting in improved stratification of cardiovascular mortality and morbidity risk when CAC data are available. Collectively,

these tools offer a comprehensive and complementary assessment of cardiovascular risk.

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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.
- CAC should be used to complement – not replace – traditional assessment, as a zero score does not exclude non-calcified atherosclerotic plaque, particularly in younger 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.

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