Medical Policy

BlueCross BlueShield Kansas
An Independent licensee of the Blue Cross Blue Shield Association

Title: Computed Tomography (CT) to Detect Coronary Artery Calcification

Related Policies:	▪ *Contrast-Enhanced CCTA for Coronary Artery Evaluation*

Professional / Institutional
Original Effective Date: April 2002 / February 2005
Latest Review Date: September 16, 2026
Current Effective Date: September 16, 2026

State and Federal mandates and health plan member contract language, including specific provisions/exclusions, take precedence over Medical Policy and must be considered first in determining eligibility for coverage. To verify a member's benefits, contact Blue Cross and Blue Shield of Kansas Customer Service.

The BCBSKS Medical Policies contained herein are for informational purposes and apply only to members who have health insurance through BCBSKS or who are covered by a self-insured group plan administered by BCBSKS. Medical Policy for FEP members is subject to FEP medical policy which may differ from BCBSKS Medical Policy.

The medical policies do not constitute medical advice or medical care. Treating health care providers are independent contractors and are neither employees nor agents of Blue Cross and Blue Shield of Kansas and are solely responsible for diagnosis, treatment and medical advice.

If your patient is covered under a different Blue Cross and Blue Shield plan, please refer to the Medical Policies of that plan.

Populations	Interventions	Comparators	Outcomes
Individuals: • Who are asymptomatic with risk of coronary artery disease	Interventions of interest are: • Coronary artery calcium scoring in combination standard risk stratification	Comparators of interest are: • Coronary artery disease risk factor stratification based on standard risks	Relevant outcomes include: • Overall survival • Test accuracy • Test validity • Morbid events • Resource utilization
Individuals: • With signs and/or symptoms	Interventions of interest are:	Comparators of interest are:	Relevant outcomes include: • Overall survival

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

Populations	Interventions	Comparators	Outcomes
suggestive of coronary artery disease	• Coronary artery calcium scoring before other diagnostic testing	• Standard diagnostic testing	• Test accuracy • Test validity • Morbid events • Resource utilization
Individuals: • Who undergo ECG-gated or non-ECG-gated chest computed tomography and are at risk of coronary artery disease	Interventions of interest are: • Artificial intelligence-based detection, quantification, or scoring of coronary artery calcium on ECG-gated or non-ECG-gated chest computed tomography	Comparators of interest are: • Standard coronary artery calcium assessment and risk stratification without artificial intelligence	Relevant outcomes include: • Overall survival • Test accuracy • Test validity • Morbid events • Resource utilization

DESCRIPTION

Several types of fast computed tomography (CT) imaging, including electron-beam CT and spiral CT, allow the quantification of calcium in coronary arteries. Coronary artery calcium (CAC) is associated with coronary artery disease (CAD). The use of CAC scores has been studied in the prediction of future risk of CAD and in the diagnosis of CAD in symptomatic individuals.

OBJECTIVE

The objective of this evidence review is to evaluate the net health outcome of the use of computed tomography to detect coronary artery calcium in 3 settings:

1. For patients with risk of coronary artery disease, who are asymptomatic, does the use of coronary artery calcium scoring as an adjunct standard risk stratification to manage treatment result in improvement in cardiac risk factors?
2. For patients with chest pain symptoms suggestive of coronary artery disease, compared to standard diagnostic testing, does the use of coronary artery calcium scoring to rule out coronary artery disease reduce the use of unnecessary invasive coronary angiography?
3. For adults undergoing non-contrast chest CT (either dedicated ECG-gated calcium-scoring CT or non-ECG-gated chest CT for noncardiac indications), does AI-based coronary artery calcium detection as an adjunct to standard risk stratification to manage treatment result in improvement in cardiac risk factors?

BACKGROUND

Coronary Artery Calcium

Coronary artery calcium (CAC) is associated with coronary artery disease (CAD). The development of fast computed tomography (CT) scanners has allowed the measurement of CAC in clinical practice. Coronary artery calcium has been evaluated in several clinical settings. The most widely studied indication is for the use of CAC in the prediction of future risk of CAD in patients with subclinical disease, with the goal of instituting appropriate risk-reducing therapy

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

(eg, statin treatment, lifestyle modifications) to improve outcomes. Also, CAC has been evaluated in patients with symptoms potentially consistent with CAD, but in whom a diagnosis is unclear.

Detection

Electron-beam computed tomography (EBCT; also known as ultrafast CT) and spiral CT (or helical CT) may be used as an alternative to conventional CT scanning due to faster throughput. In both methods, the speed of image acquisition gives them unique value for imaging a moving heart. The rapid image acquisition time virtually eliminates motion artifact related to cardiac contraction, permitting visualization of the calcium in the epicardial coronary arteries. Electron-beam computed tomography software permits quantification of calcium area and density, which are translated into calcium scores. Calcium scores have been investigated as a technique for detecting CAC, both as a diagnostic technique in symptomatic patients to rule out an atherosclerotic etiology of symptoms or, in asymptomatic patients, as an adjunctive method for risk stratification for CAD.

Electron-beam computed tomography and multidetector CT were initially the primary fast CT methods for measurement of CAC. A fast CT study for CAC measurement takes 10 to 15 minutes and requires only a few seconds of scanning time. More recently, computed tomography angiography has been used to assess coronary calcium. Because of the basic similarity between EBCT and computed tomography angiography in measuring coronary calcium, it is expected that computed tomography angiography provides information on coronary calcium that is similar to EBCT.

Computed tomography scan-derived coronary calcium measures have been used to evaluate coronary atherosclerosis. Coronary calcium is present in coronary atherosclerosis, but atherosclerosis detected may or may not be causing ischemia or symptoms. Coronary calcium measures may be correlated with the presence of critical coronary stenoses or serve as a measure of the patient's proclivity toward atherosclerosis and future coronary disease. Thus, coronary calcium could serve as a variable to be used in a risk assessment calculation to determine appropriate preventive treatment in asymptomatic patients. Alternatively, in other clinical scenarios, coronary calcium scores might help determine whether there is an atherosclerotic etiology or component to the presenting clinical problem in symptomatic patients, thus helping to direct further workup for the clinical problem. In this second scenario, a calcium score of 0 usually indicates that the patient's clinical problem is unlikely to be due to atherosclerosis and that other etiologies should be more strongly considered. In neither case does the test determine a specific diagnosis. Most clinical studies have examined coronary calcium for its potential use in estimating the risk of future coronary heart disease events.

Coronary calcium may also be identified opportunistically on non-gated chest CT scans obtained for other clinical indications, such as lung cancer screening, evaluation of pulmonary embolism, or preoperative assessment. This allows CAC information to be used for risk assessment without requiring a separate dedicated calcium-scoring examination. Although visual or semi-quantitative assessments from non-gated scans are less precise than formal Agatston scoring from ECG-gated acquisitions, studies have shown that even these opportunistic estimates correlate well with gated calcium scores. This approach extracts additional cardiovascular risk information from imaging already being performed, without added radiation exposure, cost, or patient inconvenience.

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

Artificial intelligence (AI) algorithms have been developed to automate the detection, quantification, and risk categorization of CAC on CT images. These approaches have been studied in both dedicated ECG-gated calcium-scoring examinations in asymptomatic patients and non-ECG-gated chest CT scans performed for other clinical indications, with the goal of improving efficiency, reducing interreader variability, and identifying subclinical atherosclerosis.

Nomenclature

Coronary calcium levels can be expressed in many ways. The most common method is the Agatston score, which is a weighted summed total of calcified coronary artery area observed on CT. This value can be expressed as an absolute number, commonly ranging from 0 (low-risk) to 400 (high-risk). These values can be translated into age- and sex-specific percentile values. Different imaging methods and protocols will produce different values based on the specific algorithm used to create the score, but the correlation between any 2 methods appears to be high, and scores from 1 method can be translated into scores from a different method.

REGULATORY STATUS

Many models of CT devices, including EBCT and other ultrafast CT devices, have been cleared for marketing by the U.S. Food and Drug Administration (FDA) through the 510(k) process. U.S. FDA product code: JAK. In addition, the FDA has cleared multiple AI-enabled post-processing software products for CAC analysis as Class II devices through the 510(k) pathway. These include software intended for opportunistic analysis of nongated thoracic CT scans, dedicated ECG-gated cardiac CT calcium scoring, and contrast-enhanced chest CT CAC assessment. Examples include HealthCCSng (K210085), Imbio CAC Software (K230112), iCAC Device (K230223), BriefCase-Quantification (K231631), AVIEW CAC (K233211), TeraRecon Cardiovascular Calcification CT (K250288), CT VScore+ (K252217), AI-CVD (K252029), and BunkerHill Contrast CAC (K260166). These products are intended to support clinician interpretation by providing automated CAC detection, quantification, or segmentation outputs (e.g., Agatston scoring or risk categorization) and are not intended to be used as stand-alone diagnostic tools for clinical decision-making.

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

POLICY

A. Coronary artery calcium scoring may be considered **medically necessary** as an adjunct to standard cardiovascular risk assessment in asymptomatic adults without known coronary artery disease or clinical atherosclerotic cardiovascular disease in individuals at least 40 years of age and borderline to intermediate 10-year atherosclerotic cardiovascular disease risk and who are currently not on lipid-lowering therapy (see Policy Guidelines).

B. Artificial intelligence-based automated detection, quantification, or scoring of coronary artery calcium on chest computed tomography, whether performed on dedicated ECG-gated calcium-scoring CT in asymptomatic patients or on non-contrast, non-ECG-gated chest CT performed for other clinical indications as an adjunct to standard cardiovascular risk assessment, is considered **experimental / investigational**.

C. The use of computed tomography to detect coronary artery calcification is considered **experimental / investigational** for all other indications.

POLICY GUIDELINES

A. When quantitative assessment is performed as part of the same encounter as contrast-enhanced cardiac computed tomography (codes 75572-75573) or coronary computed tomography angiography (code 75574), it is included in the service.
B. The primary fast computed tomography methods for this determination are electron beam computed tomography and multidetector computed tomography.)
C. The table below summarizes the risk category thresholds and key input variables for the PREVENT-ASCVD (Predicting Risk of cardiovascular disease EVENTs - Atherosclerotic Cardiovascular Disease) risk calculator from the American Heart Association and the American College of Cardiology, which informs primary prevention decision-making and the selection of patients who may benefit from further risk refinement.

Table 1. PREVENT-ASCVD Risk Categories and Required Variables

Risk Category	PREVENT-ASCVD
Low-risk	3%
Borderline-risk	3% to 5%
Intermediate-risk	5% to 10%
High-risk	≥10%

ASCVD: Atherosclerotic Cardiovascular Disease
Variables assessed during PREVENT-ASCVD include: age, sex, systolic blood pressure, total cholesterol, HDL cholesterol, body mass index, estimated glomerular filtration rate, diabetes status, current smoking, antihypertensive therapy, and statin or other lipid-lowering therapy use. Optional variables include hemoglobin A1c, urine albumin-to-creatinine ratio, and Social Deprivation Index. Outcomes predicted include ASCVD, heart failure, and total cardiovascular disease over 10-year and 30-year time horizons.

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

Please refer to the member's contract benefits in effect at the time of service to determine coverage or non-coverage of these services as it applies to an individual member.

RATIONALE

This evidence review was created using searches of the PubMed database. The most recent literature update was performed through March 9, 2026.

Evidence reviews assess whether a medical test is clinically useful. A useful test provides information to make a clinical management decision that improves the net health outcome. That is, the balance of benefits and harms is better when the test is used to manage the condition than when another test or no test is used to manage the condition.

The first step in assessing a medical test is to formulate the clinical context and purpose of the test. The test must be technically reliable, clinically valid, and clinically useful for that purpose. Evidence reviews assess the evidence on whether a test is clinically valid and clinically useful. Technical reliability is outside the scope of these reviews, and credible information on technical reliability is available from other sources.

Of note, this review was informed, in part, by a TEC Assessment (1998).[1,]

CORONARY ARTERY CALCIUM SCORING IN ASYMPTOMATIC INDIVIDUALS

Clinical Context and Test Purpose

The purpose of coronary artery calcium (CAC) scoring using computed tomography (CT) in asymptomatic individuals is to assess who may benefit from preventive interventions targeted to minimize the risk of atherosclerotic cardiovascular disease (ASCVD).

The following PICO was used to select literature to inform this review.

Populations

The population of interest is individuals who are asymptomatic with risk of coronary artery disease (CAD).

Interventions

The intervention of interest is CAC scoring using fast CT imaging, including electron-beam computed tomography (EBCT) and spiral CT, in combination with standard risk stratification.

Coronary artery calcium scoring is usually initiated or used to modify cardiac risk-reduction interventions in individuals asymptomatic for CAD.

Comparators

The following tool is currently being used to make decisions about managing cardiovascular disease (CVD) in asymptomatic patients: CAD risk factor stratification based on standard risks, such as the Framingham Risk Score (FRS).

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

Outcomes
The outcomes of interest include overall survival (OS), test accuracy, test validity, morbid events (eg, major adverse cardiac events [MACEs]), as well as the need for invasive coronary angiography (ICA) and revascularization.

Intermediate or surrogate outcomes of interest are changes in cardiac risk profile indicators such as smoking, hyperlipidemia, or hypertension.

Study Selection Criteria
For the evaluation of clinical validity of CAC scoring using CT, studies that meet the following eligibility criteria were considered:
- Reported on the accuracy of the marketed version of the technology;
- Included a suitable reference standard;
- Patient/sample clinical characteristics were described;
- Patient/sample selection criteria were described;
- The study reported on a minimum of 1000 patients.

Clinically Valid
A test must detect the presence or absence of a condition, the risk of developing a condition in the future, or treatment response (beneficial or adverse).

REVIEW OF EVIDENCE

Systematic Reviews
Haq et al (2024) conducted a systematic review and meta-analysis to evaluate whether CAC could predict the risk of cardiovascular events and mortality in adults aged less than 50 years.[2,] Six observational studies (N=45,919) included patients with a mean age of 43.1 years. A CAC of 1 to 100 was associated with a higher risk of cardiovascular events compared to a zero CAC (hazard ratio [HR], 1.85; 95% confidence interval [CI], 1.08 to 3.16; p=.012; I^2=65.5%) but there was no difference in mortality (p=.2917). Compared to a zero CAC, CAC greater than 100 was associated with a higher risk of cardiovascular events (HR, 6.57; 95% CI, 3.23 to 13.36; p<.0001; I^2=72.6%) and a higher mortality risk (HR, 2.91; 95% CI, 2.23 to 3.80; p<.0001).

Bell et al (2022) evaluated the incremental gain of CAC scoring in addition to traditional cardiovascular risk assessments for primary prevention in a systematic review and meta-analysis of cohort studies.[3,] Six studies (N=17,961) were included. Mean patient age ranged from 50 to 75.1 years; 38.4% to 59.4% of patients in each study were women and 38% to 100% were White. The C statistic for the traditional CVD risk assessments ranged from 0.693 (95% CI , 0.661 to 0.726) to 0.80. The addition of CAC scoring resulted in a gain of 0.036 (95% CI, 0.020 to 0.052). When CAC score reclassified low risk patients to intermediate or high risk, 85.5% to 96.4% of patients did not have a CVD event during follow-up (range, 5.1 to 10 years). Of those originally classified as high risk and reclassified as low risk after CAC scoring, 91.4% to 99.2% did not have a CVD event during follow-up. Although the CAC score did add some additional discrimination to traditional CVD risk assessment, the authors cautioned that costs, rates of incidental findings, and radiation risks may offset the benefit.

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

Observational Studies

From a pool of 27,125 patients who had had coronary computed tomography angiography (CCTA) for CAD, Han et al (2018) evaluated 3145 asymptomatic elderly patients between 52 and 62 years of age to compare the prognostic value of CCTA and CAC score.[4,] In this multicenter, prospective, observational study, the authors found that adding CCTA improved the level of discrimination of a model that only included FRS and CAC score (C statistic: 0.75 vs. 0.70; p=.015). The authors did not correlate the potential impact of CCTA results with treatment choices and downstream events. The study had a relatively short follow-up, and substantial disparity in the duration of risk prediction, FRS in particular.

Numerous observational studies have used data available from the Multi-Ethnic Study of Atherosclerosis (MESA) cohort to evaluate CAC in patients asymptomatic for CVD.[5,] The MESA cohort of 6814 asymptomatic men and women 45 to 84 years of age is designed to study the characteristics of subclinical CVD and the risk factors that predict progression to symptomatic CVD. Approximately 38% of the patients in MESA were White, 28% African American, 22% Hispanic, and 12% Asian. Cainzos-Achirica et al (2020) assessed whether use of CAC improved appropriate aspirin use for primary prevention compared with other risk calculators.[6,] In multivariable regression analysis, a CAC score ≥100 was independently associated with an increased risk of CVD events compared with those with a CAC score of 0 (HR , 3.9; 95% CI, 2.5 to 6.1]. The pooled cohort equations and an estimated cardiovascular risk threshold of >20% failed to identify optimal candidates for aspirin; however, a CAC score of at least 100 was able to identify subgroups of patients where aspirin would yield benefit. Gepner et al (2017) prospectively compared the use of CAC with carotid plaque scores in order to predict CVD, coronary heart disease (CHD), and stroke/transient ischemic attack (TIA) events.[7,] After 11.3 years of follow-up among 4955 participants (mean age, 61.6 years), 709 CVD, 498 CHD, and 262 stroke/TIA events had occurred. Coronary artery calcium score significantly reclassified non-CVD events (3%; 95% CI, 2% to 5%) and CHD events (13%; 95% CI, 5% to 18%). Carotid plaque score did not consistently reclassify CVD or CHD events or nonevents. Budoff et al (2018) evaluated the relationship between CAC and incident ASCVD (stroke, cardiovascular death, or nonfatal myocardial infarction [MI]).[8,] After a median follow-up of 11.1 years, there were 498 total CHD events in the cohort (7.3%). Results were stratified by categories of race/ethnicity, age, sex, and education. Event rates increased with increasing CAC levels across all demographic subgroups and tests for interaction with age, sex, or race/ethnicity were all non-significant, demonstrating that CAC was independently associated with events. Event rates in the CAC=0 group ranged from 1.3% to 5.6%, and in the CAC >300 group ranged from 13.1% to 25.6%. Polonsky et al (2010) also used data from MESA to determine whether incorporation of calcium score into a risk model based on traditional risk factors would improve the classification of risk.[9,] During a median of 5.8 years of follow-up among a final cohort of 5878, 209 CHD events occurred, of which 122 were MI, death from CHD, or resuscitated cardiac arrest. Addition of CAC score in the model resulted in significant improvements in risk prediction compared with the model without CAC score (NRI , 0.25; 95% CI, 0.16 to 0.34; p<.001). Subjects reclassified to high-risk had a similar risk of CHD events as those originally classified as high-risk. Davis et al (2025) used MESA data to further evaluate CAC scoring in lower-risk individuals. Among 6712 participants followed for a median of 16.7 years, ASCVD event rates were 14.3 per 1000 person-years in those with CAC versus 4.1 per 1000 person-years in those without CAC.[10,] In low-risk and borderline-risk individuals, CAC was independently associated with increased ASCVD risk (HR, 1.35; 95% CI, 1.22 to 1.50 and HR, 1.30; 95% CI, 1.16 to 1.46, respectively). When CAC

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

was added to the pooled cohort equations, categorical net reclassification improvement at the 7.5% statin eligibility threshold was 0.1014 (95% CI, 0.008 to 0.201) among low/borderline-risk individuals, suggesting approximately 10% more individuals were correctly reclassified than incorrectly reclassified

In 2017, Ferencik et al evaluated whether the distribution of CAC in individual coronary arteries and segments, as well as CAC in the proximal dominant coronary artery, as detected by cardiac CT predicts incident major CHD events independent of traditional CAC score in 1268 asymptomatic subjects without prevalent major CHD from the offspring and third generation cohorts of the Framingham Heart Study.[11,] Results revealed a total of 42 major CHD events occurring during a median follow-up period of 7.4 years. Both the number of coronary arteries with CAC (HR, 1.68 per artery, 95% CI, 1.10 to 2.57; p=.02) and the presence of CAC in the proximal dominant coronary artery (HR, 2.59; 95% CI, 1.15 to 5.83; p=.02) were associated with major CHD events after multivariable adjustment.

Nakanishi et al (2016) conducted a study among 13,092 consecutive asymptomatic individuals without known CAD (mean age, 58 years) clinically referred for a CAC scan between 1997 and 2011 at a university medical center; the study examined the predictive value of CAC for 5- and 15-year mortality rates among men and women.[12,] Coronary artery calcium showed an incremental prognostic value over traditional risk factors among men at 5 years (area under curve [AUC], 0.702 vs. 0.655; p=.002) as well as at 15 years (AUC, 0.723 vs. 0.656; p<.001). In women, the incremental prognostic value of CAC was not statistically significant at 5 years (AUC, 0.650 vs. 0.612; p=.065), but was statistically significant at 15 years (AUC, 0.690 vs. 0.624; p<.001).

Elias-Smale et al (2011) conducted a study among 2153 asymptomatic participants (69.6 years) who underwent a multidetector CT scan in the Rotterdam Study.[13,] During a median follow-up of 3.5 years, 58 CHD events (MI or death) occurred. Participants were classified into low (<5%), intermediate (5% to 10%), and high (>10%) 5-year risk categories based on a refitted Framingham risk model. For the outcome of CHD, the C statistic improved from 0.693 for the refitted Framingham model to 0.743 by addition of coronary calcium. Reclassification of subjects occurred most substantially in the intermediate-risk group (5-year risk, 5% to 10%) where 56% of persons were reclassified. Addition of CAC scoring reclassified 56% of persons: 36% moved to low-risk while 20% moved to high-risk, leading to a net gain in reclassification of 18% in persons with an event and a net decline in reclassification of 3% in persons without an event, resulting in an NRI of 15% (p<.01).

Erbel et al (2010) assessed NRI and risk prediction based on CAC scoring in comparison with traditional risk factors in 4129 subjects without overt CAD at baseline in the Heinz Nixdorf Recall study.[14,] Results revealed that 93 coronary deaths and nonfatal MIs occurred after 5 years of follow-up (cumulative risk, 2.3%; 95% CI, 1.8% to 2.8%). Reclassifying intermediate risk subjects with CAC <100 to the low risk category and with CAC ≥400 to the high risk category yielded an NRI of 21.7% (p=.0002) and 30.6% (p<.0001) for the FRS, respectively. Adding CAC scores to the FRS and National Cholesterol Education Panel ATP III categories improved the AUC from 0.681 to 0.749 (p<.003) and from 0.653 to 0.755 (p=.001), respectively. The authors concluded that limiting CAC scoring to intermediate risk subjects assists in correctly identifying a high proportion of individuals at highest risk and may contribute to reducing the number of

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

coronary events in the general population; however, clinicians need to be aware that this may not be applicable across the board, particularly for patients in a low risk category. In 2018, Lehmann et al published additional 10 year follow-up data from Heinz Nixdorf and concluded that CAC progression is associated with coronary and CV event rates, but only weakly adds to risk prediction.[15,] The authors stated that what counts is the most recent CAC value and risk factor assessment.

A number of additional studies have reported that CAC scoring adds predictive information.[16,17,18,19,20,21,22,23,24,25,]

Clinically Useful
A test is clinically useful if the use of the results informs management decisions that improve the net health outcome of care. The net health outcome can be improved if patients receive correct therapy, more effective therapy, or avoid unnecessary therapy or testing.

Direct Evidence
Direct evidence of clinical utility is provided by studies that have compared health outcomes for patients managed with and without the test. Because these are intervention studies, the preferred evidence would be from randomized controlled trials (RCTs).

Systematic Reviews
Tables 1 and 2 summarize, respectively, the characteristics and results of systematic reviews relevant to the assessment of the clinical utility of CAC scoring.

Scheu et al (2025) conducted a systematic review of 7 randomized controlled trials and 1 observational cohort study of CAC screening in asymptomatic adults in the primary prevention setting (N=51,554).[26,] Meta-analysis was not performed because of heterogeneity in populations, interventions, and outcomes. Lipid outcomes were assessed in 5 studies (n=3,693), with between-group LDL cholesterol improvements ranging from 6.0 to 44.9 mg/dL in 3 studies showing benefit, although 1 small trial reported worsening LDL cholesterol in the CAC-guided group and 1 trial found no significant difference. Five RCTs evaluated at least one cardiovascular risk factor as an outcome, but only 1 demonstrated a statistically significant improvement in systolic blood pressure. Cardiovascular medication use was reported in 7 studies (n=51,104) and varied by study design and treatment algorithm; some trials found lower protocol-based medication indications after CAC-based reclassification, whereas others reported greater initiation or use of antihypertensive or lipid-lowering therapy. Medication adherence was assessed in 3 trials (n=3,338) and improved significantly in 1 study, with statin adherence of 63.3% versus 45.6%. Behavioral outcomes were assessed in 5 trials (n=3,692); 1 study reported a higher rate of general practitioner consultation, most commonly motivated by the desire to lower cardiovascular risk, and 1 reported higher self-reported physical activity, while the remaining studies did not demonstrate significant between-group differences. Clinical event rates were low across the 3 studies reporting these outcomes (n=6,552), with 52 total events reported during follow-up.

Gupta et al (2017) performed a systematic review and meta-analysis evaluating the odds of initiating or continuing pharmacological (ie, aspirin, lipid-lowering, and blood pressure-lowering medications) and lifestyle preventive therapies in asymptomatic CAD patients with nonzero

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

versus 0 CAC scores as detected on cardiac CT.[27,] Results revealed that the odds of aspirin, lipid-lowering, and blood pressure-lowering medication initiation, lipid-lowering medication continuation, an increase in exercise, and dietary changes were significantly higher in patients with nonzero CAC versus 0 CAC scores. However, the odds of aspirin or blood pressure-lowering medication continuation were not significantly increased in the nonzero CAC group. Statistical heterogeneity was present across studies for many of the outcomes; potential sources of heterogeneity included variations in sample size and the proportion of patients with 0 versus nonzero CAC, whether patients were shown their CAC scan, and differences in clinical characteristics of study populations.

Mamudu et al (2014) conducted a systematic review of studies evaluating the effects of CAC screening on behavioral modification, risk perception, and medication adherence in asymptomatic adults.[28,] Fifteen studies were selected (3 RCTs, 12 observational studies). The size of the study populations ranged from 56 to 6814 individuals. Reviewers primarily provided descriptive results of the studies given the lack of standardization across studies regarding CAC measures and outcome variables. Coronary artery calcium screening improved medication adherence. However, the impact of CAC screening on behavioral and lifestyle factors (body mass index, diet, exercise, smoking), the perception of CAD risk, and psychosocial effects were not statistically significant compared with baseline.

Whelton et al (2012) published a meta-analysis of RCTs that evaluated the impact of CAC scores on cardiac risk profiles and cardiac procedures.[29,] Four trials were identified (N=2490); the individual trials ranged in size from 50 to 1934 patients. Reviewers pooled data from 4 trials on the impact of calcium scores on blood pressure, from 3 to evaluate the impact on low-density lipoprotein, and from 2 to determine the impact on high-density lipoprotein. Pooled analysis did not show a significant change in any of these parameters when incorporating calcium scores. Similarly, in 4 studies that looked at the rates of smoking cessation following calcium scores, no significant change was found. Two studies included rates of coronary angiography and 2 included rates of revascularization. Pooled analysis of these studies did not show a significant change after the measurement of coronary calcium.

Table 2. Characteristics of Systematic Reviews Assessing the Clinical Utility of CAC Score for Asymptomatic Patients

Study	Dates	Trials	Participants	N (Range)	Design	Duration (Range)	Outcomes
Scheu et al (2025)[26,]	2003-2024	8	Asymptomatic for CAD	51,554 (56 to 43,447)	SR of RCTs and prospective cohorts	6 to 60 months	Change in cardiovascular risk factors, use of pharmacological prevention, health-related behaviors, cardiovascular events, all-cause mortality.

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

Study	Dates	Trials	Participants	N (Range)	Design	Duration (Range)	Outcomes
Gupta et al (2017)[27,]	2006-2011	6	Asymptomatic for CAD	11,256 (505 to 6814)	SR and MA of RCTs and observational cohorts	1.6 to 6 y (mean follow-up)	Initiation or continuation of pharmacological and lifestyle preventive therapies
Mamudu et al (2014)[28,]	1996-2014	15	Asymptomatic for CAD	16,983 (56 to 6814)	SR of RCTs and prospective cohorts	3 mo to >8 y	Positive behavioral change, risk perception, medication adherence
Whelton et al (2012)[29,]	2003-2011	4	Asymptomatic for CAD	2490 (50 to 1934)	MA of RCTs	1 to 4 y	CVD and CAD risk factors, 10-y FRS event rate, incident clinical disease

CAC: coronary artery calcium; CAD: coronary artery disease; CVD: cardiovascular disease; FRS: Framingham Risk Score; MA: meta-analysis; RCT: randomized controlled trial; SR: systematic review.

Table 3. Results of Systematic Reviews Assessing the Impact of CAC Score on Clinical Risk Profile, Cardiac Procedures, and Pharmacological and Lifestyle Preventive Therapies Among Asymptomatic Patients

Study	Treatment	Comparator	Trials	Measure	Association	95% CI
Gupta et al (2017)[27,]	CAC score of 0	Nonzero CAC score	4	Aspirin initiation	2.61	1.81 to 3.78
	CAC score of 0	Nonzero CAC score	3	Lipid-lowering medication initiation	2.86	1.85 to 4.41
	CAC score of 0	Nonzero CAC score	2	BP-lowering medication initiation	1.94	1.61 to 2.33
	CAC score of 0	Nonzero CAC score	3	Aspirin continuation	1.28	0.75 to 2.18
	CAC score of 0	Nonzero CAC score	4	Lipid-lowering medication continuation	2.26	1.56 to 3.28
	CAC score of 0	Nonzero CAC score	2	BP-lowering medication continuation	1.38	0.86 to 2.23
	CAC score of 0	Nonzero CAC score	3	Increased exercise	1.84	1.41 to 2.41
	CAC score of 0	Nonzero CAC score	2	Dietary change	1.94	1.52 to 2.49

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

Study	Treatment	Comparator	Trials	Measure	Association	95% CI
Whelton et al (2012)[29,]	CAC screen	No CAC screen	4	Mean change in systolic BP	0.23	-2.25 to 2.71
	CAC screen	No CAC screen	3	Mean change in diastolic BP	-0.42	-1.18 to 0.35
	CAC screen	No CAC screen	3	Mean change in LDL	0.23	-5.96 to 6.42
	CAC screen	No CAC screen	2	Mean change in HDL	-1.18	-5.50 to 3.14
	CAC screen	No CAC screen		RR of smoking cessation	1.15	0.77 to 1.71
	CAC screen	No CAC screen		RR of angiography	1.17	0.68 to 1.99
	CAC screen	No CAC screen		RR of revascularization	1.35	0.69 to 2.63

BP: blood pressure; CAC: coronary artery calcium; CI: confidence interval; HDL: high-density lipoprotein; LDL: low-density lipoprotein; RR: relative risk.

Randomized Controlled Trials

Nerlekar et al (2025) conducted an open-label RCT (CAUGHT-CAD) in 365 asymptomatic patients with intermediate risk for CAD based on family history that compared CAC score-informed prevention and usual care.[30,] Prevention strategies included lifestyle education, patient review of CCTA images, blood pressure control, and lipid-lowering therapy. After 3 years, the change in the primary outcome (total plaque volume) was smaller in the CAC score-informed group than the usual care group (between group difference, 9.5 mm^3; 95% CI, 2.4 to 23.8; p=.009). Total cholesterol, low-density lipoprotein, and triglycerides were all significantly better with CAC score-informed therapy (all p<.001). Waist circumference and body mass index were similar between groups.

Whitmore et al (2025) conducted an RCT to assess the effect of repeated CAC testing over 3 years on cardiovascular risk reduction in asymptomatic patients.[31,] All patients had a family history of premature CAD and a CAC score of 1 to 400. Patients were randomized to a cardiovascular risk reduction program (including visualizing CAC images and statin therapy) or standard care. At 3 years, FRS scores had decreased by 3.4% (95% CI, 2.4% to 4.4%; p≤.001) in the program group, which was a greater reduction than in the control group. Reductions in low-density lipoprotein were also larger in program group than the control group (-1.2 mmol/L; 95% CI, -1.4 to -1.0; p<.001). There were no differences between groups in blood pressure or body mass index at 36 months, but there was a significant difference in adherence to daily exercise and lifestyle behaviors (p≤.001).

Rozanski et al (2011) conducted an RCT to evaluate the impact of CT scanning for CAC on cardiac risk factors.[32,] A total of 2137 healthy volunteers were randomized in a 2:1 ratio to CT scanning (n=1424) or no CT scanning (n=713) and followed for 4 years. At baseline, both groups received one session of risk factor counseling by a nurse practitioner. The primary endpoint was

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

a 4-year change in CAD risk factors and FRS. At the 4-year follow-up, there was a differential dropout among the groups, with 88.2% (1256/1424) of follow-up in the scan group and 81.9% (584/713) in the no-scan group. Compared with the no-scan group, the scan group showed a net favorable change in systolic blood pressure (p=.02), low-density lipoprotein cholesterol (p=.04), and waist circumference for those with increased abdominal girth (p=.01), and a tendency to weight loss among overweight subjects (p=.07). While there was a mean rise in FRS in the no-scan group (0.7), FRS remained static in the scan group (0.002; p=.003). Downstream medical testing in the scan group was comparable with those of the no-scan group, balanced by lower and higher resource utilization for subjects with normal CAC scans and CAC scores of 400 or higher, respectively. This trial highlights the potential benefit of CAC screening in modifying the cardiac risk profile but is not definitive in demonstrating improved outcomes. Trial limitations included differing intensities of interventions between groups and differential dropout. It is possible that the small differences reported in the trial resulted from bias related to these methodologic limitations. Also, this trial did not compare the impact of other types of risk factor intervention, most notably more intensive risk factor counseling.

O'Malley et al (2003) conducted an RCT among a consecutive sample of 450 asymptomatic active-duty U.S. Army personnel aged 39 to 45 years to assess the effects of incorporating EBCT as a motivational factor into a cardiovascular screening program.[33,] The program offered intensive case management or usual care and assessed treatment impact on 10-year FRS over 1 year. The authors used a 2 x 2 factorial design and patients were randomized to 1 of the 4 intervention arms: EBCT results provided in the setting of intensive case management (n=111) or usual care (n=119) or EBCT results withheld in the setting of intensive case management (n=124) or usual care (n=96). Mean absolute risk change in 10-year FRS between groups receiving and not receiving results was +0.30 and +0.36 (p=.81), respectively. The trial was not powered for clinical endpoints. EBCT did not produce any benefits regarding a difference in FRS at 1 year.

Observational Studies

Pavlović et al (2025) evaluated the guideline-directed use of CAC scoring for primary prevention of ASCVD in 1,903 statin-naive adults 55 to 75 years of age without ASCVD, diabetes, or LDL-C greater than 190 mg/dL from the prospective Rotterdam Study.[34,]The study compared how the 2018 ACC/AHA guideline, using either pooled cohort equations or PREVENT equations, and the 2021 ESC/EAS guideline identified candidates for CAC scanning, reclassified treatment recommendations, and stratified subsequent ASCVD risk. By the ACC/AHA approach, 18.3% of men and 11.9% of women were CAC eligible using pooled cohort equations, and 13.4% of men and 3.4% of women were CAC eligible using PREVENT; by the ESC/EAS approach, 46.6% of men and 44.9% of women were CAC eligible. After CAC-based reclassification, most ACC/AHA-eligible individuals were reclassified, with 78.5% of men and 71.8% of women increasing in risk category using pooled cohort equations (19.0% and 23.4% decreasing in risk category , respectively) and 88.8% of men and 80.0% of women increasing in risk category using PREVENT (10.3% and 20.0% decreasing in risk category, respectively). Under ESC/EAS, 48.5% of men and 22.1% of women increased in risk category and 8.7% of men and 24.4% of women were decreased in risk category. Individuals who had an increase in risk category had ASCVD incidence rates comparable to high-risk individuals already recommended for statin therapy based on traditional risk factors alone. Among CAC-eligible individuals, ASCVD incidence rates ranged from 9.3 to 23.8

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

per 1,000 person-years, and the estimated 10-year number needed to treat with high-intensity statin therapy ranged from 11 to 26.

Chain of Evidence
Indirect evidence on clinical utility rests on clinical validity. If the evidence is insufficient to demonstrate test performance, no inferences can be made about clinical utility.

Section Summary: Coronary Artery Calcium Scoring in Asymptomatic Individuals
Multiple observational cohort studies and systematic reviews of these studies have consistently demonstrated the incremental prognostic value of CAC scoring in predicting CVD events compared to standard risk stratification alone among asymptomatic populations over the intermediate and long-term Evidence has also suggested that guideline-directed use of CAC scoring can reclassify treatment recommendations and stratify subsequent ASCVD risk.

Coronary Artery Calcium Scoring in Symptomatic Patients
In certain clinical situations, such as individuals presenting with chest pain, it is uncertain whether the symptoms are due to CAD. Coronary calcium measurement has been proposed as a method to rule out CAD in certain individuals if their CAC score is 0. The presence of any coronary calcium can be a sensitive, but not specific, test for coronary disease because CAD rarely occurs in the absence of coronary calcium. False-positives occur because the calcium may not be associated with an ischemic lesion. The absence of any coronary calcium can be a specific test for the absence of coronary disease and direct the diagnostic workup toward other causes of the patient's symptoms. In this context, coronary calcium measurement is not used to make a positive diagnosis, but as a diagnostic "filter" to rule out an atherosclerotic cause for the patient's symptoms.

Clinical Context and Test Purpose
The use of CAC scoring with CT in symptomatic individuals can rule out the atherosclerotic etiology of CAD.

The following PICO was used to select literature to inform this review.

Populations
The population of interest is individuals who have signs and/or symptoms suggestive of CAD.

Interventions
The intervention of interest is CAC scoring using fast CT imaging, including EBCT and spiral CT. Computed tomography CAC scoring is utilized when individuals require evaluation for persistent stable angina or experience onset of acute chest pain.

Comparators
The following test is currently being used to make decisions about managing CAD: standard diagnostic testing, which includes functional testing and exercise electrocardiography.

Outcomes
The outcomes of interest include OS, test accuracy, test validity, and morbid events (eg, MACEs, need for ICA and revascularization).

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

Study Selection Criteria
For the evaluation of clinical validity of CAC scoring using CT, studies that meet the following eligibility criteria were considered:

- Reported on the accuracy of the marketed version of the technology;
- Included a suitable reference standard;
- Patient/sample clinical characteristics were described;
- Patient/sample selection criteria were described;
- The study reported on a minimum of 1000 patients.

Clinically Valid
A test must detect the presence or absence of a condition, the risk of developing a condition in the future, or treatment response (beneficial or adverse).

REVIEW OF EVIDENCE

Systematic Reviews
Chaikriangkrai et al (2016) conducted a systematic review and meta-analysis to examine the prognostic value and accuracy of a CAC score of 0 for identifying patients presenting with acute chest pain at acceptable low-risk for future cardiovascular events.[35,]The systematic review included only prospective cohort studies that used multidetector CT or EBCT to calculate CAC scores using the Agatston method and reported MACEs at 1 month and beyond the index emergency department visit. Eight studies evaluating 3556 patients with a median follow-up of 10.5 months were selected. Reviewers conducted a subgroup analysis of 6 studies in predominantly White patients (N=2432) to estimate the prognostic accuracy indices of CAC scores (0, >0) for cardiovascular events (MACEs, all-cause deaths, nonfatal MI). Pooled sensitivity, specificity, as well as positive and negative likelihood ratios were 96% (I^2=0%), 60% (I^2=15.1%), 2.36 (I^2=0%), and 0.07 (I^2=0%), respectively (Table 3).

The systematic review by Sarwar et al (2009), mentioned prior in this review examined the clinical, diagnostic, and prognostic significance of a CAC score of 0.[36,] Eighteen studies from 1992 to 2007, in which 10,355 symptomatic patients with suspected CAD underwent CAC testing as well as ICA, were selected in the analysis to examine the diagnostic accuracy of CAC scoring for stenosis on ICA. A total of 5805 (56%) patients had significant coronary stenosis (defined as >50%) on ICA. Pooled data revealed that the presence of calcium had a sensitivity, a specificity, as well as a positive and a negative likelihood ratio of 98%, 40%, 1.63, and 0.06, respectively, for predicting coronary artery stenosis. The summary negative predictive value was 92% (95% CI, 88% to 95%; p<.001). The summary positive predictive value was 68% (95% CI, 64% to 72%; p<.001) (Table 3).

Lo-Kioeng-Shioe et al (2019) conducted a systematic review and meta-analysis of 18 observational studies (N=34,041) to assess the ability of CAC to predict risk of MACE, defined as the composite of late cardiac revascularization, hospitalization for unstable angina pectoris or heart failure, nonfatal MI, and cardiac death or all-cause mortality, in stable patients with suspected CAD.[37,] Of 1601 cardiovascular events, 158 occurred in patients with a CAC score of 0. The pooled risk ratio for MACE in patients with CAC >0 was 5.71 (95% CI, 3.98 to 8.19), and risk

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

increased with increasing levels of CAC. The pooled relative risk for incidence of all-cause mortality or nonfatal MI was 3.64 (95% CI, 2.68 to 4.96).

Table 4. Pooled Diagnostic Performance of CAC Score for CAD Among Symptomatic Individuals

Test	Studies	N	Sensitivity (95% CI), %	Specificity (95% CI), %	LR+ (95% CI)	LR- (95% CI)
Chaikriangkrai et al (2016)[35,]						
CAC score (0, >0)	6	2432	96 (93 to 98)	60 (58 to 62)	2.36 (2.22 to 2.51)	0.07 (0.04 to 0.14)
Sarwar et al (2009)[36,]						
CAC score (0, >0)	18	10,355	98 (97 to 98)	40 (38 to 41)	1.63 (1.59 to 1.67)	0.06 (0.05 to 0.07)

CAC: coronary artery calcium; CAD: coronary artery disease; CI: confidence interval; LR: likelihood ratio.

Randomized Controlled Trials

Lubbers et al (2016) conducted a multicenter RCT to compare the effectiveness and safety of a cardiac CT algorithm with functional testing in patients with symptoms (stable chest pain or angina equivalent symptoms) suggestive of CAD.[38,] A total of 350 patients with stable angina were prospectively randomized 2:1 to cardiac CT or functional testing, such as exercise electrocardiography, myocardial perfusion imaging, or stress echocardiography. Patients in the cardiac CT arm (n=242) initially underwent calcium scanning followed by CCTA if the Agatston score was between 1 and 400. Coronary artery disease was ruled out if the patients had a CAC score of 0. The original primary endpoint of the trial was the proportion of patients undergoing catheter angiography followed by revascularization, but because of insufficient funding, the authors could not assess that endpoint and chose clinical effectiveness as the alternative primary outcome, defined as the absence of chest pain complaints after 1 year. After 1 year, fewer patients randomized to CT reported angina symptoms than those in the functional testing group (39% vs. 25%; p=.012), although the proportion of patients with similar or worsened symptoms was comparable (26% vs. 29%; p=.595). The tiered protocol study design is a strength of this trial, but the unplanned change in endpoints limits analysis and conclusions.

Observational Studies

Yuan et al (2025) conducted a prospective cohort study of 10,908 patients with a CAC score of 0 who underwent CCTA at a single center in China (mean age, 53.83 years; median follow-up 3.54 years) to evaluate the clinical significance of a CAC score of 0 in symptomatic patients.[39,] Despite a CAC score of 0, obstructive CAD (≥50% stenosis) was present on CCTA, and non-obstructive CAD was also identified. During follow-up, 130 patients (1.2%) experienced MACE. Among the subgroup with typical angina and a CAC score of 0, the rate of obstructive CAD was 27.1% and the MACE rate was 3.9%. Among patients with both a CAC score of 0 and obstructive CAD on CCTA, MACE rates were highest in those with typical angina (9.5%; MACE/year, 4.0%; HR, 7.62; 95% CI, 3.60 to 16.18; p<.001). These findings suggest that a zero CAC score should not be used in isolation to exclude clinically important CAD in symptomatic patients and that CCTA may be necessary to identify higher-risk individuals within this population.

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

- Pursnani et al (2015) published results from a subgroup analysis of the Rule Out Myocardial Infarction using Computed Assisted Tomography II trial.[40,]This analysis evaluated the incremental diagnostic value of CAC scoring plus CCTA in low- to intermediate-risk patients presenting to the emergency department with symptoms (chest pain or angina equivalent of ≥5 minutes duration within 24 hours) suggesting acute coronary syndrome (ACS). The Rule Out Myocardial Infarction using Computed Assisted Tomography II trial randomized patients with possible ACS to CCTA as part of an initial evaluation or to the standard emergency department evaluation strategy, as directed by local caregivers. As part of the trial protocol, all patients undergoing CCTA had a CAC scan; the present analysis included 473 patients who underwent both CCTA and CAC scanning. Among these patients, the ACS rate (defined as unstable angina and MI during the index hospitalization) was 8% (n=38). Patients with lower CAC scores were less likely to have a discharge diagnosis of ACS. Among 253 patients with a CAC score of 0, 2 (0.8%) patients were diagnosed with ACS (95% CI, 0.1% to 2.8%). Receiver operating characteristic curve analysis was used to predict the risk of ACS by CAC score greater than 0, continuous CAC score, CCTA results, and combined CAC and CCTA score. The optimal cut-point of CAC for ACS detection was 22 (C statistic, 0.81), with 318 (67%) patients having a CAC score of less than 22. All CCTA strategies had high sensitivity for ACS detection, without significant differences in stenosis thresholds. Coronary artery calcium was inferior to CCTA for predicting ACS (C range, 0.86 vs. 0.92; p=.03). The addition of CAC score to CCTA (ie, using selective CCTA only for patients with CAC score >22 or >0) did not significantly improve the detection of ACS (CAC plus CCTA C=0.93 vs. CCTA C=0.92; p=.88). Overall, this trial suggested that CAC scoring did not provide incremental value beyond CCTA in predicting the likelihood of ACS in a low- to intermediate-risk population presenting to the emergency department.

Chaikriangkrai et al (2015) retrospectively evaluated whether CAC added incremental value to CCTA for predicting coronary artery stenosis in 805 symptomatic patients without known CHD.[41,] Coronary artery calcium score was significantly associated with the presence of coronary artery stenosis on CCTA. Both CAC score and the presence of CCTA stenosis were significantly associated with MACE rates, including cardiac death, nonfatal MI, and late coronary revascularization. Patients with more than 50% stenosis on CCTA had higher MACE rates, compared with those who had a normal CCTA (4.5% vs. 0.1%; p<.001) and with those who had less than 50% stenosis (4.5% vs. 1.4%; p=.002). Those with a CAC score of more than 400 had higher MACE rates than those with scores between 1 and 100 (4.2% vs. 1.4%; p=.014) and those with scores of 0 (4.2% vs. 0%; p<.001). The addition of CAC score to a risk prediction model for MACE, which included clinical risk factors and CCTA stenosis, significantly improved the model's predictive performance (global c^2 score, 108 vs. 70; p=.019).

Hulten et al (2014) published results from a retrospective cohort study among symptomatic patients without a history of CAD to evaluate the accuracy of CAC scoring for excluding coronary stenosis, using CCTA as the criterion standard.[42,] The study included 1145 patients who had symptoms possibly consistent with CAD who underwent noncontrast CAC scoring and contrast-enhanced CCTA from 2004 to 2011. For detection of greater than 50% stenosis, CAC had a sensitivity, specificity, and negative predictive value of 98%, 55%, and 99%, respectively. For

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

the prediction of cardiovascular death or MI, the addition of either or both CAC and CCTA to a clinical prediction score did not significantly improve prognostic value.

Dharampal et al (2013) retrospectively evaluated a cohort of 1975 symptomatic patients (those with chest pain referred by their cardiologist for CCTA) who underwent a clinical evaluation and CAC scoring and CCTA or ICA.[43,] The primary outcome was obstructive CAD (≥50% stenosis) on ICA or CCTA (if ICA was not done). The authors evaluated the NRI with the addition of CAC score to a clinical prediction model for patients who had an intermediate probability of CHD (10% to 90%) after clinical evaluation based on chest pain characteristic, age, sex, risk factors, and electrocardiogram. Discrimination of CAD was significantly improved by incorporating the CAC score into the clinical evaluation (AUC, 0.80 vs. 0.89; p<.001).

Yoon et al (2012) conducted a prospective study among 136 Korean patients (58% men; mean age, 56 years) who presented to the emergency department with acute chest pain and nondiagnostic electrocardiograph to examine the diagnostic usefulness of the "zero calcium score criteria" as a decision-making strategy to rule out significant CAD as the etiology of acute chest pain.[44,] All patients underwent 64-slice CT for calcium scoring and CCTA. Ninety-two (68%) of 136 patients did not show detectable CAC, and 14 (15%) of these 92 without CAC had 50% or more stenosis on CCTA. Sensitivity, specificity, positive predictive value, and negative predictive value of a CAC score of 0 for the detection of 50% or more stenosis were 66% (95% CI, 50% to 80%), 83% (95% CI, 74% to 90%), 64% (95% CI, 48% to 77%), and 85% (95% CI, 75% to 91%), respectively. A calcium score of 0 did not necessarily guarantee the absence of significant CAD in an Asian population presenting to the emergency department with chest pain.

Gottlieb et al (2010) conducted a prospective multicenter study to evaluate whether the absence of coronary calcium could be used to rule out 50% or more coronary stenosis or the need for revascularization.[45,] The authors compared the diagnostic performance of 64-detector CT with that of ICA. Among 291 patients with suspected CAD included in the study, 214 (73%) were male, and the mean age was 59.3 years. Fifty-six percent of the patients had 50% or more stenosis. Among 72 patients with a CAC score of 0, 14 (19%) had at least 1 coronary artery with 50% or more stenosis. The overall sensitivity for a CAC score of 0 to predict the absence of 50% or more stenosis was 45%, specificity was 91%, the negative predictive value was 68%, and the positive predictive value was 81%. Additionally, 9 (12.5%) patients with a CAC score of 0 underwent revascularization within 30 days of calcium scoring.

Clinically Useful
A test is clinically useful if the use of the results informs management decisions that improve the net health outcome of care. The net health outcome can be improved if patients receive correct therapy, more effective therapy, or avoid unnecessary therapy or testing.

Direct Evidence
Direct evidence of clinical utility is provided by studies that have compared health outcomes for patients managed with and without the test. Because these are intervention studies, the preferred evidence would be from RCTs.

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

Observational Studies
Yerramasu et al (2014) prospectively assessed an evaluation algorithm including CAC scoring for patients presenting to a rapid access chest pain clinic with stable chest pain possibly consistent with CHD.[46,] Three hundred patients presenting with acute chest pain to 1 of 3 chest pain clinics underwent CAC scoring. If the CAC score was 1000 or more Agatston units, ICA was performed; if the CAC score was less than 1000, CCTA was performed. All patients with a CAC score of 0 and low pretest likelihood of CHD had no obstructive CHD on CCTA and were event-free during follow-up. Of the 18 patients with CAC scores from 400 to 1000, 17 (94%) had greater than 50% obstruction on subsequent CCTA and were referred for further evaluation, 14 (78%) of whom had obstructive CHD. Of 15 patients with CAC scores 1000 or more and who were referred for coronary angiography, obstructive CHD was present in 13 (87%). This study suggested that CAC scoring can be used in the acute chest pain setting to stratify decision-making for further testing.

ten Kate et al (2013) prospectively evaluated the accuracy of cardiac CT, including CAC scoring with or without CCTA, in distinguishing heart failure due to CAD from heart failure due to non-CAD causes.[47,] Data on the predictive ability of a negative CAC score in ruling out CAD was also included. The study included 93 symptomatic patients with newly diagnosed heart failure of unknown etiology, all of whom underwent CAC scoring. Those with a CAC score greater than 0 underwent CCTA and, if the CCTA was positive for CAD (>20% luminal diameter narrowing), ICA was recommended. Forty-six percent of patients had a CAC score of 0. At a mean follow-up of 20 months, no patient with a CAC score of 0 had a MI, underwent percutaneous coronary intervention, had a coronary artery bypass graft, or had signs of CAD.

Chain of Evidence
Indirect evidence on clinical utility rests on clinical validity. If the evidence is insufficient to demonstrate test performance, no inferences can be made about clinical utility.

Because the clinical validity of CAC scoring for symptomatic patients has not been established, a chain of evidence supporting the clinical utility of CAC scoring in this population cannot be constructed.

Section Summary: Coronary Artery Calcium Scoring in Symptomatic Patients
Systematic reviews and meta-analyses have reported a very low negative likelihood ratio for CAC score in predicting MACEs and significant coronary stenosis, suggesting the potential value of a calcium score of 0 in ruling out an atherosclerotic etiology of the disease. However, multiple observational studies with angiographic (CCTA or ICA) interventions have suggested that a CAC score of 0 may not rule out the presence of significant atherosclerotic CAD among symptomatic patients. Currently, evidence from nonrandomized, observational studies has suggested a very low short- or long-term risk of cardiovascular events or death in patients having calcium scores of 0 compared with those having positive (>0) calcium scores. However, considering the inconsistency in evidence regarding the diagnostic accuracy of calcium scoring and lack of evidence from RCTs, further research is needed to examine the clinical utility of ruling out atherosclerotic CAD based on a CAC score of 0.

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

AI-Based CAC Detection on ECG-Gated and Non-ECG-Gated Chest CT
The purpose of artificial intelligence (AI)-based coronary artery calcium (CAC) detection is to perform automated or structured post-processing of chest computed tomography (CT) imaging, including both dedicated noncontrast electrocardiogram (ECG)-gated calcium-scoring CT acquired specifically for CAC quantification and previously acquired noncontrast, non–ECG-gated chest CT performed for other clinical indications (e.g., lung cancer screening low-dose computed tomography [LDCT] or diagnostic chest CT), for the detection, quantification, and categorical scoring of CAC. The intended purpose is to identify subclinical atherosclerosis, to support or serve as an automated alternative to manual expert CAC segmentation on dedicated gated examinations, and to improve ASCVD risk stratification, clinical decision-making, and preventive management.

The following PICO was used to select literature to inform this review.

Populations
The population of interest includes adults undergoing noncontrast, ECG-gated or non–ECG-gated chest CT for whom CAC may inform atherosclerotic cardiovascular disease risk assessment and preventive therapy.

Interventions
The interventions of interest are AI-based CAC detection and quantification performed from ECG-gated or existing non-ECG-gated chest CT datasets, with outputs intended as adjunctive information to clinician interpretation rather than stand-alone diagnostic decision-making.

Comparators
The comparator of interest is usual radiology interpretation and standard care without AI-based CAC analysis.

Outcomes
The outcomes of interest include test accuracy and test validity (e.g., agreement with reference standards), morbid events and overall survival, and resource utilization. Intermediate outcomes of interest include changes in clinical management, such as statin initiation and other preventive therapy changes.

Study Selection Criteria
For the evaluation of the clinical validity of AI-based CAC scoring, studies that meet the following eligibility criteria were considered:
- Reported on the accuracy of the marketed version of the technology;
- Included a suitable reference standard;
- Patient/sample clinical characteristics were described;
- Patient/sample selection criteria were described;
- The study reported on a minimum of 100 patients.

Clinically Valid
A test must detect the presence or absence of a condition, the risk of developing a condition in the future, or treatment response (beneficial or adverse).

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

REVIEW OF EVIDENCE

OBSERVATIONAL STUDIES

Dedicated ECG-gated Calcium-Scoring CT in Asymptomatic Patients

On dedicated ECG-gated calcium-scoring CT with manual expert segmentation as the reference standard, AI-based CAC scoring has demonstrated strong technical performance (See Table 5). Across 3 studies enrolling 148 to 1,077 patients, reported categorical accuracies ranged from 91.2% to 96.8%, intraclass correlation coefficients (ICCs) from 0.951 to 0.997, and weighted kappa of 0.97, with area under the receiver operating characteristics curve (AUROC) values of 0.99 at CAC thresholds of 0, 100, and 300.[48,49,] These findings were corroborated by FDA validation data for the BunkerHill CAC Algorithm (K240369), in which stand-alone retrospective testing of ECG-gated CT scans from 6 U.S. sites yielded a weighted kappa of 0.972 (95% CI, 0.958 to 0.987) for 4-category CAC score-group assessment, exceeding the prespecified acceptance criterion of weighted kappa ≥0.90.[50,] Agatston-level precision was high, with a mean Agatston bias of 7.4 ± 102.6 and a mean MESA-percentile bias of 2.1% ± 12%.[48,] Where reported, misclassification between risk categories was infrequent (3.2%) and asymmetric, with 85.7% of misclassified cases shifted to a lower-risk rather than a higher-risk category.[49,] False-negative detection was low, with a false-zero rate of 4.1% in one study in which all discordant zeros corresponded to true Agatston scores below 4.[48,]

Incidental CAC Detection on Noncontrast, Non-ECG-Gated Chest CT

For individuals undergoing noncontrast, non-ECG-gated chest CT for other clinical indications, AI-based opportunistic CAC assessment has shown strong performance (See Table 5). When AI-derived scores on non-gated chest CT are compared against manual scoring or consensus radiologist interpretation on the same nongated scan, agreement has been consistently high, with reported binary or categorical accuracies of 87.3% to 96.0%, ICCs of 0.96 to 0.994, and weighted kappa coefficients of 0.90 to 0.96 across studies of 491 to 1,077patients.[51,49,52,53,54,] U.S. Food and Drug Administration (FDA) validation data for 4 cleared algorithms (HealthCCSng, Imbio CAC Software, iCAC, and AVIEW CAC) corroborate these findings, with overall binary or categorical accuracy rates (CAC present or absent or categorical by CAC thresholds) of 79.7% to 92.5%, Cohen or ICC values of 0.896 to 0.907; each submission met its prespecified acceptance threshold.[55,50,56,57,58,59,] Performance is more modest when AI-derived scores on nongated chest CT are benchmarked against paired ECG-gated CT as the reference standard. In this comparison, multicenter studies reported accuracies ranging from 79.2% to 82.8%, and weighted kappa coefficients from 0.72 to 0.9, with misclassification rates of up to 17.2%; where reported, the large majority of misclassified cases shifted to a lower-risk category.[49,52,53,54,] One study additionally reported that higher AI CAC categories were associated with increased 10-year all-cause mortality (60.2% for CAC >400 vs 25.4% for CAC 0; hazard ratio for mortality 3.49; hazard ratio for composite cardiovascular outcome 3.00), supporting the prognostic relevance of AI-derived scores at the population level.[54,]

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

Table 5. Summary of AI Studies for CAC Detection with FDA-cleared Devices

Study	Device	Design, N	Population, setting, and comparator	Key Outcomes
Dedicated ECG-gated calcium-scoring CT in asymptomatic patients				
Chamberlin et al (2025)[48,]	syngo.CT CaScoring VB60 (Siemens)	Retrospective N=148	Sequential asymptomatic adults undergoing routine ECG-gated calcium-scoring CT at a single center; comparator was manual expert segmentation on the same gated CT.	**Vs. Gated-CT** Accuracy (categorical): 91.2% ICC: 0.951 (95% CI, 0.933 to 0.964) Mean Agatston bias: 7.4 ± 102.6 Mean MESA percentile bias: 2.1% ± 12% False CAC 0 rate: 4.1%, all Agatston <4
Kim et al (2025)[49,]	ClariCT.AI (ClariPi Inc.)	Retrospective N=1,077	Adults (SNUH subset (n=652): mean age 60.8 years, 79.4% male; Stanford-COCA subset (n=425): demographics not reported in source) undergoing ECG-gated calcium-scoring CT across multivendor datasets from 2 academic centers (SNUH and Stanford-COCA); comparator was manual or semimanual expert CAC scoring on the same gated CT.	**Vs. Gated-CT** Accuracy (categorical): 96.8% ICC: 0.997 (95% CI, 0.995 to 0.997) Weighted κ: 0.97 (95% CI, 0.96 to 0.98) AUROC: 0.99 for CAC thresholds 0, 100, and 300 Misclassification: 3.2%; 85.7% of misclassified shifted to a lower-risk category.
FDA [50,]	CAC Algorithm (BunkerHill) (K240369)	Retrospective N=NR	Adults aged ≥30 years undergoing ECG-gated chest CT at 6 geographically diverse U.S. sites; comparator was expert-adjudicated ground-truth 4-category CAC detection on the same gated CT.	**Vs. Gated-CT** Weighted κ: 0.972 (95% CI, 0.958 to 0.987) *Primary acceptance criterion: weighted Cohen κ ≥0.90 for 4-category score-group assessment*

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

Study	Device	Design, N	Population, setting, and comparator	Key Outcomes
Non-gated chest CT with ECG-gated CT or Non-Gated Scoring as Reference				
Kim et al (2025)[49,]	ClariCT.AI (ClariPi)	Retrospective N=851	Adults (SNUH subset (n=652): mean age 60.8 years, 79.4% male; Stanford-COCA subset (n=425) undergoing non-contrast low-dose non-gated chest CT across multivendor datasets; comparator was manual CAC scoring on the same non-gated CT and, in a secondary analysis, paired ECG-gated CAC CT.	**Vs. Non-Gated-CT (Stanford-COCA)** Accuracy (categorical): 96.0% ICC: 0.994 (95% CI, 0.992 to 0.995) Weighted κ: 0.96 AUROC: 0.98 to 0.99 **Vs. Gated-CT (SNUH)** Accuracy (categorical): 82.8% ICC: 0.968 (95% CI, 0.96 to 0.98) Weighted κ: 0.88 Misclassification: 17.2%; 92.5% lower-risk shift
Hamelink et al (2025)[52,]	ImaLife AI CAC system (Siemens)	Retrospective N=684	Adults (mean age 58.9 ± 4.8 years, 48.8% male) enrolled in the ImaLife cohort undergoing non-ECG-gated low-dose chest CT at a single site (paired ECG-gated cardiac CT was acquired as part of the protocol); comparator was manual Agatston scoring on the same non-gated chest CT.	**Vs. Non-Gated-CT** Accuracy (binary): 92.1% ICC: 0.992 Weighted κ: 0.901 Accuracy (categorical): 91.4% False-negative rate: 8.5% Risk reclassification: 8.6%
McKinney et al (2025)[53,]	ClearRead CT CAC (Riverain Technologies)	Retrospective N=491	Adults (55.4% women; mean age 65.6 ± 10.1 years) undergoing non-contrast non-gated chest CT at 5 hospitals; comparator was consensus radiologist scoring	**Vs. Non-Gated-CT** Accuracy (categorical): 92.3% Weighted κ: 0.959 Spearman r: 0.975 **Vs. Gated-CT** Accuracy (categorical): 79.2% Weighted κ: 0.906 Spearman r: 0.942

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

Study	Device	Design, N	Population, setting, and comparator	Key Outcomes
			on the same non-gated CT and, in a secondary analysis, paired ECG-gated CAC CT.	
Hagopian et al (2025)[54,]	AI-CAC Algorithm (Veterans Administration)	Retrospective N=795 paired test cases N=102 tuning cases N=8052 LDCT screening cases	Veterans undergoing non-contrast non-gated chest CT across 98 VA medical centers (N=795 paired test cases, 102 tuning cases, 8,052 LDCT screening cases); comparator was paired ECG-gated CAC CT and expert manual segmentation on the same non-gated CT.	**Vs. Gated-CT** Weighted κ: 0.72 (95% CI, 0.69 to 0.75) **Vs. Non-Gated-CT** ICC: 0.96 (r: 0.90) Range (CAC < 1; CAC <100, CAC < 400): Accuracy (categorical): 87.3 to 89.4% Sensitivity: 80.2 to 91.9% Specificity: 79.5 to 92.1% PPV: 86.9 to 94.8% NPV: 70.5 to 87.7% 10-year all-cause mortality: 60.2% for CAC >400 vs. 25.4% for CAC 0 Hazard ratio for mortality: 3.49 Hazard ratio for composite outcome: 3.00
Kerndt et al (2023)[51,]	HealthCCSng (Nano-X AI)	Retrospective N=527	Adults aged ≥30 years undergoing non-contrast non-gated chest CT at a single center in West Michigan (536 consecutive scans, 527 analyzed after exclusions); comparator was single-cardiologist overread of the same non-gated CT, with semiquantitative Agatston-equivalent categories (normal-mild <100, moderate 100-399, severe ≥400).	**Vs. Non-Gated-CT** Accuracy (categorical): 88.76% Accuracy (moderate CAC) 83.49% Accuracy (severe CAC): 92.62 (p=.022)

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

Study	Device	Design, N	Population, setting, and comparator	Key Outcomes
FDA [56],	HealthCCSng (K210085)	Retrospective N=447	Adults aged 30-93 years (mean 62.6 ± 14.4; 57.7% male) undergoing non-contrast non-gated chest CT at 2 sites; comparator was expert-adjudicated ground-truth CAC category on the same non-gated CT.	**Vs. Non-Gated-CT** Accuracy (categorical): 92.5% (89.7% to 95.5%) *Prespecified success threshold: ≥85%*
FDA [57],	Imbio CAC Software (K230112)	Retrospective N=500	Adults (mean age 64.3 ± 10.0 years) undergoing chest CT across a multicenter dataset (mixed gated and non-gated CT); comparator was expert-adjudicated ground-truth Agatston scoring.	**Vs. Non-Gated-CT** Cohen's κ: 0.907 (0.895 to 0.920) *Prespecified success threshold: κ > 0.859*
FDA [58],	iCAC Device (K230223)	Retrospective N=762	Adults aged ≥30 years undergoing paired non-contrast non-gated chest CT and ECG-gated coronary CT at 9 geographically diverse sites; comparator was expert-adjudicated ground-truth 4-category CAC detection derived from the paired gated CT.	**Vs. Non-Gated-CT** Accuracy (categorical): 79.7% *Prespecified success threshold: ≥73% overall alignment* PPV: 68.1 to 90.1% across CAC score groups *Prespecified success threshold: PPV ≥65% for each of 4 score groups*
FDA [55],	Aview Device (K233211)	Retrospective N=150 non-gated chest CT cases; N=150 gated CT cases used in performance testing;	Adults aged >40 years undergoing non-contrast non-gated chest CT on GE scanners (N=150 non-gated cases, 150 gated cases, 280 multi-institution MI-	**Vs. Non-Gated-CT** ICC (total Agatston scoring): 0.896 (95% CI 0.857 to 0.925) Correlation coefficient: over 90%

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

Study	Device	Design, N	Population, setting, and comparator	Key Outcomes
		N=280 multi-institution datasets in MI functionality testing	functionality cases); comparator was expert-adjudicated ground-truth Agatston scoring and predicate-device concordance; no clinical study was required, and substantial equivalence was supported by nonclinical testing.	
Clinical Utility Studies of AI-based Incidental CAC Detection				
Sandhu et al (2023)[60,]	iCAC Device (BunkerHill) (K230223)*	RCT N=194 (NOTIFY-1)	Statin-naïve adults without known ASCVD with radiologist-confirmed incidental CAC on a prior (2014-2019) non-contrast non-gated chest CT in the Stanford Healthcare System; randomized 1:1 to clinician-and-patient notification versus usual care.	**AI CAC Notification Vs. No Notification** Statin prescription at 6 mos: +44.3% (p<.001) CAD testing: +12.8% (p=.008)
Bouladian et al (2025)[61,]	iCAC Device (BunkerHill) (K230223)*	RCT N=163 (NOTIFY-EXTEND)	Notified patients from NOTIFY-1 with radiologist-confirmed incidental CAC on a prior non-gated chest CT in the Stanford Healthcare System (86 early notification, 77 delayed notification after completion of NOTIFY-1); comparator was each patient's own baseline.	**AI CAC Notification Vs. Baseline levels** Statin prescribed within 6 mos: 46% Statin prescribed within 12 mos: 53% Statin prescribed or documented statin discussion within 12 mos: 72% LDL cholesterol, MD from BL to 12 mos: -25.0 mg/dL (p<.001) Triglycerides, MD from BL to 12 mos: -14.9 mg/dL (p=.003)

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

Study	Device	Design, N	Population, setting, and comparator	Key Outcomes
Dudum et al (2026)[62,]	iCAC Device (BunkerHill) (K230223)*	RCT N=202 (NOTIFY-PICTURE)	Lipid-lowering-naïve adults with AI-detected incidental CAC on a near-real-time non-gated chest CT in the Stanford Healthcare System; randomized 1:1 to clinician-and-patient notification versus usual care.	**AI CAC Notification Vs. No Notification** Statin prescription at 6 mos: +34% (95% CI, 23% to 46%; p<.001)

*NOTIFY-1, NOTIFY-EXTEND, and NOTIFY-PICTURE were conducted within a single health system using a BunkerHill-linked AI CAC detection platform. These studies are included as clinical utility evidence for the BunkerHill program/device lineage, although the publications do not necessarily establish that the exact same commercial algorithm version later cleared by FDA was used in each study.
AI: artificial intelligence; ASCVD: atherosclerotic cardiovascular disease; AU: Agatston units; AUROC: area under the receiver operating characteristic curve; BL: baseline; CAC: coronary artery calcium; CAD: coronary artery disease; CI: confidence interval; CT: computed tomography; ECG: electrocardiogram; FDA: U.S. Food and Drug Administration; GE: General Electric; ICC: intraclass correlation coefficient; LDCT: low-dose computed tomography; LDL: low-density lipoprotein; MD: mean difference; mos: months; N: number (sample size); NPV: negative predictive value; NR: not reported; PPV: positive predictive value; RCT: randomized controlled trial; SNUH: Seoul National University Hospital; VA: Veterans Affairs; κ: kappa.

Clinically Useful
A test is clinically useful if the use of the results informs management decisions that improve the net health outcome of care. The net health outcome can be improved if patients receive correct therapy, more effective therapy, or avoid unnecessary therapy or testing.

Direct Evidence
Direct evidence of clinical utility is provided by studies that have compared health outcomes for patients managed with and without the test. Because these are intervention studies, the preferred evidence would be from RCTs.

RANDOMIZED CONTROLLED TRIALS

Incidental CAC Detection on Non-contrast, Non-ECG-Gated Chest CT
Three studies from the NOTIFY program, all conducted within the Stanford Healthcare System using the same deep-learning algorithm (later cleared as BunkerHill CAC, K240369), have evaluated whether notifying clinicians and patients about AI-detected incidental CAC on non-gated chest CT increases initiation of preventive therapy (See Table 5). Across the 2 randomized comparisons, 6-month statin prescription was consistently higher in notified patients than in those receiving usual care, with absolute differences of 44.3% (51.2% vs 6.9%; p<.001) and 34.0% (44.0% vs 9.8%; 95% CI, 23% to 46%; p<.001), respectively.[62,60,] NOTIFY-1 found that CAD testing was also more frequent with notification (15.1% vs 2.3%; p=.008); in NOTIFY-PICTURE, the prescribing effect was concentrated in patients without baseline ASCVD (47% vs 6%) and did not increase overall healthcare utilization; and in NOTIFY-EXTEND, statin

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

prescription or documented statin discussion rose to 72% by 12 months, with mean LDL cholesterol declining by 25.0 mg/dL (115.6 to 90.6 mg/dL; p<.001) and mean triglycerides by 14.9 mg/dL (106.2 to 91.3 mg/dL; p=.003) from baseline.

Chain of Evidence
Indirect evidence on clinical utility rests on clinical validity. If the evidence is insufficient to demonstrate test performance, no inferences can be made about clinical utility.

Section Summary: AI-Based CAC Detection on ECG-Gated and Non-ECG-Gated Chest CT
Multiple observational studies and several randomized trials have shown that CAC assessment, either on dedicated ECG-gated calcium-scoring CT or, opportunistically, on previously acquired non-contrast, non-ECG-gated chest CT, can identify subclinical atherosclerosis and generally demonstrates good agreement with manual expert scoring. Studies of AI-based approaches have reported high technical performance in many datasets, with categorical accuracies, intraclass correlation coefficients, and weighted kappa coefficients approaching radiologist-level agreement on gated CT and strong but reference-dependent performance on non-gated CT; however, accuracy has varied by acquisition protocol, reference standard, and algorithm, and clinically meaningful misclassification has been reported in some non-gated cohorts. Limited evidence suggests that notification of AI-detected incidental CAC on non-gated chest CT may increase statin prescribing and support preventive management, with pooled estimates indicating substantially higher statin initiation among notified patients compared with usual care. However, the available interventional studies have generally been single-center, short-term, and focused on intermediate process outcomes rather than myocardial infarction, stroke, cardiovascular mortality, or all-cause mortality. All currently U.S. Food and Drug Administration (FDA)-cleared AI CAC algorithms are indicated as adjunctive tools intended to support, not replace, physician review, and the incremental value of AI-assisted interpretation over manual review alone has not been well established. As a result, while the evidence supports the technical feasibility of AI-based CAC assessment on both gated and non-gated chest CT, it remains insufficient to determine that use of this approach improves the net health outcome relative to established manual interpretation.

SUPPLEMENTAL INFORMATION
The purpose of the following information is to provide reference material. Inclusion does not imply endorsement or alignment with the evidence review conclusions.

Practice Guidelines and Position Statements
Guidelines or position statements will be considered for inclusion in 'Supplemental Information' if they were issued by, or jointly by, a US professional society, an international society with US representation, or National Institute for Health and Care Excellence (NICE). Priority will be given to guidelines that are informed by a systematic review, include strength of evidence ratings, and include a description of management of conflict of interest.

American Heart Association
The American Heart Association (2025) published a scientific statement on opportunistic detection of CAC on non-cardiac chest CT.[63,] The statement noted that reporting incidental CAC on previously acquired non-ECG-gated chest CT "can enhance atherosclerotic cardiovascular

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

disease risk stratification without additional radiation exposure, cost, or burden to the patient" and that "systematic approaches are needed to ensure appropriate reporting, interpretation, and action, while avoiding unnecessary downstream testing." The statement also noted that the Society of Cardiothoracic Computed Tomography and the Society of Thoracic Radiology provide a Class I recommendation that physicians provide at least a qualitative interpretation of CAC from noncardiac chest CT. This publication was an American Heart Association scientific statement and did not provide its own class of recommendation or level of evidence for opportunistic CAC detection.

American Heart Association/American College of Cardiology

The American College of Cardiology and American Heart Association (2019) Guideline on the Primary Prevention of Cardiovascular Disease is in line with the blood cholesterol guideline stating that adults (40 to 75 years of age) who are being evaluated for cardiovascular disease prevention should initially undergo 10-year atherosclerotic cardiovascular disease (ASCVD) risk estimation with a clinician-patient risk discussion before starting pharmacological therapy.[64,] The guideline also notes that assessing for other risk-enhancing factors can help guide decision making "about preventive interventions in select individuals, as can CAC scanning." The guideline specifically states the following recommendation regarding assessment of cardiovascular risk and CAC:

- In adults at intermediate risk (≥7.5% to <20% 10-year ASCVD risk) or selected adults at borderline risk (5% to <7.5% 10-year ASCVD risk), if risk-based decisions for preventive interventions remain uncertain, it is reasonable to measure a CAC score to guide clinician-patient risk discussion [Class (Strength) of Recommendation: IIa; Level (Quality) of Evidence: B-NR]. A IIa class of recommendation is of moderate strength based on moderate quality nonrandomized studies.

The American Heart Association, American College of Cardiology (2021) Guideline on Evaluation and Diagnosis of Chest Pain includes a recommendation for CAC as first-line testing in patients with stable chest pain with no known coronary artery disease and low likelihood of obstruction.[65,] The guidelines recommend the addition of CAC may also be useful for intermediate-high risk patients with stable chest pain and no known coronary artery disease undergoing stress testing.

The American College of Cardiology, the American Heart Association, and 9 other organizations (2026) issued an updated guideline on the management of dyslipidemia.[66,] The guideline recommends selective use of a noncontrast CAC scan for men aged 40 and older and women aged 45 and older with borderline or intermediate 10-year ASCVD risk when the result will help with the decision to prescribe a statin. The guideline states that any amount of CAC supports an LDL-C goal of less than 100 mg/dL, with lower LDL-C targets for higher amounts of calcium, and an LDL-C goal of less than 70 mg/dL for individuals with subclinical atherosclerosis.

The American College of Cardiology and American Heart Association (2026) Guideline on the Management of Dyslipidemia assigns specific classes of recommendation and levels of evidence for coronary artery calcium (CAC) scoring, including the selective use of CAC for risk reclassification and CAC-based treatment goals.

For Selective Imaging of Subclinical Atherosclerosis in Men ≥40 or Women ≥45 years of age, the guideline provides the following recommendations:

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

CAC Testing to Guide Initiation of LLT

- Class 1 (Strong), Level of Evidence B-R: In adults at intermediate risk and select adults at borderline risk with no prior atherosclerotic cardiovascular disease (ASCVD), if the decision regarding lipid-lowering therapy remains uncertain, a CAC score should be used for further risk stratification and to guide the decision to withhold, postpone, or initiate therapy.
- Class 2a (Moderate), Level of Evidence B-NR: In adults at intermediate risk or select adults at borderline risk who undergo CAC testing, if the CAC score is 0 Agatston units (AU) and there is preference to avoid lipid-lowering therapy and focus on lifestyle management, and no higher-risk conditions are present (familial hypercholesterolemia [FH], severe hypercholesterolemia >190 mg/dL, diabetes and age >40 years, current cigarette smoking, strong family history of premature ASCVD), it is reasonable to defer therapy and reassess with repeat CAC testing in 3 to 7 years

CAC of 0, Deferral and Reassessment

- Class 1, Level of Evidence B-NR: In adults at intermediate risk and select adults at borderline risk, if the CAC score is >0 AU, it is recommended to initiate lipid-lowering therapy, particularly if the CAC score is ≥100 AU or ≥75th standardized percentile.

CAC Testing to Guide Intensity of LLT

- Class 2a, Level of Evidence B-NR: In adults at intermediate or high risk with no prior ASCVD, if there is uncertainty about the intensity of lipid-lowering therapy, a CAC score can be useful to refine treatment goals and decide whether to intensify therapy.

Incidental CAC on Noncardiac CT (Including AI-Based Detection)

- Class 1, Level of Evidence B-NR: In adults with no prior ASCVD, if incidental CAC is identified on noncardiac computed tomography (CT) scans (eg, by visual estimation or a validated artificial-intelligence-based algorithm), the presence of coronary atherosclerosis should be considered during decision-making about initiation or intensification of LLT to reduce ASCVD risk.

The guideline emphasizes that CAC scoring is incorporated within the "CPR" framework (Calculate risk, Personalize risk, Reclassify with CAC, and Reassess treatment) as a tool for selective use when clinical decision-making remains uncertain after initial risk calculation and personalization. The guideline notes that CAC testing enhances cardiovascular risk assessment and can identify individuals without CAC who are less likely to benefit from statin therapy, compared with those with CAC, who are more likely to benefit, with risk reclassification strongest among intermediate-risk adults.

Special Report - American Heart Association/American College of Cardiology

The American Heart Association and the American College of Cardiology (2019) issued a special report on the use of risk assessment tools to guide decision-making in the primary prevention of ASCVD.[67,] This report includes an algorithm of clinical approaches to incorporate CAC measurement in risk assessment for borderline- and intermediate-risk patients:

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

"For borderline-risk (10-year risk 5% to <7.5%) and intermediate-risk (7.5% to <20%) patients who are undecided regarding statin therapy, or when there is clinical uncertainty regarding the net benefit, consider the value of additional testing with measurement of CAC. If CAC is measured, interpret results as follows:

a. CAC score of 0 indicates that a borderline- or intermediate-risk individual is reclassified to a 10-y event rate lower than predicted, and below the threshold for benefit from a statin. Consider avoiding or postponing statin therapy unless there is a strong family history of premature ASCVD, history of diabetes mellitus, or heavy cigarette smoking. Consider repeat CAC measurement in 5 years if patient remains at borderline or intermediate risk.

b. CAC score 1 to 99 and <75th percentile for age/sex/race/ethnicity indicates that there is subclinical atherosclerosis present. This may be sufficient information to consider initiating statin therapy, especially in younger individuals, but does not indicate substantial reclassification of the 10-y risk estimate. Consider patient preferences and, if statin decision is postponed, consider repeat CAC scoring in 5 years.

c. CAC score 100 or >75th percentile for age/sex/race/ethnicity indicates that the individual is reclassified to a higher event rate than predicted, that is above the threshold for statin benefit. Statin therapy is more likely to provide benefit for such patients."

European Respiratory Society/European Society of Thoracic Surgeons/European Society for Radiotherapy and Oncology et al

The 2023 European Respiratory Society / European Society of Thoracic Surgeons / European Society for Radiotherapy and Oncology / European Society of Radiology / European Society of Thoracic Imaging / European Federation of Organizations for Medical Physics issued a statement on management of incidental findings from low-dose CT lung cancer screening, identifying CAC as an important incidental finding in the screening setting.[68,] The statement notes that "CAC is a common finding on CT in lung cancer screening" and that "CAC confers an adverse prognosis, in particular for cardiovascular events and mortality." The authors state that "CAC may be scored in a variety of ways, but simple visual scoring is able to stratify risk of adverse outcome," and they note that major lung cancer screening trials have shown "strong associations between severity of CAC and worse outcomes." The statement further indicates that "guidelines recommend reporting of CAC and considering referral and primary preventive measures," and that current management documents agree "on the importance of noting and reporting the presence and severity of CAC on (low dose) chest CT, at least using a simple visual scoring (none, mild, moderate, severe)." The panel also noted that primary prevention decisions may be guided by an overall cardiovascular risk assessment, without requiring formal quantification of CAC.

National Institute for Health and Care Excellence

For patients with "stable chest pain who cannot be excluded by clinical assessment alone," the National Institute for Health and Care Excellence recommended CT using 64-slice imaging.[69,]

National Comprehensive Cancer Network

The NCCN Lung Cancer Screening Guidelines note that "Reporting the presence of CAC detected on LDCT is a useful marker of atherosclerosis and future cardiovascular risk." [70,] The guideline further indicates that CAC may be reported using either a visual scale (none, mild, moderate,

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

severe) or a quantitative score such as the Agatston score, and recommends additional clinical evaluation when CAC is severe. The guideline further indicates that additional clinical evaluation is recommended when CAC is severe. In a large analysis of the ACR Lung Cancer Screening Registry, moderate or severe CAC was the most common potentially clinically significant incidental finding, present in 11.6% of examinations.

U.S. Preventive Services Task Force Recommendations

The U.S. Preventive Services Task Force (2018, update in progress) updated its recommendations on the use of nontraditional or novel risk factors in assessing coronary heart disease risk in asymptomatic adults with no known cardiovascular disease.[59,71,] Calcium score was 1 of 3 nontraditional risk factors considered. Reviewers concluded the current evidence was insufficient to assess the balance of benefits and harms of adding any of the nontraditional risk factors studied to traditional risk assessment in asymptomatic adults with no known cardiovascular disease.

Ongoing and Unpublished Clinical Trials

Some ongoing trials that might influence this review are listed in Table 4.

Table 6. Summary of Key Trials

NCT No.	Trial Name	Planned Enrollment	Completion Date
Ongoing			
NCT05700877	Screening and Intervention for Subclinical Coronary Artery Disease in Patients With Type 2 Diabetes: THE STENO INTEN-CT STUDY	7300	Mar 2029
NCT03972774	Assessment of Patients With Suspected Coronary Artery Disease by Coronary Calcium First Strategy Versus Usual Care Approach	2500	Nov 2029
NCT04075162	Community Benefit of No-charge Calcium Score Screening Program	77,000	Dec 2032
NCT03439267	Effectiveness of a Proactive Cardiovascular Primary Prevention Strategy, With or Without the Use of Coronary Calcium Screening, in Preventing Future Major Adverse Cardiac Events	5765	May 2027
NCT05267990	Impact of a Coronary Artery Calcium-guided Primary Prevention of Major Coronary Heart Disease for Asymptomatic Coronary Artery Disease in Diabetes: a Prospective Cohort Study	2000	Dec 2028

NCT: national clinical trial.

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

CODING

The following codes for treatment and procedures applicable to this policy are included below for informational purposes. This may not be a comprehensive list of procedure codes applicable to this policy.

Inclusion or exclusion of a procedure, diagnosis or device code(s) does not constitute or imply member coverage or provider reimbursement. Please refer to the member's contract benefits in effect at the time of service to determine coverage or non-coverage of these services as it applies to an individual member.

The code(s) listed below are medically necessary ONLY if the procedure is performed according to the "Policy" section of this document.

CPT/HCPCS	
75571	Computed tomography, heart, without contrast material, with quantitative evaluation of coronary calcium
75572	Computed tomography, heart, with contrast material, for evaluation of cardiac structure and morphology (including 3D image postprocessing, assessment of cardiac function, and evaluation of venous structures, if performed)
75573	Computed tomography, heart, with contrast material, for evaluation of cardiac structure and morphology in the setting of congenital heart disease (including 3D image postprocessing, assessment of LV cardiac function, RV structure and function, and evaluation of vascular structures, if performed)
75574	Computed tomographic angiography, heart, coronary arteries and bypass grafts (when present), with contrast material, including 3D image postprocessing (including evaluation of cardiac structure and morphology, assessment of cardiac function, and evaluation of venous structures, if performed)
75577	Quantification and characterization of coronary atherosclerotic plaque to assess severity of coronary disease, derived from augmentative software analysis of the data set from a coronary computed tomographic angiography, with interpretation and report by a physician or other qualified health care professional
S8092	Electron beam computed tomography (also known as ultrafast CT, cine CT)

REVISIONS	
11-14-2008	▪ Changed title from Electron Beam Computerized Tomography (EBCT) Screening for Cardiovascular Calcium Deposits also known as Ultrafast CT, CT angiography and CINE CT to Computed Tomography to Detect Coronary Artery Calcification. ▪ Added a rationale section to the policy. ▪ In Coding section, added CPT codes: 0144T, 0147T, 0149T.
09-18-2009	In Header: ▪ Added reference policies: Contrast-Enhanced CTA for Coronary Artery Evaluation, CTA and MRA of the Chest (excluding the heart), CTA and MRA of the Head, Neck, Abdomen, Pelvis, Lower Extremity, and Upper Extremity, and Cardiac Computed Tomography (CT).
	Updated Rationale and References sections
01-01-2010	In Coding Section: ▪ Added CPT Code: 75571 ▪ Removed CPT Codes: 0144T, 0147T, 0149T

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

REVISIONS	
09-20-2011	Description section updated.
	Rationale section added.
	References section updated.
11-06-2012	Rationale section added.
	In Coding Section: Added a Diagnosis section and the following wording, "Experimental/Investigational for all diagnoses related to this policy." As no reference to diagnosis was previously reflected in the policy.
	References section updated.
11-24-2015	Description section updated
	In Policy section: ▪ Added "(CAC)" the abbreviation for coronary artery calcification. No change in policy intent is made by this addition.
	Rationale section updated
	References updated
01-18-2017	Description section updated
	Rationale section updated
	In Coding section: ▪ Coding notations updated
	References updated
11-15-2017	Description section updated
	Rationale section updated
	References updated
01-17-2020	Description section updated
	Rationale section updated
	References updated
04-16-2021	Description section updated
	Rationale section updated
	In Coding section: • Added codes 0623T, 0624T, 0625T, 0626T that became effective 1/1/21
	References updated
11-5-2021	In Related Policy section Deleted *CTA and MRA of the Head, Neck, Abdomen, Pelvis, and Extremities- archived 052421*
	Updated Description section
	Updated Rationale section
	Updated Reference section
04-25-2022	In Code Section: ▪ Updated nomenclature for 75573
12-09-2022	Updated Description Section
	Updated Rationale Section
	Updated Coding Section ▪ Removed: 0623T, 0624T, 0625T, 0626T ▪ Added: 75572, 75574, 0710T, 0711T, 0712T, 0713T
	Updated References Section
10-24-2023	Updated Description Section
	Updated Rationale Section
	Updated Coding Section ▪ Removed ICD-10 Diagnosis Box

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

<table>
<tr><th colspan="2">REVISIONS</th></tr>
<tr><td></td><td>Updated References Section</td></tr>
<tr><td>11-20-2024</td><td>Updated Description Section</td></tr>
<tr><td></td><td>Updated Rationale Section</td></tr>
<tr><td></td><td>Updated References Section</td></tr>
<tr><td>10-28-2025</td><td>Updated Description Section</td></tr>
<tr><td></td><td>Updated Rationale Section</td></tr>
<tr><td></td><td>Updated Reference Section</td></tr>
<tr><td>09-16-2026</td><td>Updated Description Section</td></tr>
<tr><td></td><td>Updated Policy Section
▪ Added Statement A:Coronary artery calcium scoring may be considered medically necessary as an adjunct to standard cardiovascular risk assessment in asymptomatic adults without known coronary artery disease or clinical atherosclerotic cardiovascular disease in individuals at least 40 years of age and borderline to intermediate 10-year atherosclerotic cardiovascular disease risk and who are currently not on lipid-lowering therapy (see Policy Guidelines).
▪ Added Statement B: Artificial intelligence-based automated detection, quantification, or scoring of coronary artery calcium on chest computed tomography, whether performed on dedicated ECG-gated calcium-scoring CT in asymptomatic patients or on non-contrast, non-ECG-gated chest CT performed for other clinical indications as an adjunct to standard cardiovascular risk assessment, is considered experimental / investigational.
▪ Added to Statement C: "for all other indications"</td></tr>
<tr><td></td><td>Updated Policy Guidelines Section
▪ Added:
A. When quantitative assessment is performed as part of the same encounter as contrast-enhanced cardiac computed tomography (codes 75572-75573) or coronary computed tomography angiography (code 75574), it is included in the service.
B. The primary fast computed tomography methods for this determination are electron beam computed tomography and multidetector computed tomography.)
C. The table below summarizes the risk category thresholds and key input variables for the PREVENT-ASCVD (Predicting Risk of cardiovascular disease EVENTs - Atherosclerotic Cardiovascular Disease) risk calculator from the American Heart Association and the American College of Cardiology, which informs primary prevention decision-making and the selection of patients who may benefit from further risk refinement.
Table 1. PREVENT-ASCVD Risk Categories and Required Variables
<table>
<tr><td>Risk Category</td><td>PREVENT-ASCVD</td></tr>
<tr><td>Low-risk</td><td>3%</td></tr>
<tr><td>Borderline-risk</td><td>3% to 5%</td></tr>
<tr><td>Intermediate-risk</td><td>5% to 10%</td></tr>
<tr><td>High-risk</td><td>≥10%</td></tr>
</table>
ASCVD: Atherosclerotic Cardiovascular Disease
Variables assessed during PREVENT-ASCVD include: age, sex, systolic blood pressure, total cholesterol, HDL cholesterol, body mass index, estimated glomerular filtration rate, diabetes status, current smoking, antihypertensive therapy, and statin or other lipid-lowering therapy use. Optional variables include hemoglobin A1c, urine albumin-to-creatinine ratio, and Social Deprivation Index. Outcomes predicted include ASCVD, heart failure, and total cardiovascular disease over 10-year and 30-year time horizons.</td></tr>
<tr><td></td><td>Updated Rationale Section</td></tr>
</table>

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

REVISIONS	
	Updated Coding Section ▪ Add code 75577 ▪ Remove codes 0710T, 0711T, 0712T, 0713T
	Updated Reference Section

REFERENCES

1. Blue Cross and Blue Shield Association Technology Evaluation Center (TEC). Diagnosis and screening for coronary artery disease with electron beam computed tomography. TEC Assessments. 1998;Volume 13:Tab 27.
2. Haq A, Veerati T, Walser-Kuntz E, et al. Coronary artery calcium and the risk of cardiovascular events and mortality in younger adults: a meta-analysis. Eur J Prev Cardiol. Jul 23 2024; 31(9): 1061-1069. PMID 38113426
3. Bell KJL, White S, Hassan O, et al. Evaluation of the Incremental Value of a Coronary Artery Calcium Score Beyond Traditional Cardiovascular Risk Assessment: A Systematic Review and Meta-analysis. JAMA Intern Med. Jun 01 2022; 182(6): 634-642. PMID 35467692
4. Han D, Hartaigh BÓ, Gransar H, et al. Incremental prognostic value of coronary computed tomography angiography over coronary calcium scoring for major adverse cardiac events in elderly asymptomatic individuals. Eur Heart J Cardiovasc Imaging. Jun 01 2018; 19(6): 675-683. PMID 28977374
5. Multi-Ethnic Study of Atherosclerosis (MESA). About MESA. https://www.mesa-nhlbi.org/aboutMESA.aspx. Accessed March 9, 2026.
6. Cainzos-Achirica M, Miedema MD, McEvoy JW, et al. Coronary Artery Calcium for Personalized Allocation of Aspirin in Primary Prevention of Cardiovascular Disease in 2019: The MESA Study (Multi-Ethnic Study of Atherosclerosis). Circulation. May 12 2020; 141(19): 1541-1553. PMID 32233663
7. Gepner AD, Young R, Delaney JA, et al. Comparison of Carotid Plaque Score and Coronary Artery Calcium Score for Predicting Cardiovascular Disease Events: The Multi-Ethnic Study of Atherosclerosis. J Am Heart Assoc. Feb 14 2017; 6(2). PMID 28196817
8. Budoff MJ, Young R, Burke G, et al. Ten-year association of coronary artery calcium with atherosclerotic cardiovascular disease (ASCVD) events: the multi-ethnic study of atherosclerosis (MESA). Eur Heart J. Jul 01 2018; 39(25): 2401-2408. PMID 29688297
9. Polonsky TS, McClelland RL, Jorgensen NW, et al. Coronary artery calcium score and risk classification for coronary heart disease prediction. JAMA. Apr 28 2010; 303(16): 1610-6. PMID 20424251
10. Davis JR, Razavi AC, Ellberg CC, et al. Utility of coronary artery calcium scoring in low-risk patients: The Multi-Ethnic Study of Atherosclerosis (MESA). Am J Prev Cardiol. Dec 2025; 24: 101329. PMID 41159137
11. Ferencik M, Pencina KM, Liu T, et al. Coronary Artery Calcium Distribution Is an Independent Predictor of Incident Major Coronary Heart Disease Events: Results From the Framingham Heart Study. Circ Cardiovasc Imaging. Oct 2017; 10(10). PMID 28956774
12. Nakanishi R, Li D, Blaha MJ, et al. All-cause mortality by age and gender based on coronary artery calcium scores. Eur Heart J Cardiovasc Imaging. Nov 2016; 17(11): 1305-1314. PMID 26705490

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

13. Elias-Smale SE, Wieberdink RG, Odink AE, et al. Burden of atherosclerosis improves the prediction of coronary heart disease but not cerebrovascular events: the Rotterdam Study. Eur Heart J. Aug 2011; 32(16): 2050-8. PMID 21606087
14. Erbel R, Möhlenkamp S, Moebus S, et al. Coronary risk stratification, discrimination, and reclassification improvement based on quantification of subclinical coronary atherosclerosis: the Heinz Nixdorf Recall study. J Am Coll Cardiol. Oct 19 2010; 56(17): 1397-406. PMID 20946997
15. Lehmann N, Erbel R, Mahabadi AA, et al. Value of Progression of Coronary Artery Calcification for Risk Prediction of Coronary and Cardiovascular Events: Result of the HNR Study (Heinz Nixdorf Recall). Circulation. Feb 13 2018; 137(7): 665-679. PMID 29142010
16. Won KB, Chang HJ, Niinuma H, et al. Evaluation of the predictive value of coronary artery calcium score for obstructive coronary artery disease in asymptomatic Korean patients with type 2 diabetes mellitus. Coron Artery Dis. Mar 2015; 26(2): 150-6. PMID 25356815
17. Kelkar AA, Schultz WM, Khosa F, et al. Long-Term Prognosis After Coronary Artery Calcium Scoring Among Low-Intermediate Risk Women and Men. Circ Cardiovasc Imaging. Apr 2016; 9(4): e003742. PMID 27072301
18. Chang SM, Nabi F, Xu J, et al. Value of CACS compared with ETT and myocardial perfusion imaging for predicting long-term cardiac outcome in asymptomatic and symptomatic patients at low risk for coronary disease: clinical implications in a multimodality imaging world. JACC Cardiovasc Imaging. Feb 2015; 8(2): 134-44. PMID 25677886
19. Johnson JE, Gulanick M, Penckofer S, et al. Does knowledge of coronary artery calcium affect cardiovascular risk perception, likelihood of taking action, and health-promoting behavior change?. J Cardiovasc Nurs. 2015; 30(1): 15-25. PMID 24434820
20. Budoff MJ, Möhlenkamp S, McClelland R, et al. A comparison of outcomes with coronary artery calcium scanning in unselected populations: the Multi-Ethnic Study of Atherosclerosis (MESA) and Heinz Nixdorf RECALL study (HNR). J Cardiovasc Comput Tomogr. 2013; 7(3): 182-91. PMID 23849491
21. Silverman MG, Blaha MJ, Krumholz HM, et al. Impact of coronary artery calcium on coronary heart disease events in individuals at the extremes of traditional risk factor burden: the Multi-Ethnic Study of Atherosclerosis. Eur Heart J. Sep 01 2014; 35(33): 2232-41. PMID 24366919
22. Gibson AO, Blaha MJ, Arnan MK, et al. Coronary artery calcium and incident cerebrovascular events in an asymptomatic cohort. The MESA Study. JACC Cardiovasc Imaging. Nov 2014; 7(11): 1108-15. PMID 25459592
23. Jacobs PC, Gondrie MJ, van der Graaf Y, et al. Coronary artery calcium can predict all-cause mortality and cardiovascular events on low-dose CT screening for lung cancer. AJR Am J Roentgenol. Mar 2012; 198(3): 505-11. PMID 22357989
24. Jacobs PC, Gondrie MJ, Mali WP, et al. Unrequested information from routine diagnostic chest CT predicts future cardiovascular events. Eur Radiol. Aug 2011; 21(8): 1577-85. PMID 21603881
25. Gershon GS, Barr JR, Razavi AC, et al. Coronary artery calcium burden across the pooled cohort equation versus the American Heart Association PREVENT risk calculator. Am J Prev Cardiol. Dec 2025; 24: 101301. PMID 41078705
26. Scheu V, Alwan L, Gräni C, et al. Coronary atherosclerosis screening in asymptomatic adults using coronary artery calcium for cardiovascular prevention: a systematic review of

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

randomised controlled trials and prospective cohorts. BMJ Open. Jul 05 2025; 15(7): e101472. PMID 40617605
27. Gupta A, Lau E, Varshney R, et al. The Identification of Calcified Coronary Plaque Is Associated With Initiation and Continuation of Pharmacological and Lifestyle Preventive Therapies: A Systematic Review and Meta-Analysis. JACC Cardiovasc Imaging. Aug 2017; 10(8): 833-842. PMID 28797402
28. Mamudu HM, Paul TK, Veeranki SP, et al. The effects of coronary artery calcium screening on behavioral modification, risk perception, and medication adherence among asymptomatic adults: a systematic review. Atherosclerosis. Oct 2014; 236(2): 338-50. PMID 25128971
29. Whelton SP, Nasir K, Blaha MJ, et al. Coronary artery calcium and primary prevention risk assessment: what is the evidence? An updated meta-analysis on patient and physician behavior. Circ Cardiovasc Qual Outcomes. Jul 01 2012; 5(4): 601-7. PMID 22811506
30. Nerlekar N, Vasanthakumar SA, Whitmore K, et al. Effects of Combining Coronary Calcium Score With Treatment on Plaque Progression in Familial Coronary Artery Disease: A Randomized Clinical Trial. JAMA. Apr 22 2025; 333(16): 1403-1412. PMID 40042839
31. Whitmore K, Zhou Z, Ryan JDM, et al. Influence of repeated plaque visualization on cardiovascular risk reduction after 3 years: a randomized controlled trial. Eur J Prev Cardiol. May 12 2025; 32(7): 596-605. PMID 38243798
32. Rozanski A, Gransar H, Shaw LJ, et al. Impact of coronary artery calcium scanning on coronary risk factors and downstream testing the EISNER (Early Identification of Subclinical Atherosclerosis by Noninvasive Imaging Research) prospective randomized trial. J Am Coll Cardiol. Apr 12 2011; 57(15): 1622-32. PMID 21439754
33. O'Malley PG, Feuerstein IM, Taylor AJ. Impact of electron beam tomography, with or without case management, on motivation, behavioral change, and cardiovascular risk profile: a randomized controlled trial. JAMA. May 07 2003; 289(17): 2215-23. PMID 12734132
34. Pavlović J, Bos D, Ikram MK, et al. Guideline-Directed Application of Coronary Artery Calcium Scores for Primary Prevention of Atherosclerotic Cardiovascular Disease. JACC Cardiovasc Imaging. Apr 2025; 18(4): 465-475. PMID 40047745
35. Chaikriangkrai K, Palamaner Subash Shantha G, Jhun HY, et al. Prognostic Value of Coronary Artery Calcium Score in Acute Chest Pain Patients Without Known Coronary Artery Disease: Systematic Review and Meta-analysis. Ann Emerg Med. Dec 2016; 68(6): 659-670. PMID 27765299
36. Sarwar A, Shaw LJ, Shapiro MD, et al. Diagnostic and prognostic value of absence of coronary artery calcification. JACC Cardiovasc Imaging. Jun 2009; 2(6): 675-88. PMID 19520336
37. Lo-Kioeng-Shioe MS, Rijlaarsdam-Hermsen D, van Domburg RT, et al. Prognostic value of coronary artery calcium score in symptomatic individuals: A meta-analysis of 34,000 subjects. Int J Cardiol. Jan 15 2020; 299: 56-62. PMID 31229262
38. Lubbers M, Dedic A, Coenen A, et al. Calcium imaging and selective computed tomography angiography in comparison to functional testing for suspected coronary artery disease: the multicentre, randomized CRESCENT trial. Eur Heart J. Apr 14 2016; 37(15): 1232-43. PMID 26746631
39. Yuan NL, Zheng JN, Ma YN, et al. The role of chest pain symptoms in predicting coronary artery disease severity and MACE events in patients with zero CAC: a study from a large

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

CCTA cohort. Int J Cardiovasc Imaging. Jul 15 2025; 41:1555-1565. doi:10.1007/s10554-025-03454-2
40. Pursnani A, Chou ET, Zakroysky P, et al. Use of coronary artery calcium scanning beyond coronary computed tomographic angiography in the emergency department evaluation for acute chest pain: the ROMICAT II trial. Circ Cardiovasc Imaging. Mar 2015; 8(3). PMID 25710925
41. Chaikriangkrai K, Velankar P, Schutt R, et al. Additive prognostic value of coronary artery calcium score over coronary computed tomographic angiography stenosis assessment in symptomatic patients without known coronary artery disease. Am J Cardiol. Mar 15 2015; 115(6): 738-44. PMID 25604930
42. Hulten E, Bittencourt MS, Ghoshhajra B, et al. Incremental prognostic value of coronary artery calcium score versus CT angiography among symptomatic patients without known coronary artery disease. Atherosclerosis. Mar 2014; 233(1): 190-5. PMID 24529143
43. Dharampal AS, Rossi A, Dedic A, et al. Restriction of the referral of patients with stable angina for CT coronary angiography by clinical evaluation and calcium score: impact on clinical decision making. Eur Radiol. Oct 2013; 23(10): 2676-86. PMID 23774892
44. Yoon YE, Chang SA, Choi SI, et al. The absence of coronary artery calcification does not rule out the presence of significant coronary artery disease in Asian patients with acute chest pain. Int J Cardiovasc Imaging. Feb 2012; 28(2): 389-98. PMID 21347595
45. Gottlieb I, Miller JM, Arbab-Zadeh A, et al. The absence of coronary calcification does not exclude obstructive coronary artery disease or the need for revascularization in patients referred for conventional coronary angiography. J Am Coll Cardiol. Feb 16 2010; 55(7): 627-34. PMID 20170786
46. Yerramasu A, Lahiri A, Venuraju S, et al. Diagnostic role of coronary calcium scoring in the rapid access chest pain clinic: prospective evaluation of NICE guidance. Eur Heart J Cardiovasc Imaging. Aug 2014; 15(8): 886-92. PMID 24513880
47. ten Kate GJ, Caliskan K, Dedic A, et al. Computed tomography coronary imaging as a gatekeeper for invasive coronary angiography in patients with newly diagnosed heart failure of unknown aetiology. Eur J Heart Fail. Sep 2013; 15(9): 1028-34. PMID 23759285
48. Chamberlin JH, Abrol S, Munford J, et al. Artificial intelligence-derived coronary artery calcium scoring saves time and achieves close to radiologist-level accuracy accuracy on routine ECG-gated CT. Int J Cardiovasc Imaging. Feb 2025; 41(2): 269-278. PMID 39680296
49. Kim S, Park EA, Ahn C, et al. Performance of fully automated deep-learning-based coronary artery calcium scoring in ECG-gated calcium CT and non-gated low-dose chest CT. Eur Radiol. Nov 2025; 35(11): 7084-7095. PMID 40348882
50. U.S. Food and Drug Administration. 510(k) Premarket Notification: CAC Algorithm (K240369). Applicant: Bunkerhill, Inc. Silver Spring, MD: U.S. Food and Drug Administration; 2024. Accessed March 20, 2026. https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpmn/pmn.cfm?ID=K240369
51. Kerndt CC, Chopra R, Weber P, et al. Using Artificial Intelligence to Semi-Quantitate Coronary Calcium as an 'Incidentaloma' on Non-Gated, Non-Contrast CT Scans, A Single-Center Descriptive Study in West Michigan. Spartan Med Res J. 2023; 8(1): 89132. PMID 38084339
52. Hamelink II, Nie ZZ, Severijn TEJT, et al. Validation of artificial intelligence software for automatic calcium scoring in cardiac and chest computed tomography. Eur J Radiol. Oct 2025; 191: 112323. PMID 40690836

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

53. McKinney SE, Mercaldo SF, Chin JK, et al. Evaluation of an artificial intelligence model for opportunistic Agatston scoring on non-gated chest computed tomography. Sci Rep. Nov 11 2025; 15(1): 39535. PMID 41219315
54. Hagopian R, Strebel T, Bernatz S, et al. AI Opportunistic Coronary Calcium Screening at Veterans Affairs Hospitals. NEJM AI. May 16 2025; 2(6). PMID 40746702
55. U.S. Food and Drug Administration. 510(k) Premarket Notification: AVIEW CAC (K233211). Applicant: Coreline Soft Co., Ltd. Silver Spring, MD: U.S. Food and Drug Administration; 2024. Accessed March 19, 2026. https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpmn/pmn.cfm?ID=K233211
56. U.S. Food and Drug Administration. 510(k) Premarket Notification: HealthCCSng (K210085). Applicant: Zebra Medical Vision Ltd. Decision date: September 15, 2021. Silver Spring, MD: U.S. Food and Drug Administration; 2021. Accessed March16, 2026. https://www.accessdata.fda.gov/cdrh_docs/pdf21/K210085.pdf
57. U.S. Food and Drug Administration. 510(k) Premarket Notification: Imbio CAC Software (K230112). Applicant: Imbio, Inc. Silver Spring, MD: U.S. Food and Drug Administration; 2023. March 16, 2026. https://www.accessdata.fda.gov/cdrh_docs/pdf23/K230112.pdf
58. U.S. Food and Drug Administration. 510(k) Premarket Notification: iCAC Device (K230223). Applicant: Bunkerhill, Inc. Decision date: April 25, 2023. Silver Spring, MD: U.S. Food and Drug Administration; 2023. Accessed March 17, 2026. https://www.accessdata.fda.gov/cdrh_docs/pdf23/K230223.pdf
59. U.S. Preventive Services Task Force. Cardiovascular Disease: Risk Assessment With Nontraditional Risk Factors. 2018; https://www.uspreventiveservicestaskforce.org/Page/Document/UpdateSummaryFinal/cardiovascular-disease-screening-using-nontraditional-risk-assessment?ds=1&s=risk%20assessment. Accessed March 9, 2026.
60. Sandhu AT, Rodriguez F, Ngo S, et al. Incidental Coronary Artery Calcium: Opportunistic Screening of Previous Nongated Chest Computed Tomography Scans to Improve Statin Rates (NOTIFY-1 Project). Circulation. Feb 28 2023; 147(9): 703-714. PMID 36342823
61. Bouladian SG, Ngo S, Mastrodicasa D, et al. Statin Therapy Persistence Following Opportunistic Screening for Coronary Artery Calcium on Nongated Chest CTs: NOTIFY-EXTEND. JACC Cardiovasc Imaging. Jul 2025; 18(7): 841-843. PMID 40372339
62. Dudum R, Jain SS, Mastrodicasa D, et al. Effects of Real-Time Notification of AI-Detected Incidental Coronary Artery Calcium on Statin Prescription: The NOTIFY-PICTURE Trial. Circulation. Jan 20 2026; 153(3): 210-212. PMID 41213130
63. Foraker R, Sperling L, Bratzke L, et al. Opportunistic Detection of Coronary Artery Calcium on Noncardiac Chest Computed Tomography: An Emerging Tool for Cardiovascular Disease Prevention: A Scientific Statement From the American Heart Association. Circulation. Nov 11 2025; 152(19): e391-e401. PMID 41099128
64. Arnett DK, Blumenthal RS, Albert MA, et al. 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Circulation. Sep 10 2019; 140(11): e596-e646. PMID 30879355
65. Gulati M, Levy PD, Mukherjee D, et al. 2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR Guideline for the Evaluation and Diagnosis of Chest Pain: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Circulation. Nov 30 2021; 144(22): e368-e454. PMID 34709879

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information

66. Blumenthal RS, Morris PB, Gaudino M, et al. 2026 ACC/AHA/AACVPR/ABC/ACPM/ADA/AGS/APhA/ASPC/NLA/PCNA Guideline on the Management of Dyslipidemia: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. J Am Coll Cardiol. May 19 2026; 87(19): 2624-2757. PMID 41824590
67. Lloyd-Jones DM, Braun LT, Ndumele CE, et al. Use of Risk Assessment Tools to Guide Decision-Making in the Primary Prevention of Atherosclerotic Cardiovascular Disease: A Special Report From the American Heart Association and American College of Cardiology. Circulation. Jun 18 2019; 139(25): e1162-e1177. PMID 30586766
68. O'Dowd EL, Tietzova I, Bartlett E, et al. ERS/ESTS/ESTRO/ESR/ESTI/EFOMP statement on management of incidental findings from low dose CT screening for lung cancer. Eur Respir J. Oct 2023; 62(4). PMID 37802631
69. National Institute for Health and Care Excellence. Recent-onset chest pain of suspected cardiac origin: assessment and diagnosis [CG95]. 2016; https://www.nice.org.uk/guidance/cg95/chapter/Recommendations. Accessed March 9, 2026.
70. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology: Lung Cancer Screening. Version 1.2026. September 16, 2025. Accessed April 12, 2026. Available at: https://www.nccn.org/guidelines/guidelines-detail?category=2&id=1441.
71. Lin JS, Evans CV, Johnson E, et al. Nontraditional Risk Factors in Cardiovascular Disease Risk Assessment: Updated Evidence Report and Systematic Review for the US Preventive Services Task Force. JAMA. Jul 17 2018; 320(3): 281-297. PMID 29998301

Current Procedural Terminology © American Medical Association. All Rights Reserved.
Blue Cross and Blue Shield Kansas is an independent licensee of the Blue Cross Blue Shield Association

Contains Public Information