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Impact of coronary artery calcification detection on cardiovascular care trajectories in patients undergoing lung cancer screening: a systematic review

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Abstract

Importance: Coronary artery calcification (CAC) is commonly identified on low-dose computed tomography (LDCT) performed for lung cancer screening (LCS) and is associated with increased cardiovascular (CV) risk. Although guidelines increasingly recommend reporting and incorporating CAC into CV risk stratification, whether its detection translates into downstream CV preventive care remains unclear.

Objective: To systematically evaluate reporting practices and downstream clinical management following CAC detection during LDCT LCS.

Evidence Review: We searched MEDLINE, Embase, Cochrane Central Register of Controlled Trials, and Web of Science Core Collection from inception to September 23, 2026, and searched grey literature through September 20, 2026. We included original studies of adults undergoing LDCT within established or pilot LCS programs if they evaluated downstream management following CAC detection or reporting. Reviewers independently extracted data in duplicate on CAC assessment, reporting, communication, preventive pharmacotherapy, referrals, investigations, and clinical outcomes. We assessed study quality using the Newcastle-Ottawa Scale (NOS). Owing to clinical and methodological heterogeneity, we synthesized findings narratively.

Findings: We included twelve studies published between 2020 and 2026 from the United States, Canada, United Kingdom, Australia, and France. Visual assessment was the predominant method for CAC identification, although reporting and communication practices varied substantially. Statin initiation (N=7) ranged from 3% to 38%, cardiology referral (N=3) from 6.9% to 44%, and cardiac stress testing (N=2) from 12.5% to 21.6%. Structured CV follow-up pathways were evaluated in five studies. Three studies found greater a CAC severity or a more explicit reporting was associated with increased statin initiation. Study quality was moderate overall, with NOS scores ranging from four to eight of nine; common limitations included absence of comparator groups and limited adjustment for confounding.

Conclusions and Relevance: CAC detected during LCS was followed by variable downstream CV preventive care, and reporting alone does not consistently translate into clinical action. Greater CAC severity and more explicit reporting were associated with increased clinical action in some studies, but reporting alone did not consistently translate into preventive management. Comparative studies are needed to determine whether structured communication and follow-up pathways improve cardiovascular care and clinical outcomes.

KEY POINTS

Question: Does coronary artery calcification (CAC) detected during low-dose CT lung cancer screening translate into downstream cardiovascular preventive care?

Findings: In this systematic review of 12 studies, downstream management varied substantially across screening programs. Statin initiation ranged from 3% to 38%, cardiology referral from 6.9% to 44%, and cardiac stress testing from 12.5% to 21.6%. Greater CAC severity and more explicit reporting were associated with greater clinical action in some studies.

Meaning: CAC reporting alone may be insufficient; structured communication and defined cardiovascular follow-up pathways may help translate detection into preventive care.

INTRODUCTION

Lung cancer screening (LCS) utilizing low dose computed tomography (LDCT) reduces lung cancer mortality, but also commonly identifies clinically non-lung findings relevant to competing causes of death.[1–4] Cardiovascular (CV) disease (CVD) is a major cause of mortality among LCS participants, who frequently have CV risk factors related to age and tobacco exposure.[5,6] Coronary artery calcification (CAC), a marker of subclinical atherosclerotic disease, is identified on approximately half of non-gated thoracic CT examinations and is associated with increased CV mortality[7–10].

CAC identified on non-gated LDCT can be visually graded and used to inform CV risk assessment[11–13]. Moreover, CAC burden assessed on non-gated imaging demonstrates strong agreement with gated measurements and provides similar prognostic information for subsequent CV risk[14]. Major radiological and LCS guidelines recommend reporting CAC,[15–19] and the 2026 American College of Cardiology/American Heart Association dyslipidemia guideline recommends incorporating incidentally detected CAC on noncardiac CT into decisions regarding lipid-lowering therapy (see **Supplement eText pg. 2–5** and **eTable 1**).[20] Thus, incidental CAC increasingly represents an actionable CV risk marker rather than solely a radiological finding.

However, whether CAC detection during LCS translates into CV preventive care remains unclear.[21] Reporting practices and management pathways vary across programs, and downstream actions may include cardiovascular risk assessment, preventive pharmacotherapy, additional testing, or specialist referral (see **Supplement eText pg. 6–8** and **eTable 2**). This systematic review evaluated how CAC detected during LDCT LCS is assessed, reported, communicated, and translated into downstream cardiovascular management.

METHODS

We conducted this systematic review according to PRISMA guidelines.[22] We prospectively registered the review protocol and search strategy, developed with an academic librarian, on PROSPERO (CRD420261292410). We developed the search strategy and eligibility criteria using the following population, exposure, and outcome (PEO) framework consisting of: (P) adults (≥ 18 years) undergoing LDCT for lung cancer screening; (E) clinically detected and/or reported incidental CAC on non-contrast, non-gated LDCT performed for lung cancer screening; and (O) downstream changes in care trajectories following incidental CAC identification (see **Supplement eMethods** and **eTable 3**).

We searched MEDLINE, Embase, Cochrane Central Register of Controlled Trials, and Web of Science through September 23, 2026, supplemented by grey literature searches through September 20, 2026, reference-list screening, and forward citation searching. We included English-language original studies conducted within established or pilot LCS programs that evaluated downstream CV management following CAC detection. We excluded studies reporting only CAC prevalence, imaging performance, radiologic agreement, or prognostic associations without downstream management.

We performed screening, full-text review, data extraction, and quality assessment independently in duplicate, with disagreements resolved by consensus. We extracted outcomes including CAC assessment and reporting, communication, preventive pharmacotherapy, referrals, CV investigations, and management according to CAC severity. We assessed study quality using the Newcastle-Ottawa Scale (NOS) with prespecified criteria. Because of substantial clinical and methodological heterogeneity, we synthesized findings narratively without meta-analysis.

RESULTS

Study characteristics

We included 12 studies after screening and deduplication (**eFigure 1**). Excluded studies from full-text review are available in **eTable 4**. Studies were published between 2020 and 2026 and were conducted in the United States (N=7),[23–29] Canada (N=1),[30] United Kingdom (N=2),[31,32] Australia (N=1),[33] and France (N=1)[24,31] (**Table 1**). Sample sizes ranged from 159 to 8,987 participants.[24–29] Nine studies employed retrospective cohort designs,[23–30,32] while three used prospective noncomparative cohort designs.[31,33,34] Nine studies were conducted in established clinical LCS programs,[24–30,32] and four were pilot, trial-based, or outreach screening initiatives.[23,31,33]

Study populations were generally representative of contemporary LCS cohorts, with mean participant ages ranging from 58.8 to 67 years. Eight studies included a majority male participants (range across all studies: 37.6-94.0%) (**Table 1**).[24,26–28,30,31,33,34] One study did not report participant age ranges or sex/gender proportions for the CAC cohort.[32] All studies included current and/or former smokers, with eligibility criteria following the United States Preventive Services Task Force (USPSTF) (N=5),[25–29] Prostate, Lung, Colorectal, Ovarian Cancer Screening Trial 2012 criteria (PLCOm2012) (N=3),[30,31,33] National Comprehensive Cancer Network (NCCN) (N=2),[25,34] or regional screening program eligibility criteria (N=2).[30,32] In one study, participants underwent LCS following physician referral (N=1),[28] but specific screening eligibility criteria was not reported. Pre-existing cardiovascular disease was variably defined and reported across studies. Among mixed cohorts reporting baseline disease prevalence, 15.8% to 31.4% had pre-existing ischemic heart disease (IHD), coronary artery disease (CAD), or atherosclerotic CVD (ASCVD).[24,25,27–29,32,34] Three studies restricted their cardiovascular analyses to participants without known CVD or CAD,[23,30,33] and one study restricted its CAC referral subgroup to participants without known is IHD.[31] Among studies reporting baseline statin use, prevalence ranged from 27% to 73% where ported.[25,34] One additional study reported 75.7% of baseline population was receiving lipid-lowering therapy use,[32] while another study specifically evaluated statin-eligible populations.[28]

CAC assessment and reporting practices

Methods for CAC assessment varied across studies (**Table 2**). Visual assessment of CAC on LDCT scans was the predominant approach (N=10).[23–25,27,29–31,33,34] Among studies using visual assessment, two applied visual ordinal scoring across all severities (e.g., none, mild, moderate, severe),[30,33] and three reported only moderate/severe CAC categories only.[23,32,34] Two studies additionally quantified CAC retrospectively with Agatston scoring methods following initial visual assessment.[23,35]

CAC reporting approaches differed in reporting thresholds, report format, and downstream communication (**Table 2**). Four studies implemented structured radiology reporting templates or Lung-RADS based reporting,[26,27,33,35] whereas three studies selectively reported CAC when meeting study-specific thresholds for clinical significance.[23,26,34] Four studies incorporated protocolized notification pathways involving primary care providers or patients.[25,27,31,32] The remaining three studies documented CAC within routine radiology reports without a standardized reporting template or management pathway.[24,28,30]

Downstream CV management following CAC detection

Eleven studies evaluated medication-related outcomes,[23–25,27–31,33,34] four reported cardiology referral or consultation,[23,26,33,34] three reported cardiac stress testing,[24–26] and four evaluated primary care CV risk assessment or other follow-up pathways.[8,23,31,32] Two studies reported subsequent clinical CV events (**Table 3**).[25,32] Lipid-lowering therapy was the most frequently reported preventive intervention. Statin initiation rates ranged from 3% to 38%, although comparisons were limited by differences in baseline statin use, eligibility criteria, study populations, and follow-up duration.[31,34] In one study, 77 of 220 participants (35.0%) not receiving lipid-lowering therapy at baseline, initiated treatment within two years, including 30 (13.6%) within six months.[32] Two studies reported statin intensification,[25,27] while one study evaluated aspirin initiation.[23]

Nine studies reported additional CV evaluation following CAC detection. Reported interventions included primary care CV risk assessment (N=2)[31], cardiology referral (N=4),[27,33,34,36] cardiac stress testing (N=3),[24,25,27] and additional CV investigations (N=1).[34] Cardiology referral rates ranged from 6.9% to 44% and cardiac stress testing was reported in 12.5% to 21.6% of participants.[25,26,31] Four studies implemented structured follow-up pathways involving standardized communication with primary care providers or recommendations for CV assessment.[26] In one study reporting completion of recommended follow-up, found 57% of recommended cardiovascular evaluations were completed.[25,26,31] Two studies reported cardiac events, with one study reporting hospitalization in 5.7% of participants, including acute coronary syndrome (3.9%), percutaneous coronary intervention (1.9%), and coronary artery bypass

grafting (0.4%) during the follow-up period.[26] Another study reported 42 (4.7%) deaths at two years among 904 participants with moderate or severe CAC, of which 14 (33.3% of deaths; 1.5% of the cohort) were CV related.[32]

Across three studies, greater CAC burden was associated with greater downstream CV management, including initiation of preventive pharmacotherapy (N=3),[23,27,33] CV referral (N=4),[23,28,30,33] cardiac stress testing (N=3),[24–26] and other cardiovascular examinations or interventions (N=1).[34] Three retrospective studies reported greater odds of lipid-lowering therapy or statin initiation with CAC presence, reporting, or increasing CAC severity.[24,28,30] Reported associations included an OR of 1.53 (95% CI 1.22–1.92) for reported CAC, an OR of 1.46 (95% CI 1.20-1.77) per increasing CAC severity, and adjusted-ORs of 2.60 (95% CI 1.12-6.02) for CAC presence and 2.21 (95% CI 1.35-3.60) for increasing CAC severity.[24,28,30] In another study, CAC reporting was associated with higher odds of statin initiation (OR 1.9), increasing to OR 4.4 where CAC was designated as significant using the Lung-RADS S-modifier.[24]

Study quality assessment

Study quality varied across included studies, with NOS scores ranging from 4 to 8 out of 9 and a median score of 6 (**Table 4**). According to the JAMA evidence-rating scheme, 9 studies were rated level 3 and 3 were rated level 4, reflecting the predominance of retrospective cohorts and absence of prospective comparative studies. Most studies met NOS criteria for representativeness of the study population (N=11), CAC ascertainment (N=10), and outcome assessment (N=10). The most common methodological limitations were the absence of a comparator group (N=7) and limited adjustment for potential confounding (N=7). Seven studies met the prespecified criterion for adequate follow-up.

Table 1. Study characteristics. CVD = cardiovascular disease.

Population characteristics										
Author/year	**Study design**	**Setting**	**Country**	**N**	**Age**	**Sex distribution (% male)**	**Smoking status**	**Lung cancer eligibility criteria**	**Pre-existing CVD**	**Baselin statin u**
Barlett 2021[31]	Prospective multicenter cohort	LCS pilot program in urban West London	United Kingdom	159	60–75 years (range)	69.20%	100% current or former smokers	PLCOm2012 ≥1.51% and/or LLPv2 ≥2.0%	CAC referral subgroup excluded known IHD[a]	0% (lipi lowerin therapy exclude
Berzingi 2024[23]	Retrospective single-center cohort	Mobile LCS outreach program in rural Appalachia	United States	526	61 years (range 47–100)	37.60%	67.9% current smokers; mean 36 pack-years	Physician referral	No known CVD[b]	43.90%
Bonney 2025[33]	Prospective single-center cohort	Single Australian site within an international LCS trial	Australia	226	65 ± 6.1 years	69%	53% current, 47% former smokers	PLCOm2012 risk ≥1.51% or ≥30 pack-years	No known CAD[c]	32% (interm risk); 49 (high ris
Burzić 2026[32]	Retrospective single-center cohort	Established organized NHS LCS program in Nottingham	United Kingdom	904	Not reported (screening eligibility 55-74 years)	Not reported for CAC cohort	Current or former smokers; number not reported	NHS England LCS Program criteria (specific criteria NR)	15.8% IHD	75.7% li lowerin therapy statin-specific NR
Gendarme 2024[34]	Prospective single-center cohort	Pilot multidisease screening program (CVD, LCS, COPD) in urban France	France	302	58.8 years (IQR 54.3–64.0)	61%	77% current, 23% former smokers; mean 43.4 pack-years	NCCN v1.2014	19% CVD	27%
Hammer 2023[24]	Retrospective single-center cohort	Established multicenter LCS program (2 Academic, 2 community hospitals)	United States	8,987	64 years (range 55–81)	53%	42% current, 42% former smokers	Age >55 years undergoing LCS (specific criteria NR)	24% ASCVD/CVD	55.8% (ASCVD subset)
Majeed 2022[25]	Retrospective single-center cohort	Established LCS program at academic medical center in urban Pennsylvania	United States	259	66.7 ± 5.7 years	46.30%	46.7% current, 53.3% former smokers; mean 55.6 ± 24.1 pack-years	USPSTF 2021, CMS, or NCCN Group II criteria	25.5% ASCVD[d]	73% (moder CAC)
Melzer 2024[26]	Retrospective single-center cohort	Established LCS program at Veterans' Affairs center in urban Minneapolis	United States	901	65 ± 5.6 years	94%	62.1% current smokers; former smoking proportion NR	USPSTF 2013	NR	NR
Mendoza 2020[27]	Retrospective single-center cohort	Established LCS program at an academic medical center in urban Massachusetts	United States	756	67 ± 6.4 years	61.60%	60.6% current, 39.4% former smokers	USPSTF 2013	31.2% CAD	72.90%
Mengesha 2025[30]	Retrospective single-center cohort	Ontario High Risk Lung Cancer Screening Pilot Program	Canada	1,486	66 ± 5.5 years	51.50%	68.4% current, 31.6% former smokers	Age 55–74 years; current or former smokers ≥20 pack-	No known CAD[e]	NR

Population characteristics										
Author/year	**Study design**	**Setting**	**Country**	**N**	**Age**	**Sex distribution (% male)**	**Smoking status**	**Lung cancer eligibility criteria**	**Pre-existing CVD**	**Baselin statin u**
								years; PLCOm2012 ≥2% (6-year risk)		
Tailor 2021[28]	Retrospective multicenter cohort	Established LCS program at three academic medical centers in North Carolina	United States	5,495	65 years (IQR 60–70)	52.70%	44.1% current, 53.5% former smokers	USPSTF 2013	31.4% ASCVD[f]	39.5% (statin-eligible particip
Velangi 2021[29]	Retrospective single-center cohort	Established LCS program in the University of Minnesota Health system	United States	614	64.1 ± 6.0 years	50%	55.2% current, 44.8% former smokers	USPSTF 2013	26.5% CAD	58%

Abbreviations: *ASCVD = atherosclerotic cardiovascular disease; CAD = coronary artery disease; CAC = coronary artery calcium; CVD = cardiovascular disease; CMS = Centers for Medicare & Medicaid Services; IHD = ischemic heart disease; IQR = interquartile range; LCS = lung cancer screening; LLPv2 = Liverpool Lung Project risk model version 2; NCCN = National Comprehensive Cancer Network; NR = not reported; PLCOm2012 = Prostate, Lung, Colorectal and Ovarian Cancer Screening Trial 2012 lung cancer risk prediction model; USPSTF = United States Preventive Services Task Force*

[a] Participants referred to moderate-to-severe CAC were required to have no known IHD and not already receiving lipid-lowering therapy.

[b] Study included participants with no known history of CVD.

[c] Downstream-management cohort included participants with CAC and no prior CAD.

[d] ASCVD defined as coronary heart disease, cerebrovascular accident/transient ischemic attack, or peripheral vascular disease.

[e] Prior myocardial infarction and/or coronary revascularization were exclusion criteria.

[f] ASCVD defined as myocardial infarction, angina, stroke, transient ischemic attack, and/or peripheral arterial disease documented before baseline LCS.

Table 2. Calcium artery calcification reporting practices.

			CAC reporting		
Author/year	**CT screening setting**	**CAC assessment method/severity classification**	**CAC reporting approach**	**Clinician/patient notification**	**Automated pathway**
Barlett 2021[31]	Trial-based screening	Visual assessment (method not explicitly reported)	Protocolized referral pathway with GP letter	GP notified by letter	Yes
Berzingi 2024[23]	Mobile outreach	Visual assessment with retrospective Agatston scoring	Radiologists instructed to report moderate/severe CAC; reporting inconsistent	Inconsistently reported	No
Bonney 2025[33]	Trial-based screening	Visual ordinal scoring	Structured radiology report using standardized template; report sent to GP	GP notified; 28% of participants recalled notification	NR
Burzić 2026[32]	Clinical screening program	Visual qualitative grading (moderate/severe CAC only)	CAC graded in radiology report; standardized letter sent directly to participant and GP	Patient and GP notified by standardized letter	No
Gendarme 2024[34]	Trial-based screening	Visual scoring	Moderate/severe CAC prompted patient letter and cardiology referral	Patient notified by mail	No
Hammer 2023[24]	Clinical screening program	Visual scoring	No standardized reporting; S-modifier used in 28% of CAC reports	NR	No
Majeed 2022[25]	Clinical screening program	Visual scoring	CAC reviewed with patients; standardized letter sent to primary care provider; no standardized management recommendations	Patient and PCP notified	Yes
Melzer 2024[26]	Clinical screening program	NR	Lung-RADS reporting with S-modifier; significant CAC reported in body, impression, or S-modifier	Significant CAC in impression: 36%; non-significant CAC: 13%	No
Mendoza 2020[27]	Clinical screening program	Visual scoring	Structured radiology report with automated reporting prompts and provider emails	Automated notification to referring provider	Yes
Mengesha 2025[30]	Trial-based screening	Visual ordinal scoring	CAC documented in radiology report	CAC reported in 62.9% of positive scans	No
Tailor 2021[28]	Clinical screening program	NR	CAC documented in radiology report	Yes	No
Velangi 2021[29]	Clinical screening program	Visual assessment with retrospective Agatston scoring	Structured radiology report using ACR Lung-RADS template	70.7% of CAC-positive scans reported; impression: 19.1%, narrative: 78.4%, both: 17.7%	No

Abbreviations: *ACR = American College of Radiology; CAC = coronary artery calcium; GP = general practitioner; LDCT = low-dose computed tomography; Lung-RADS = Lung Imaging Reporting and Data System; NR = not reported; PCP = primary care provider; SRM = screening review meeting*

Table 3. Downstream management and clinical outcomes after coronary artery calcium (CAC) detection in lung cancer screening studies. CV = cardiovascular.

Author/year	Follow-up	Medication management	Primary care/CV risk assessment	Cardiology referral	CV investigations	Clinical CV outcomes
Barlett 2021[31]	3–9 mo	38.1% of all CAC referrals and 58.5% completing QRISK initiated statin therapy	73.2% with moderate/severe CAC completed recommended primary care QRISK assessment	NR	NR	NR
Berzingi 2024[23]	3 mo medications; 6 mo testing	6.3% initiated statins; higher CAC score associated with initiation (P<0.01). Aspirin initiated in 3.3% overall and 9.3% with CAC >400.	NR	7.5% with CAC >100 referred to primary care or cardiology	NR / report if available	NR
Bonney 2025[33]	18 mo-4 y	9% with moderate/severe CAC and no baseline lipid-lowering therapy-initiated treatment	NR	15% referred to cardiology	NR	NR
Burzić 2026[32]	2 y	Among 220 not on lipid-lowering therapy at baseline, 30 (13.6%) initiated within 6 mo and a further 47 (21.4%) by 2 y; 77/220 (35.0%) total initiated by 2 y	Standardized letter advised CV risk assessment; 200/220 (90.9%) untreated participants had estimated QRISK3 ≥10%	NR	NR	42/904 (4.7%) all-cause mortality at 2 y; 14/42 deaths (33.3%) were cardiovascular (14/904, 1.5%)
Gendarme 2024[34]	5 y	3% initiated statin therapy	NR	44% referred; 10% attended cardiology consultation	23/299 (7.7%) underwent CV examinations or interventions	NR
Hammer 2023[24]	90 d statins; 6 mo stress testing	8.3% initiated statins; reporting OR 1.9; S-modifier OR 4.4	NR	NR	Increased stress testing among participants with reported CAC; no increase in overall cohort	NR
Majeed 2022[25]	12 mo	21% initiated statins; 9.5% underwent intensification	NR	NR	21.6% underwent cardiac stress testing	5.7% cardiac hospitalization; 3.9% ACS; 1.9% PCI; 0.4% CABG
Melzer 2024[26]	Mean 14.4 mo	Medication change in 15.1%	NR	6.9% cardiology referral	12.5% stress testing among participants without known CAD	NR
Mendoza 2020[27]	6 mo	NR	32% with significant CAC received follow-up recommendations; 57% of recommendations completed	NR	NR	NR
Mengesha 2025[30]	2017-2025	Reported CAC associated with lipid-lowering therapy (OR 1.53); severity OR 1.46	NR	NR	NR	NR
Tailor 2021[28]	90 d	8.2% initiated statins; presence aOR 2.60; severity aOR 2.21	NR	NR	NR	NR
Velangi 2021[29]	Pre/post guideline	No significant change in statin prescribing	NR	NR	NR	NR

Abbreviations: *ACS = acute coronary syndrome; aOR = adjusted odds ratio; CAC = coronary artery calcium; CABG = coronary artery bypass grafting; CI = confidence interval; LDCT = low-dose computed tomography; NR = not reported; OR = odds ratio; PCI = percutaneous coronary intervention; QRISK = QRISK cardiovascular risk assessment algorithm; SCCT = Society of Cardiovascular Computed Tomography; STR = Society of Thoracic Radiology.*

Table 4. Newcastle-Ottawa scale for cohort studies quality assessment and JAMA evidence rating

Author/year	Representativeness	Comparator	CAC ascertainment	Outcome absent at baseline	Confounding adjustment[A]	Outcome assessment[B]	Follow-up duration[C]	Follow-up completeness[D]	Total NOS score
Barlett 2021[31]	★	0	★	★	0	★	0	★	5
Berzingi 2024[23]	★	★	★	★	0	★	0	0	5
Bonney 2025[33]	★	0	★	★	0	★	★	★	6
Burzić 2026[32]	★	0	★	★	0	★	★	★	6
Gendarme 2024[34]	★	0	★	★	★	0	★	0	4
Hammer 2023[24]	★	★	★	★	0	★	★	0	6
Majeed 2022[25]	★	0	★	★	0	★	0	★	5
Melzer 2024[26]	★	0	★	★	0	★	★	★	6
Mendoza 2020[27]	★	★	0	★	★★	★	★	★	8
Mengesha 2025[30]	★	★	0	★	★	★	0	★	6
Tailor 2021[28]	★	★	★	0	★	★	0	★	6
Velangi 2021[29]	0	0	★	★	★	0	★	0	4

[A] Confounding adjustment (comparability) was awarded up to two stars for adjustment for age and/or sex (one star) and additional cardiovascular risk factors (one star).

[B] The outcome of interest was downstream CV management or clinical CV events following coronary artery calcium detection.

[C] Adequate follow-up was defined as ≥1 year for management outcomes.

[D] Follow-up completeness threshold was ≥80% of study participants.

[E] JAMA evidence ratings were assigned according to study design: 1 = properly powered randomized clinical trial or systematic review with meta-analysis; 2 = well-designed controlled trial without randomization or prospective comparative cohort; 3 = case-control or retrospective cohort study; 4 = case series with or without intervention or cross-sectional study; 5 = expert opinion or case report.

★ = criterion met; ★★ = two criteria met for confounding adjustment; 0 = criterion not met

DISCUSSION

In this systematic review of 12 studies, we evaluated the downstream clinical management following CAC identified during LDCT LCS. We found that CAC identification and reporting on LDCT LCS exams was followed by a range of CV preventive care actions, including initiation of lipid-lowering therapy, cardiology referral, and additional CV investigations. However, the uptake of preventive care was heterogenous, and varied considerably between screening programs. Greater CAC severity and more structured approaches to reporting and follow-up were generally associated with greater downstream clinical action. Together, these findings suggest that the clinical impact of CAC detection during LCS depends on how it is communicated and integrated into subsequent care.

Frequent detection of CAC creates an opportunity to refine CV risk without additional imaging or radiation exposure.[24] This is particularly relevant in a population at elevated risk because of older age, smoking exposure, and other shared risk factors for lung cancer and CVD.[6,31,37,38] In the NLST, CVD accounted for at least as many deaths as lung cancer, highlighting the competing CV mortality burden in this population.[4,37] Consequently, LCS represents an important opportunity not only to identify lung cancer, but also to identify individuals who may benefit from CV risk assessment and preventive management.[23] However, our findings suggest that identification and reporting alone do not consistently translate into clinical action, with statin initiation ranging from 3% to 38% across included studies, despite recent 2026 ACC/AHA guidance recommending that CAC identified on noncardiac CT may inform

decisions regarding initiation or intensification of lipid-lowering therapy.[6,20,23,29] Downstream management appeared greater when CAC reporting was paired with more explicit communication and clinical follow-up.[6,24,27] In a UK National Health Service (NHS) LCS cohort, general practitioners received standardized notification for participants with moderate or severe CAC, yet only 35% of those not receiving lipid-lowering therapy at baseline initiated treatment within two years.[32] Standardized reporting may therefore be an important first step, but consistent preventive care may require effective communication with clearly defined responsibility and integration with clinical follow-up pathways.[6,24,27]

Variation in downstream management likely reflected substantial heterogeneity in how programs assessed, reported, communicated, and incorporated CAC into follow-up pathways, as well as how responsibility for subsequent CV care was coordinated across screening programs, primary care, and specialty care.[23,24,27,31] Programs also differed in whether they explicitly communicated CAC findings to patients or primary care clinicians, recommended CV risk assessment or referral, and whether standardized follow-up pathways were available.[6,25,31] More explicit reporting appeared to influence downstream management; in one study, CAC reported without a Lung-RADS S-modifier was associated with 1.8-fold greater odds of statin initiation, increasing to 4.4-fold when CAC was designated as a significant finding with the S-modifier.[24] Even within a protocolized pathway, not all participants progressed through each stage of care: in one LCS program, 63 participants with moderate-to-severe CAC were referred for CV risk assessment, 42 attended primary care, and 24 ultimately initiated statin therapy.[31] Differences in study populations, baseline preventive therapy, follow-up duration, and health-system context also limited direct comparisons. Baseline CVD was also inconsistently defined and reported across studies, with some studies restricting participants without known CVD or CAD, whereas others included substantial proportions with established IHD, CAD, or ASCVD. This distinction is clinically important because incidental CAC may have greater incremental value for primary prevention among individuals without previously recognized ASCVD, compared with those with established disease may already have indications for secondary preventive therapy.

Lower rates of downstream treatment may reflect barriers at multiple stages between CAC detection and treatment. When responsibility for follow-up is distributed across screening programs, primary care, and specialty services without clearly integrated pathways, unclear ownership for follow-up may contribute to clinical inertia and missed opportunities for preventive care.[20] Clinical inertia is well recognized in lipid-lowering therapy more broadly and may arise from clinician-, patient-, and health-system factors.[20,39] However, non-initiation of therapy does not necessarily indicate inappropriate care and may instead reflect baseline CV risk, existing therapy, contraindications, or patient preferences.[20] Because included studies generally did not systematically evaluate factors leading to non-action, it remains unclear whether lower uptake reflects appropriate individualized decision-making, clinician uncertainty regarding incidental CAC, fragmented responsibility for follow-up, competing priorities within LCS pathways, patient factors, or health-system barriers to CV assessment. Furthermore, the available evidence was insufficient to determine whether CAC reporting and subsequent preventive management translated into improved cardiovascular outcomes.[25,32]

Previous research has established the high prevalence and prognostic importance of CAC detected on non-gated thoracic CT, but comparatively less is known about whether CAC identification during LCS translates into changes in CV preventive care. Emerging prospective studies are beginning to address different stages of this implementation pathway. In a recent randomized pilot trial among LCS participants, patient-centered communication of quantified CAC and guideline-based recommendation produced a numerical increase in statin use without increased anxiety or healthcare utilization, although the association was not statistically significant (NCT06055972).[40] Evidence outside LCS more strongly supports active communication for implementation: in NOTIFY-1, systematic notification of clinicians and patients regarding incidental CAC increased statin prescribing at 6 months (51.2% with notification vs. 6.9% with usual care), while NOTIFY-PICTURE similarly found increased statin prescribing at 6 months (44.0% with notification vs. 9.8% with usual care).[41,42] The ongoing AI INFORM multicenter randomized trial is evaluating automated CAC assessment on non-contrast chest CT combined with clinician notification and preventive treatment recommendations (NCT06235112). Collectively, these studies support a shift from passive reporting toward active strategies that connect CAC identification with CV prevention.

Several limitations should be considered. Most included studies were observational, limiting causal inference regarding whether changes in CV management were directly attributable to CAC identification. The most common methodological limitations were the absence of comparator groups and limited adjustment for confounding, restricting the ability to isolate the independent effect of CAC identification or reporting on downstream management. Considerable heterogeneity in CAC assessment and reporting methods, definitions of downstream outcomes, follow-up duration, baseline use of preventive therapies, and clinical pathways, precluded meta-analysis and limited direct comparisons between studies. Differences in screening programs and health systems may also have influenced observed management through variation in referral practices and access to CV care. Baseline ASCVD status was inconsistently reported, and downstream management was rarely stratified by pre-existing disease, limiting assessment of the incremental clinical impact of CAC among participants without previously recognized ASCVD. Studies reporting on CV events or mortality were generally not designed or powered to determine whether CAC reporting or subsequent management altered clinical outcomes. Finally, the evidence base was relatively small and predominantly from North American, United Kingdom, Australia, and France, which may limit generalizability to other LCS programs and health systems. Nonetheless, our review also has several strengths. We comprehensively synthesized a rapidly evolving evidence base with a specific focus on downstream clinical management following CAC identification during LCS. We also examined the full downstream management pathway beyond CAC detection and prognostic significance, including reporting and communication practices, CV risk assessment, preventive pharmacotherapy, referrals, investigations, and structured follow-up across diverse LCS programs and health systems.

Future research should focus on how LCS programs can translate these findings into appropriate preventive CV care. Prospective implementation studies should stratify participants by pre-existing ASCVD status and, where appropriate, compare downstream care among participants with and without CAC to better determine the incremental effect of CAC detection on preventive management. Implementation studies should explicitly evaluate determinants of non-action after CAC detection, while testing standardized approaches to CAC assessment and reporting, clinician and patient notification, CV risk assessment, and clearly defined management pathways.[6,16,43] Relevant outcomes should include preventive therapy initiation, appropriateness of downstream

investigations, patient-oriented CV outcomes, health-system resource use, and cost-effectiveness. Longitudinal studies evaluating CV events and mortality are also needed to determine whether systematic CAC reporting and linked preventive care ultimately improve outcomes in the LCS population. Automated CAC assessment, including emerging artificial intelligence-based approaches, may improve the consistency of detection and quantification, but their clinical value will depend on integration with effective downstream care.[44–46] As LCS programs continue to expand, standardized approaches to clinically significant CAC may provide an opportunity to extend the benefits of screening beyond lung cancer detection and support CVD prevention in this high-risk population.[6]

Conclusion

Although greater CAC severity may prompt more preventive management, reporting practices and downstream care pathways remain heterogeneous across LCS programs. Standardized CAC reporting, integrated CV follow-up pathways, and appropriate treatment algorithms may help translate this common and potentially actionable finding into evidence-based preventive care. Longitudinal evaluation is needed to determine whether systematic CAC reporting and linked preventive care improves CV management and clinical outcomes in LCS populations.

Declarations

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DATA AVAILABILITY STATEMENT

All data in this systematic review are included in this published article and its supplementary data files. Additional review materials, including the prespecified review methods, are available through the PROSPERO registration (CRD420261292410). Further information may be obtained from the corresponding author upon request.

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References

1. de Koning HJ, van der Aalst CM, de Jong PA et al (2020) Reduced Lung-Cancer Mortality with Volume CT Screening in a Randomized Trial. N Engl J Med 382(6):503–513. 10.1056/NEJMoa1911793
2. Pastorino U, Silva M, Sestini S et al (2019) Prolonged lung cancer screening reduced 10-year mortality in the MILD trial: new confirmation of lung cancer screening efficacy. Ann Oncol 30(7):1162–1169. 10.1093/annonc/mdz117
3. Jongebloed H, Gao L, Yong HH et al (2026) The landscape of lung cancer screening globally: a comparison of established programs and estimates of eligibility to participate. Lancet Reg Health – Western Pac 70. 10.1016/j.lanwpc.2026.101862
4. The National Lung Screening Trial Research Team (2011) Reduced Lung-Cancer Mortality with Low-Dose Computed Tomographic Screening. N Engl J Med 365(5):395–409. 10.1056/NEJMoa1102873
5. Malik RF, Sun KJ, Azadi JR et al (2024) Opportunistic Screening for Coronary Artery Disease: An Untapped Population Health Resource. J Am Coll Radiol 21(6):880–889. 10.1016/j.jacr.2024.02.010
6. Henderson LM, Kim RY, Tanner NT et al (2025) Lung Cancer Screening and Incidental Findings: A Research Agenda: An Official American Thoracic Society Research Statement. Am J Respir Crit Care Med 211(3):436–451. 10.1164/rccm.202501-0011ST
7. Mascalchi M, Puliti D, Romei C et al (2021) Moderate-severe coronary calcification predicts long-term cardiovascular death in CT lung cancer screening: The ITALUNG trial. Eur J Radiol 145:110040. 10.1016/j.ejrad.2021.110040
8. Gendarme S, Goussault H, Assié JB, Taleb C, Chouaïd C, Landre T (2021) Impact on All-Cause and Cardiovascular Mortality Rates of Coronary Artery Calcifications Detected during Organized, Low-Dose, Computed-Tomography Screening for Lung Cancer: Systematic Literature Review and Meta-Analysis. Cancers 13(7):1553. 10.3390/cancers13071553
9. Osborne-Grinter M, Ali A, Williams MC (2024) Prevalence and clinical implications of coronary artery calcium scoring on non-gated thoracic computed tomography: a systematic review and meta-analysis. Eur Radiol 34(7):4459–4474. 10.1007/s00330-023-10439-z
10. Al-Antary N, Hirko KA, Cassidy-Bushrow AE et al (2025) Coronary Artery Calcification Identified on Lung Cancer Screening CT Scans. Chest 168(3):719–736. 10.1016/j.chest.2025.03.031

11. Huang YL, Wu FZ, Wang YC et al (2013) Reliable categorisation of visual scoring of coronary artery calcification on low-dose CT for lung cancer screening: validation with the standard Agatston score. Eur Radiol 23(5):1226–1233. 10.1007/s00330-012-2726-5
12. Wu MT, Yang P, Huang YL et al (2008) Coronary Arterial Calcification on Low-Dose Ungated MDCT for Lung Cancer Screening: Concordance Study with Dedicated Cardiac CT. Am J Roentgenol 190(4):923–928. 10.2214/AJR.07.2974
13. Kim YK, Sung YM, Cho SH, Park YN, Choi HY (2014) Reliability analysis of visual ranking of coronary artery calcification on low-dose CT of the thorax for lung cancer screening: comparison with ECG-gated calcium scoring CT. Int J Cardiovasc Imaging 30(2):81–87. 10.1007/s10554-014-0507-8
14. Verghese D, Trujillo R, Abraham D et al (2026) Predictive Value of Coronary Artery Calcium Score From Nongated Chest CT Scans Compared With Gated Scans and Incidence of Cardiovascular Events. Circulation 154(4):302–312. 10.1161/CIRCULATIONAHA.125.078431
15. O'Dowd EL, Tietzova I, Bartlett E et al (2023) ERS/ESTS/ESTRO/ESR/ESTI/EFOMP statement on management of incidental findings from low dose CT screening for lung cancer. Eur Respir J 62(4). 10.1183/13993003.00533-2023
16. Hecht HS, Cronin P, Blaha MJ et al (2017) 2016 SCCT/STR guidelines for coronary artery calcium scoring of noncontrast noncardiac chest CT scans: A report of the Society of Cardiovascular Computed Tomography and Society of Thoracic Radiology. J Cardiovasc Comput Tomogr 11(1):74–84. 10.1016/j.jcct.2016.11.003
17. Munden RF, Carter BW, Chiles C et al (2018) Managing Incidental Findings on Thoracic CT: Mediastinal and Cardiovascular Findings. A White Paper of the ACR Incidental Findings Committee. J Am Coll Radiol 15(8):1087–1096. 10.1016/j.jacr.2018.04.029
18. BC Cancer Lung Screening Strandard and Protocols *BC Cancer*. Published online 2023
19. Williams MC, Abbas A, Tirr E et al (2021) Reporting incidental coronary, aortic valve and cardiac calcification on non-gated thoracic computed tomography, a consensus statement from the BSCI/BSCCT and BSTI. Br J Radiol 94(1117):20200894. 10.1259/bjr.20200894
20. Members WC, Blumenthal RS, Morris PB 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. *Circulation*. 2026;153(17):e1154-e1276. 10.1161/CIR.0000000000001423
21. Henderson LM, Kim RY, Tanner NT et al (2025) Lung Cancer Screening and Incidental Findings: A Research Agenda: An Official American Thoracic Society Research Statement. Am J Respir Crit Care Med 211(3):436–451. 10.1164/rccm.202501-0011ST
22. Page MJ, McKenzie JE, Bossuyt PM et al (2021) The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ Published online March 29:n71. 10.1136/bmj.n71
23. Berzingi S, Piechowski K, Hendricks E et al (2024) Integrating cardiovascular risk assessment into mobile low-dose CT lung screenings in rural Appalachia: A comprehensive analysis of the relationship between lung cancer risk, coronary artery calcium burden, and cardiovascular risk reduction strategies. Am J Prev Cardiol 19:100719. 10.1016/j.ajpc.2024.100719
24. Hammer MM, Byrne SC, Blankstein R (2023) Reporting and Outcomes of Coronary Calcification on Lung Cancer Screening CT. Acad Radiol 30(8):1614–1619. 10.1016/j.acra.2022.11.009
25. Majeed A, Ruane B, Shusted CS et al (2022) Frequency of Statin Prescription Among Individuals with Coronary Artery Calcifications Detected Through Lung Cancer Screening. Am J Med Qual 37(5):388. 10.1097/JMQ.0000000000000053
26. Melzer AC, Atoma B, Fabbrini AE, Campbell M, Clothier BA, Fu SS (2024) Variation in Reporting of Incidental Findings on Initial Lung Cancer Screening and Associations With Clinician Assessment. J Am Coll Radiol 21(1):118–127. 10.1016/j.jacr.2023.03.023
27. Mendoza DP, Kako B, Digumarthy SR, Shepard JAO, Little BP (2020) Impact of Significant Coronary Artery Calcification Reported on Low-Dose Computed Tomography Lung Cancer Screening. J Thorac Imaging 35(2):129. 10.1097/RTI.0000000000000458
28. Tailor TD, Chiles C, Yeboah J et al (2021) Cardiovascular Risk in the Lung Cancer Screening Population: A Multicenter Study Evaluating the Association Between Coronary Artery Calcification and Preventive Statin Prescription. J Am Coll Radiol 18(9):1258–1266. 10.1016/j.jacr.2021.01.015
29. Velangi PS, Kenny B, Hooks M et al (2021) Impact of 2016 SCCT/STR guidelines for coronary artery calcium scoring of noncardiac chest CT scans on lung cancer screening CT reporting. Int J Cardiovasc Imaging 37(9):2777–2784. 10.1007/s10554-021-02241-z
30. Mengesha B, Kasuku KM, Small TD et al (2025) Coronary artery calcium on lung cancer screening-CT: An opportunity to optimize cardiovascular disease risk reduction. IJC Heart Vasculature 61:101826. 10.1016/j.ijcha.2025.101826
31. Bartlett EC, Belsey J, Derbyshire J et al (2021) Implications of incidental findings from lung screening for primary care: data from a UK pilot. NPJ Prim Care Respiratory Med 31:36. 10.1038/s41533-021-00246-8
32. Burzić A, Baldwin DR, McKeever TM, O'Dowd EL (2026) Structured triage of incidental findings in lung cancer screening: Outcomes from a UK programme. Lung Cancer 220:109565. 10.1016/j.lungcan.2026.109565
33. Bonney A, Chua M, McCusker MW et al (2025) Coronary artery calcification detected on low-dose computed tomography in high-risk participants of an Australian lung cancer screening program: A prospective observational study. Respirology 30(1):62–69. 10.1111/resp.14832
34. Gendarme S, Maitre B, Hanash S, Pairon JC, Canoui-Poitrine F, Chouaïd C (2024) Beyond lung cancer screening, an opportunity for early detection of chronic obstructive pulmonary disease and cardiovascular diseases. JNCI Cancer Spectr 8(5):pkae082. 10.1093/jncics/pkae082
35. Velangi PS, Kenny B, Hooks M et al (2021) Impact of 2016 SCCT/STR guidelines for coronary artery calcium scoring of noncardiac chest CT scans on lung cancer screening CT reporting. Int J Cardiovasc Imaging 37(9):2777–2784. 10.1007/s10554-021-02241-z
36. Berzingi S, Piechowski K, Hendricks E et al (2024) Integrating cardiovascular risk assessment into mobile low-dose CT lung screenings in rural Appalachia: A comprehensive analysis of the relationship between lung cancer risk, coronary artery calcium burden, and cardiovascular risk reduction strategies. Am J Prev Cardiol 19:100719. 10.1016/j.ajpc.2024.100719

37. Balata H, Knight SB, Barber P et al (2018) Targeted lung cancer screening selects individuals at high risk of cardiovascular disease. Lung Cancer 124:148–153. 10.1016/j.lungcan.2018.08.006
38. Ruparel M, Quaife SL, Dickson JL et al (2019) Evaluation of cardiovascular risk in a lung cancer screening cohort. Thorax 74(12):1140–1146. 10.1136/thoraxjnl-2018-212812
39. Lewinski AA, Jazowski SA, Goldstein KM, Whitney C, Bosworth HB, Zullig LL (2022) Intensifying approaches to address clinical inertia among cardiovascular disease risk factors: A narrative review. Patient Educ Couns 105(12):3381–3388. 10.1016/j.pec.2022.08.005
40. Lim DM, Naumova A, Triplette M, Agarwal P, Yang E, Ordovas K (2026) 26-a-10183-acc impact of a patient-centered approach for communicating coronary artery calcium on cardiovascular health in lung cancer screening patients: a pilot trial. JACC 87(13Supplement):A173–A173. 10.1016/j.jacc.2026.02.431
41. Sandhu AT, Rodriguez F, Ngo S et al (2023) Incidental Coronary Artery Calcium: Opportunistic Screening of Previous Nongated Chest Computed Tomography Scans to Improve Statin Rates (NOTIFY-1 Project). Circulation 147(9):703–714. 10.1161/CIRCULATIONAHA.122.062746
42. Dudum R, Jain SS, Mastrodicasa D et al (2026) Effects of Real-Time Notification of AI-Detected Incidental Coronary Artery Calcium on Statin Prescription: the NOTIFY-PICTURE Trial. Circulation 153(3):210–212. 10.1161/CIRCULATIONAHA.125.078155
43. Parsa S, Saleh A, Raygor V et al (2024) Measurement and Application of Incidentally Detected Coronary Calcium. JACC 83(16):1557–1567. 10.1016/j.jacc.2024.01.039
44. Lam S, Baldwin DR, Devaraj A et al (2026) A Game-Changing 20 Years: Progress and Future Directions in Lung Cancer Screening. J Thorac Oncol 21(2):235–252. 10.1016/j.jtho.2025.11.017
45. Rathore S, Gautam A, Raghav P et al (2025) Fully automated coronary artery calcium score and risk categorization from chest CT using deep learning and multiorgan segmentation: A validation study from National Lung Screening Trial (NLST). IJC Heart Vasculature 56:101593. 10.1016/j.ijcha.2024.101593
46. Hamelink II, Nie ZZ, Severijn TEJT et al (2025) Validation of artificial intelligence software for automatic calcium scoring in cardiac and chest computed tomography. Eur J Radiol 191:112323. 10.1016/j.ejrad.2025.112323

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