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Subject: Computed Tomographic Angiography (CTA) Heart

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DESCRIPTION:

Coronary computed tomographic angiography (CTA, CCTA) is a noninvasive imaging study that uses intravenously administered contrast material and high-resolution, rapid imaging computed tomography (CT) equipment to obtain detailed volumetric images of the coronary blood vessels. This guideline addresses the use of coronary computed tomographic angiography (CTA, CCTA) in the outpatient setting.

Summary and Analysis of Evidence: An UpToDate review on "Clinical use of coronary computed tomographic angiography" (Villines) states that "Coronary computed tomographic angiography (CCTA) is a well-validated and increasingly utilized noninvasive test for the assessment of coronary artery disease (CAD) in appropriately selected patients with suspected acute or chronic coronary syndromes. In addition to detecting CAD, CCTA is an excellent method to exclude angiographically significant coronary stenoses. The principal indications for CCTA include: As an alternative to stress testing as the initial test in patients with chronic (stable) symptoms suggestive of ischemic heart disease who do not have previously established CAD. As an alternative to invasive coronary angiography in patients with nondiagnostic or equivocal stress test results and persistent symptoms in whom a diagnosis of CAD is uncertain. As the initial test in patients without known CAD who present with possible acute coronary syndrome (ACS) when highly sensitive troponin assay testing and the clinical evaluation cannot confidently exclude ACS. CCTA should not be performed in patients with ongoing chest pain who may have ACS since transporting them is unsafe and CT suites are generally not equipped to deal with potentially unstable patients. As an alternative to stress testing or invasive coronary angiography in selected patients without previously known CAD who are diagnosed with non-ST-elevation ACS with clinically low-risk presentation (e.g., absence of heart failure and refractory ischemic symptoms), and in

whom there is a clinician or patient desire to avoid invasive coronary angiography, or when the cause for troponin elevation is uncertain."

Summary and Analysis of Evidence: Rinehart et al (2024) evaluated the clinical utility of Artificial Intelligence Plaque Analysis (AI-QCPA) in clinical decision making. One hundred cases were reviewed by 3 highly experienced practicing cardiologists who are Society of Cardiovascular Computed Tomography (SCCT) level 3 coronary computed angiography tomographic (CCTA) readers. Patients had varying levels of calcium (median coronary artery calcium score (CACS: 99.5) and Coronary Artery Disease Reporting and Data System (CAD-RADS) scores. Initial management plan for each case was a majority decision based upon patient demographics, clinical history, and CCTA report. AI-QCPA was then provided for each patient, and the plan was reconsidered. The primary endpoint was the reclassification rate (RR). In a secondary analysis of 40 cases, the above process was repeated but the initial plan was based upon review of the actual CCTA images. RR following AI-QCPA review was 66% (66/100) of cases (95% CI, 56.72%-75.28%). RR ranged from 47% in cases with CACS 0 to 96% in cases with CACS >400, and from 40% in CAD-RADS 1 cases to 94% in CAD-RADS 4 cases. RR was higher in cases with coronary stenoses ≥50% (89.5%) vs cases with stenoses <50% (51.6%). RR was 39% in cases with LDL <70 mg/dL vs 70% in LDL ≥70 mg/dL. Following review of the CCTA images rather than the CCTA report, the RR was 50% (95% CI of 34.51% - 65.49%). The primary reclassification effect was to intensify preventative medical therapy. Adding AI-QCPA to CCTA alone leads to a change in clinical care in two-thirds of patients. The authors stated that this study is not without limitations. There was variability among readers and institutions in the descriptive elements included within the CCTA reports. Another limitation was that decisions regarding medical therapy were not based on cost considerations. Lastly, this was a "proof of concept" study identifying theoretical changes in medical decision-making based on review of actual patient data and CCTA reports and images by an expert panel of prevention and imaging-focused cardiologists. These findings should be confirmed in real-world prospective observational data and potentially randomized controlled trials to determine whether such medication management changes are associated with changes in downstream cardiovascular outcomes. The authors noted that their findings reveal that incorporation of AI-QCPA information into CCTA reporting has the potential to better align treatment strategies with individual patient risk, primarily by intensification of medical therapy.

The authors Thribhuvan et al (2024) explored the potential of artificial intelligence (AI) in coronary CT angiography (CCTA), a key tool for diagnosing coronary artery disease (CAD). CAD is a major cause of death worldwide. Effective and accurate diagnostic methods are required to identify and manage the condition. CCTA is a noninvasive alternative for diagnosing CAD, but it requires a large amount of data as input. The authors discussed the idea of incorporating AI into CCTA, which enhances its diagnostic accuracy and operational efficiency. Using such AI technologies as machine learning (ML) and deep learning (DL) tools, CCTA images are automated to perfection and the analysis is significantly refined. It enables the characterization of a plaque, assesses the severity of the stenosis, and makes more accurate risk stratifications than traditional methods, with pinpoint accuracy. Automating routine tasks through AI-driven CCTA will reduce the radiologists' workload considerably, which is a standard benefit of such technologies. More importantly, it would enable radiologists to allocate more time and expertise to complex cases, thereby improving overall patient care. However, the field of AI in CCTA is not without its challenges, which include data protection, algorithm transparency, as well as criteria for standardization encoding. Despite such obstacles, it appears that the integration of AI technology into CCTA in the future holds great promise for keeping CAD itself in check, thereby aiding the fight against this disease and

begetting better clinical outcomes and more optimized modes of healthcare. Future research on AI algorithms for CCTA, making ethical use of AI, and thereby overcoming the technical and clinical barriers to widespread adoption of this new tool, will hopefully pave the way for profound AI-driven transformations in healthcare. The authors stated that despite the huge benefits of introducing AI in CCTA, some challenges hinder the practical application of AI. These challenges involve data privacy, transparency of AI algorithms, and standardization across different platforms and institutions. It is imperative to overcome these challenges to establish trust in AI-assisted diagnostics systems and capitalize on their full capacity. Going forward, continual efforts on the part of clinicians, developers, and regulators are required to get the most out of AI-assisted imaging. This involves training clinicians about working with AI, rendering AI more transparent to the final user, and developing abidance to guide the ethical use of AI. Ultimately, AI and medical imaging will be integrated seamlessly into how CAD patients are cared for, immensely improving clinical outcomes and enhancing workflow efficiency.

The ability to characterize and to quantify the extent of coronary artery disease has the potential to improve the prognostic capability of coronary computed tomography angiography. Although reproducible techniques have been described in those with mild coronary disease, this has yet to be assessed in patients with advanced disease. Twenty patients with known multivessel disease underwent repeated computed tomography coronary angiography, 2 weeks apart. Coronary artery segments were analyzed using semi-automated software by two trained observers to determine intraobserver, interobserver and interscan reproducibility. Overall, 149 coronary arterial segments were analyzed. There was excellent intraobserver and interobserver agreement for all plaque volume measurements (Lin's coefficient 0.95 to 1.0). There were no substantial interscan differences ($P > 0.05$ for all) for total (2063 ± 1246 mm^3, mean of differences -35.6 mm^3), non-calcified (1795 ± 910 mm^3, mean of differences -4.3 mm^3), calcified (298 ± 425 mm^3, mean of differences -31.3 mm^3) and low-attenuation (13 ± 13 mm^3, mean of differences -2.6 mm^3) plaque volumes. Interscan agreement was highest for total and noncalcified plaque volumes. Calcified and low-attenuation plaque (-236.6 to 174 mm^3 and -15.8 to 10.5 mm^3 respectively) had relatively wider 95% limits of agreement reflecting the lower absolute plaque volumes. In the presence of advanced coronary disease, semi-automated plaque quantification provides excellent reproducibility, particularly for total and non-calcified plaque volumes. This approach has major potential to assess change in disease over time and optimize risk stratification in patients with established coronary artery disease. The authors stated that their study has some limitations. The number of patients was relatively small although repeated scanning and radiation exposure does present challenges to conducting such a study in larger numbers of patients. The population was predominantly male, but the results of the plaque reproducibility would be expected to be similar irrespective of gender. They did not compare plaque volumes with a reference standard, such as intravascular ultrasound, although this has been previously reported by others. They concluded that have demonstrated the excellent intraobserver, interobserver and scan-rescan reproducibility of semi-automated plaque volume quantification in patients with advanced coronary artery disease. This validates its use as a novel approach to quantify change in coronary artery disease over time and optimize risk stratification in patients with coronary artery disease (Meah et al 2021).

Tzimas et al (2024) developed nomographic quantitative plaque values from a large consecutive multicenter cohort using coronary computed tomographic angiography (CTA). Quantitative assessment of total atherosclerotic plaque and plaque subtype volumes was performed in patients undergoing clinically indicated coronary CTA, using an Artificial Intelligence-Enabled Quantitative Coronary Plaque

Analysis tool. A total of 11,808 patients were included in the analysis; their mean age was 62.7 ± 12.2 years, and 5,423 (45.9%) were women. The median total plaque volume was 223 mm^3 (IQR: 29-614 mm^3) and was significantly higher in male participants (360 mm^3; IQR: 78-805 mm^3) compared with female participants (108 mm^3; IQR: 10-388 mm^3) ($P < 0.0001$). Total plaque increased with age in both male and female patients. Younger patients exhibited a higher prevalence of noncalcified plaque. The distribution of total plaque volume and its components was reported in every decile by age group and sex. The authors developed pragmatic age- and sex-stratified percentile nomograms for atherosclerotic plaque measures using findings from coronary CTA. The impact of age and sex on total plaque and its components should be considered in the risk-benefit analysis when treating patients. Artificial Intelligence-Enabled Quantitative Coronary Plaque Analysis workflows could provide context to better interpret coronary computed tomographic angiographic measures and could be integrated into clinical decision making. The authors presented age- and sex-stratified percentile nomograms for atherosclerotic plaque volumes on the basis of coronary CTA from a new AI-QCPA tool. These findings could provide context for quantitative plaque volumes to allow clinical integration and to help inform clinical decision making. Our study provides a nomographic framework, but future studies are needed to evaluate the relationship with downstream clinical outcomes and whether quantitative plaque informs clinical decision making in a fashion that improves outcomes beyond visual assessment.

POSITION STATEMENT:

Computed tomographic angiography (CTA/CCTA) **meets the definition of medical necessity** for the following indications:

Evaluation in suspected coronary artery disease (CAD)

- An alternative to coronary angiography before valve surgery or transcatheter intervention
- Equivocal, borderline, or discordant stress imaging evaluation with continued symptoms concerning CAD
- Evaluation of coronary anomaly or aneurysm
- Evaluation of coronary artery bypass grafts
- Exercise ECG stress test with intermediate Duke Treadmill Score (- 10 to + 4) in whom stress echo cannot be performed
- High pretest probability as an alternative to coronary angiography
- Members with intermediate pretest probability of CAD in whom either exercise electrocardiogram (ECG) stress or stress echocardiogram cannot be performed
- Newly diagnosed clinical systolic heart failure (ejection fraction [EF] < 50%) without recent CAD evaluation in the presence of angina or an anginal equivalent
- Reduced ejection fraction (EF) (EF <40%) as an alternative to invasive coronary arteriography
- Repeat testing in member with new or worse symptoms since prior normal stress imaging.

Additional Information:

Stable individuals without known CAD fall into 2 categories (asymptomatic and symptomatic):

- Asymptomatic, for whom global risk of CAD events can be determined from coronary risk factors, using online cardiac risk calculator (see Reimbursement Information section).
- Symptomatic, for whom we estimate the pretest probability that their chest-related symptoms are due to clinically significant (> 50%) CAD.

Three Types of Chest Pain or Discomfort

- **Typical Angina (definite):** Defined as including all of the following characteristics:
  - Substernal chest pain or discomfort with characteristic quality and duration
  - Provoked by exertion or emotional stress
  - Relieved by rest and/or nitroglycerin.
- **Atypical angina (probable):** Chest pain or discomfort that lacks one of the characteristics of typical angina (definite).
- **Non-anginal Chest Pain:** Chest pain or discomfort that meets one or none of the typical angina (definite) characteristics.

Note: Once the type of chest pain has been established from the medical record, the pretest probability of CAD (meaning obstructive CAD defined as coronary arterial narrowing ≥ 50%) is estimated from the below table (Table 1) (Diamond and Forrester Pre-Test Probability of Coronary Artery Disease by Age, Sex (gender) and Symptoms). Additional coronary risk factors could increase pretest probability.

Determination of Pretest Probability for Coronary Artery Disease (CAD)

Table 1: Determination of Pretest Probability for Coronary Artery Disease Based on Age, Sex, and Symptoms (Source: American College of Cardiology Criteria for Pretest Probability of Coronary Artery Disease (CAD).

The following risk assessment may be used to determine pre-test probability of coronary artery disease:

Age (years)	Sex	Typical/Definite Angina Pectoris	Atypical/Probable Angina Pectoris	Non-anginal Chest Pain	Asymptomatic
≤ 39	Men	Intermediate	Intermediate	Low	Very low
	Women	Intermediate	Very low	Very low	Very low
40 – 49	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Low	Very low	Very low
50 – 59	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Intermediate	Low	Very low
≥ 60	Men	High	Intermediate	Intermediate	Low
	Women	High	Intermediate	Intermediate	Low

Very low: Less than 5% pretest probability of CAD
Low: Between 5% and 10% pretest probability of CAD
Intermediate: Between 10% and 90% pretest probability of CAD
High: Greater than 90% pretest probability of CAD

Adapted from: Wolk MJ, Bailey SR, Doherty JU et al. ACCF/AHA/ASE/ASNC/HFSA/HRS/SCAI/SCCT/SCMR/STS 2013 Multimodality appropriate use criteria for the detection and risk assessment of stable ischemic heart disease. Journal of the American College of Cardiology 2014; 63(4): 380-406.

Taylor AJ, Cerqueira M, Hodgson JM, et al. ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 appropriate use criteria for cardiac computed tomography. Journal of the American College of Cardiology 2010;56(22):1864-1894.

Global Risk of Cardiovascular Disease (coronary disease (CAD))

Global risk of CAD is defined as the probability of manifesting cardiovascular disease over the next 10 years and refers to asymptomatic members without known cardiovascular disease. It should be determined using one of the cardiac risk calculators below. A high risk is considered greater than 20% risk of a cardiovascular event over the ensuing 10 years. High global risk by itself generally lacks scientific support as an indication for stress imaging. There are rare exemptions, such as members requiring IC antiarrhythmic drugs, who might require coronary risk stratification prior to initiation of the drug, when global risk is moderate or high.

CAD Risk—Low:10-year absolute coronary or cardiovascular risk less than 10%.

CAD Risk—Moderate: 10-year absolute coronary or cardiovascular risk between 10% and 20%.

CAD Risk—High: 10-year absolute coronary or cardiovascular risk of greater than 20%.

Duke Treadmill Score

- The equation for calculating the Duke treadmill score (DTS) is, DTS = exercise time in minutes - (5 x ST deviation in mm or 0.1 mV increments) - (4 x exercise angina score), with angina score being 0 = none, 1 = non limiting, and 2 = exercise-limiting.
- The score typically ranges from -25 to +15. These values correspond to low-risk (with a score of ≥ +5), intermediate risk (with scores ranging from - 10 to + 4), and high-risk (with a score of ≤ -11) categories.

Online cardiac risk calculator and assessment tools

The links for the online cardiac risk calculator and assessment tools are to an outside source and is provided for your convenience. Use of the links and related calculator and assessment tools are subject to the terms and conditions of the website and is not warranted, maintained or affiliated with Florida Blue.

Framingham Risk Score Calculator

http://www.medcalc.com/heartrisk.html

Reynolds Risk Score

http://www.reynoldsriskscore.org/

Pooled Cohort Risk Assessment Equations

http://clincalc.com/Cardiology/ASCVD/PooledCohort.aspx

ACC/AHA Risk Calculator

http://tools.acc.org/ASCVD-Risk-Estimator-Plus/#!/calculate/estimate/

MESA Risk Calculator (With addition of coronary artery calcium score, for CAD-only risk)

https://www.mesa-nhlbi.org/MESACHDRisk/MesaRiskScore/RiskScore.aspx

Automated quantification and characterization of coronary atherosclerotic plaque is considered **experimental or investigational**. The evidence is insufficient to determine that automated quantification and characterization of coronary atherosclerotic plaque results in an improvement in the net health outcome.

BILLING/CODING INFORMATION:

CPT Coding:

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)
0623T	Automated quantification and characterization of coronary atherosclerotic plaque to assess severity of coronary disease, using data from coronary computed tomographic angiography; data preparation and transmission, computerized analysis of data, with review of computerized analysis output to reconcile discordant data, interpretation and report (**Investigational**)
0624T	Automated quantification and characterization of coronary atherosclerotic plaque to assess severity of coronary disease, using data from coronary computed tomographic angiography; data preparation and transmission (**Investigational**)
0625T	Automated quantification and characterization of coronary atherosclerotic plaque to assess severity of coronary disease, using data from coronary computed tomographic angiography; computerized analysis of data from coronary computed tomographic angiography (**Investigational**)
0626T	Automated quantification and characterization of coronary atherosclerotic plaque to assess severity of coronary disease, using data from coronary computed tomographic angiography; review of computerized analysis output to reconcile discordant data, interpretation and report (**Investigational**)

REIMBURSEMENT INFORMATION:

LOINC Codes:

The following information may be required documentation to support medical necessity: physician history and physical, physician progress notes, plan of treatment, laboratory studies and reason for computed tomographic angiography (CTA).

Documentation Table	LOINC Codes	LOINC Time Frame Modifier Code	LOINC Time Frame Modifier Codes Narrative
Physician history and physical	28626-0	18805-2	Include all data of the selected type that represents observations made six months or fewer before starting date of service for the claim
Attending physician progress note	18741-9	18805-2	Include all data of the selected type that represents observations made six months or fewer before starting date of service for the claim
Plan of treatment	18776-5	18805-2	Include all data of the selected type that represents observations made six months or fewer before starting date of service for the claim

PROGRAM EXCEPTIONS:

Federal Employee Plan (FEP): Follow FEP guidelines.

Medicare Advantage products: The following Local Coverage Determination (LCD) Computed Tomography (220.1) is located at fcso.com. No National Coverage Determination (NCD) was found at the time of the last guideline reviewed date.

DEFINITIONS:

No guideline specific definitions apply.

RELATED GUIDELINES:

Computed Tomography to Detect Coronary Artery Calcification, 04-70450-02

OTHER:

Other names used to report computed tomographic angiography (CTA) for coronary artery evaluation:

Cardiac Computed Tomography (CCT) (or CT Angiography)

Coronary angiography (CCTA)

Multi-detector row computed (computerized) tomography (MDCT)

Multi-slice spiral computed (computerized) tomography (MSCT)

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COMMITTEE APPROVAL:

This Medical Coverage Guideline (MCG) was approved by the Florida Blue Medical Policy and Coverage Committee on 01/23/25.

GUIDELINE UPDATE INFORMATION:

12/15/04	New Medical Coverage Guideline.
02/15/06	Revised investigational rationales deleted “a lack of” and change to “insufficient evidence”. Added screening for coronary artery disease (CAD) to when services are not covered. Added the word “evaluation” to coronary artery bypass graft patency and coronary artery aneurysm (when services are not covered). Added the wording “delineation of” to congenital coronary artery anomaly (when services are not covered). Added delineation of coronary artery anatomy to when services are not covered. Added CPT “T” codes: 0146T, 0147T, 0148T, and 0149T (tag investigational-MPF), and updated references. Revised name of MCG, deleted “for coronary artery evaluation” – Computed Tomographic Angiography (CTA).
04/01/06	HCPCS update, deleted S8093.
05/15/06	Added 0145T, 0150T, and 0151T.
03/15/07	Scheduled review. Added “for Coronary Artery Evaluation” to the title of the MCG. Revised the descriptor section, to update the information regarding computed tomographic angiography (CTA) and multidetector row helical CT (MDCT) and multislice CT (MSCT). Revised WHEN SERVICES ARE COVERED, added coverage statement for evaluation for evaluation of anomalous coronary arteries. Revised WHEN SERVICES ARE NOT COVERED, added investigational statement for all other indications. Deleted CPT code: 0145T, 0150T, and 0151T from the BILLING/CODING INFORMATION section. Added program exception for Medicare Advantage products. Added cardiac computed tomography (CCT) to OTHER section, and updated references.
06/15/07	Reformatted guideline.
07/01/07	Updated Program Exception section.
01/01/08	HCPCS update. Revised 0146T, 0147T, 0148T, and 0149T descriptor.
01/21/08	Updated Program Exceptions.
03/15/08	Scheduled review. Revised position statement. Updated billing/coding information section, added ICD-9 diagnosis coronary artery anomaly 746.85. Updated reimbursement information section, and updated references.
11/05/08	Updated Program Exceptions.

05/21/09	Removed Federal Employee Plan (FEP) from Florida Blue Radiology Management program exception statement. Added FEP program exception statement: FEP is excluded from the National Imaging Associates (NIA) review; follow FEP guidelines.
06/25/09	Updated Florida Blue Radiology Management program exception; added BlueSelect.
01/01/10	Annual HCPCS coding update: deleted 0146T, 0147T, 0148T, 0149T, and 0151T; added 75572, 75573, and 75574. Revised Florida Blue Radiology Management program exception section, and updated the references.
05/15/10	Updated guideline name, deleted “for coronary artery evaluation”. Revised description. Expanded medical necessity indications; added criteria, and updated references.
06/15/11	Annual review: maintain position statements. Updated references.
10/01/11	Revision; formatting changes.
06/15/12	Scheduled review; added indications for computed tomography, heart. Deleted ICD-9 codes (Medicare). Updated references.
12/15/12	Updated Medicare program exception. Added Computed Tomography to Detect Coronary Artery Calcification, 04-70450-02 to related guidelines section.
01/01/14	Review/revision. Added “of the heart and coronary arteries” to computed tomographic angiography (CTA).
05/15/18	Revision; revised position statement. Updated references.
11/15/19	Revised description and position statements; added evaluation in suspected coronary artery disease (CAD). Updated references.
03/15/20	Review/revison. Revised position statement: for exercise electrocardiogram, deleted usually typical or atypical angina; for evaluation of coronary artery bypass grafts revise and expanded criteria. Added definition of coronary artery disease and global risk of cardiovascular disease. Reformatted reimbursement information; moved information (anginal equivalent, Duke treadmill score, online cardiac risk calculator and assessment tools) to position statement. Updated references.
05/15/22	Review/update. Revised and expanded criteria. Updated description, program exception and references.
07/01/22	Revision to Program Exceptions section.
09/30/23	Review: position statements and references updated.
06/15/24	Review; no change in position statement. Updated references.
02/15/25	Review/revision. Added statement for automated quantification and characterization of coronary atherosclerotic plaque (0623T, 0624T, 0625T, 0626T). Updated references.