BlueCross BlueShield Federal Employee Program.

FEP Medical Policy Manual

FEP 6.01.43 Contrast-Enhanced Computed Tomographic Angiography for Coronary Artery Evaluation

Effective Policy Date: January 1, 2023

Original Policy Date: September 2012

Related Policies:

6.01.03 - Computed Tomography to Detect Coronary Artery Calcification
6.01.59 - Coronary Computed Tomography Angiography With Selective Noninvasive Fractional Flow Reserve

Contrast-Enhanced Computed Tomographic Angiography for Coronary Artery Evaluation

Description

Description

Contrast-enhanced coronary computed tomography angiography (CCTA) is a noninvasive imaging test that requires the use of intravenously administered contrast material and high-resolution, high-speed computed tomography machinery to obtain detailed volumetric images of blood vessels. It is a potential diagnostic alternative to current tests for cardiac ischemia (ie, noninvasive stress testing and/or coronary angiography).

OBJECTIVE

The objective of this evidence review is to evaluate whether coronary computed tomography angiography (CCTA) improves health outcomes compared with alternative testing strategies and/or standard of care. Three major indications for cardiac or CCTA are considered: (1) evaluation of patients with acute chest pain without known coronary disease presenting in the emergency department setting, (2) evaluation of stable patients with signs and symptoms of coronary artery disease in the non-emergency department setting, and (3) evaluation of anomalous coronary arteries.

POLICY STATEMENT

Contrast-enhanced coronary computed tomography angiography (CCTA) for evaluation of individuals with acute chest pain and without known coronary artery disease in the emergency department setting is considered **medically necessary**.

Contrast-enhanced CCTA for evaluation of individuals with stable chest pain and meeting guideline criteria for a noninvasive test in the outpatient setting (see Policy Guidelines) is considered **medically necessary**.

Contrast-enhanced CCTA for evaluation of individuals with suspected anomalous (native) coronary arteries is considered **medically necessary**.

Contrast-enhanced CCTA for coronary artery evaluation is considered **investigational** for all other indications.

POLICY GUIDELINES

The 2012 collaborative medical association guidelines for the diagnosis and management of individuals with stable heart disease list several class I recommendations on the use of noninvasive testing in individuals with suspected stable ischemic heart disease. A class I recommendation indicates that a test should be performed. In general, individuals with at least intermediate risk (10% to 90% risk by standard risk prediction instruments) are recommended to have some type of test, the choice depending on interpretability of the electrocardiogram, capacity to exercise, and presence of comorbidity.

BENEFIT APPLICATION

Experimental or investigational procedures, treatments, drugs, or devices are not covered (See General Exclusion Section of brochure).

FDA REGULATORY STATUS

Coronary computed tomographic angiography is performed using multidetector-row computed tomography, and multiple devices have been cleared for marketing by the U.S. Food and Drug Administration (FDA) through the 510(k) process. Current machines are equipped with at least 64 detector rows. Intravenous iodinated contrast agents used for CCTA also have received FDA approval.

RATIONALE

Summary of Evidence

For individuals who have acute chest pain and suspected coronary artery disease (CAD) in the emergency setting, at intermediate- to low-risk, who receive coronary computed tomography angiography (CCTA), the evidence includes several randomized controlled trials (RCTs), a systematic review, and a prospective head-to-head study comparing CCTA with an alternative noninvasive test. Relevant outcomes are overall survival, morbid events, and resource utilization. Trials have shown similar patient outcomes, with faster patient discharges from the ED, and lower short-term costs. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have stable chest pain, intermediate-risk of CAD, and meeting guideline criteria for noninvasive testing (ie, intermediate-risk) who receive CCTA, the evidence includes studies of diagnostic accuracy of CCTA, randomized trials and observational studies comparing CCTA with alternative diagnostic strategies, and systematic reviews. Relevant outcomes are overall survival, test accuracy, morbid events, and resource utilization. Studies of diagnostic accuracy have shown that CCTA has higher sensitivity and similar specificity to alternative noninvasive tests. Although randomized trials have not shown the superiority of CCTA over other diagnostic strategies, results are consistent with noninferiority (ie, similar health outcomes) to other diagnostic strategies. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have suspected anomalous coronary arteries who receive CCTA, the evidence includes case series. Relevant outcomes are overall survival, test accuracy, morbid events, and resource utilization. Series have shown that CCTA can detect anomalous coronary arteries missed by other diagnostic modalities. Anomalous coronary arteries are rare, and formal studies to assess clinical utility are unlikely to be performed. In most situations, these case series alone would be insufficient to determine whether the test improves health outcomes. However, in situations where patient management will be affected by CCTA results (eg, with changes in surgical planning), a chain of evidence indicates that health outcomes are improved. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome.

SUPPLEMENTAL INFORMATION

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 College of Cardiology Foundation et al

The American College of Cardiology along with several other organizations (2021) published guidelines for evaluation and diagnosis of chest pain that include recommendations for CCTA.[64,]

For intermediate-risk patients with no known CAD the guidelines pertinent to CCTA state:

- "For intermediate-risk patients with acute chest pain and no known CAD eligible for diagnostic testing after a negative or inconclusive evaluation for ACS, CCTA is useful for exclusion of atherosclerotic plaque and obstructive CAD."
- "For intermediate-risk patients with acute chest pain with evidence of previous mildly abnormal stress test results (≤1 year), CCTA is reasonable for diagnosing obstructive CAD."
- "For intermediate-risk patients with acute chest pain and no known CAD, as well as an inconclusive prior stress test, CCTA can be useful for excluding the presence of atherosclerotic plaque and obstructive CAD."

For intermediate-risk patients with known CAD the guidelines pertinent to CCTA state:

- "For intermediate-risk patients with acute chest pain and known nonobstructive CAD, CCTA can be useful to determine progression of atherosclerotic plaque and obstructive CAD."

The American College of Cardiology Foundation and several other medical societies (2012) issued joint guidelines for the management of patients with stable ischemic heart disease (Table 1).[36,]

Table 1. Guidelines on Management of Stable IHD

Diagnosis	Recommendation	Class	LOE
Unknown			
	Able to exercise		
	"CCTA might be reasonable for patients with an intermediate pretest probability of IHD who have at least moderate physical functioning or no disabling comorbidity."	IIb	B
	Unable to exercise		
	"CCTA is reasonable for patients with a low-to-intermediate pretest probability of IHD who are incapable of at least moderate physical functioning or have a disabling comorbidity."	IIa	B
	"CCTA is reasonable for patients with an intermediate pretest probability of IHD who a) have continued symptoms with prior normal test findings, or b) have inconclusive results from prior exercise or pharmacological stress testing, or c) are unable to undergo stress with nuclear MPI or echocardiography."	IIa	C
Known coronary disease			
	Able to exercise		
	"CCTA may be reasonable for risk assessment in patients with SIHD who are able to exercise to an adequate workload but have an uninterpretable ECG."	IIb	B
	Able to exercise		
	"Pharmacological stress imaging (nuclear MPI, echocardiography, or CMR) or CCTA is not recommended for risk assessment in patients with SIHD who are able to exercise to an adequate workload and have an interpretable ECG."	III	C
	Unable to exercise		
	"Pharmacological stress CMR is reasonable for risk assessment in	IIa	B

	patients with SIHD who are unable to exercise to an adequate workload regardless of interpretability of ECG."		
	"CCTA can be useful as a first-line test for risk assessment in patients with SIHD who are unable to exercise to an adequate workload regardless of interpretability of ECG."	IIa	C
	Unable to exercise		
	"A request to perform either a) more than 1 stress imaging study or b) a stress imaging study and a CCTA at the same time is not recommended for risk assessment in patients with SIHD."	III	C
	Regardless of patients' ability to exercise		
	"CCTA might be considered for risk assessment in patients with SIHD unable to undergo stress imaging or as an alternative to invasive coronary angiography when functional testing indicates a moderate- to high-risk result and knowledge of angiographic coronary anatomy is unknown."	IIb	C

CCTA: coronary computed tomography angiography; CMR: cardiac magnetic resonance; ECG: electrocardiography; IHD: ischemic heart disease; LOE: level of evidence; MPI: myocardial perfusion imaging; SIHD: stable ischemic heart disease.

The American College of Cardiology Foundation and other medical societies (2013) published appropriate use criteria for detection and risk assessment of stable ischemic heart disease.[65,] Coronary computed tomography angiography (CCTA) was considered appropriate for:

- Symptomatic patients with intermediate (10% to 90%) pretest probability of coronary artery disease (CAD) and uninterpretable electrocardiogram (ECG) or inability to exercise
- Patients with newly diagnosed systolic heart failure
- Patients who have had a prior exercise ECG or stress imaging study with abnormal or unknown results
- Patients with new or worsening symptoms and normal exercise ECG.

National Institute for Health and Care Excellence

The National Institute for Health and Care Excellence (2016) has recommended CCTA as first-line testing for patients with stable angina if the clinical assessment indicates typical or atypical angina, or if the clinical assessment indicates non anginal chest pain but 12-lead resting ECG has been done and indicates ST-T changes or Q waves.[66,]

Society of Cardiovascular Computed Tomography

The Society of Cardiovascular Computed Tomography (2021) published an expert consensus document on CCTA.[67,] Recommendations on use of CCTA in select patients are included in Table 2. In addition to the recommendations listed below, the expert consensus included additional recommendations in several patient populations, including patients with known CAD.

Table 2. Society of Cardiovascular Computed Tomography Guidelines on Coronary Computed Tomography Angiography

Diagnosis	Recommendation
Stable chest pain with no known CAD	It is appropriate to perform CTA as the first line test for evaluating patients with no known CAD who present with stable typical or atypical chest pain, or other symptoms which are thought to represent a possible anginal equivalent (eg, dyspnea on exertion, jaw pain).
	It is appropriate to perform coronary CTA following a nonconclusive functional test, in order to obtain more precision regarding diagnosis and prognosis, if such information will influence subsequent patient management.
	Coronary CTA is rarely appropriate in very low risk symptomatic patients, such as those <40 years of age who have noncardiac symptoms (eg, chest wall pain, pleuritic chest pain).
Noncardiac surgery	It is appropriate to perform CTA as an alternative to other noninvasive tests for evaluation of selected patients prior to noncardiac surgery.
Coronary anomalies	It is appropriate to perform CTA for the evaluation of coronary anomalies.

CAD: coronary artery disease; CTA: cardiac computed tomography angiography.

U.S. Preventive Services Task Force Recommendations

No **U.S. Preventive Services Task Force** recommendations for CCTA have been identified.

Medicare National Coverage

There is no national coverage determination. In the absence of a national coverage determination, coverage decisions are left to the discretion of local Medicare carriers.

REFERENCES

1. Mastouri R, Sawada SG, Mahenthiran J. Current noninvasive imaging techniques for detection of coronary artery disease. Expert Rev Cardiovasc Ther. Jan 2010; 8(1): 77-91. PMID 20030023
2. Chow BJ, Small G, Yam Y, et al. Incremental prognostic value of cardiac computed tomography in coronary artery disease using CONFIRM: COroNary computed tomography angiography evaluation for clinical outcomes: an InteRnational Multicenter registry. Circ Cardiovasc Imaging. Sep 2011; 4(5): 463-72. PMID 21730027
3. National Research Council, Committee to Assess Health Risks from Exposure to Low Level of Ionizing Radiation. Health risks from exposure to low levels of ionizing radiation: BEIR VII Phase 2. Washington, D.C.: National Academies Press; 2006.
4. Berrington de Gonzalez A, Mahesh M, Kim KP, et al. Projected cancer risks from computed tomographic scans performed in the United States in 2007. Arch Intern Med. Dec 14 2009; 169(22): 2071-7. PMID 20008689
5. Smith-Bindman R, Lipson J, Marcus R, et al. Radiation dose associated with common computed tomography examinations and the associated lifetime attributable risk of cancer. Arch Intern Med. Dec 14 2009; 169(22): 2078-86. PMID 20008690
6. Einstein AJ, Henzlova MJ, Rajagopalan S. Estimating risk of cancer associated with radiation exposure from 64-slice computed tomography coronary angiography. JAMA. Jul 18 2007; 298(3): 317-23. PMID 17635892
7. Bischoff B, Hein F, Meyer T, et al. Comparison of sequential and helical scanning for radiation dose and image quality: results of the Prospective Multicenter Study on Radiation Dose Estimates of Cardiac CT Angiography (PROTECTION) I Study. AJR Am J Roentgenol. Jun 2010; 194(6): 1495-9. PMID 20489088
8. Hausleiter J, Meyer TS, Martuscelli E, et al. Image quality and radiation exposure with prospectively ECG-triggered axial scanning for coronary CT angiography: the multicenter, multivendor, randomized PROTECTION-III study. JACC Cardiovasc Imaging. May 2012; 5(5): 484-93. PMID 22595156
9. Hadamitzky M, Achenbach S, Malhotra V, et al. Update on an International Registry for monitoring cardiac CT radiation dose [abstract]. J Cardiovasc Comput Tomogr. 2011;5(4S):S48.
10. Gerber TC, Carr JJ, Arai AE, et al. Ionizing radiation in cardiac imaging: a science advisory from the American Heart Association Committee on Cardiac Imaging of the Council on Clinical Cardiology and Committee on Cardiovascular Imaging and Intervention of the Council on Cardiovascular Radiology and Intervention. Circulation. Feb 24 2009; 119(7): 1056-65. PMID 19188512

11. Hausleiter J, Meyer T, Hermann F, et al. Estimated radiation dose associated with cardiac CT angiography. JAMA. Feb 04 2009; 301(5): 500-7. PMID 19190314
12. Eisenberg MJ, Afilalo J, Lawler PR, et al. Cancer risk related to low-dose ionizing radiation from cardiac imaging in patients after acute myocardial infarction. CMAJ. Mar 08 2011; 183(4): 430-6. PMID 21324846
13. Aglan I, Jodocy D, Hiehs S, et al. Clinical relevance and scope of accidental extracoronary findings in coronary computed tomography angiography: a cardiac versus thoracic FOV study. Eur J Radiol. Apr 2010; 74(1): 166-74. PMID 19268514
14. Husmann L, Tatsugami F, Aepli U, et al. Prevalence of noncardiac findings on low dose 64-slice computed tomography used for attenuation correction in myocardial perfusion imaging with SPECT. Int J Cardiovasc Imaging. Dec 2009; 25(8): 859-65. PMID 19662511
15. Kawano Y, Tamura A, Goto Y, et al. Incidental detection of cancers and other non-cardiac abnormalities on coronary multislice computed tomography. Am J Cardiol. Jun 01 2007; 99(11): 1608-9. PMID 17531590
16. Kirsch J, Araoz PA, Steinberg FB, et al. Prevalence and significance of incidental extracardiac findings at 64-multidetector coronary CTA. J Thorac Imaging. Nov 2007; 22(4): 330-4. PMID 18043387
17. Koonce J, Schoepf JU, Nguyen SA, et al. Extra-cardiac findings at cardiac CT: experience with 1,764 patients. Eur Radiol. Mar 2009; 19(3): 570-6. PMID 18925400
18. Lazoura O, Vassiou K, Kanavou T, et al. Incidental non-cardiac findings of a coronary angiography with a 128-slice multi-detector CT scanner: should we only concentrate on the heart?. Korean J Radiol. Jan-Feb 2010; 11(1): 60-8. PMID 20046496
19. Lehman SJ, Abbara S, Cury RC, et al. Significance of cardiac computed tomography incidental findings in acute chest pain. Am J Med. Jun 2009; 122(6): 543-9. PMID 19486717
20. Machaalany J, Yam Y, Ruddy TD, et al. Potential clinical and economic consequences of noncardiac incidental findings on cardiac computed tomography. J Am Coll Cardiol. Oct 13 2009; 54(16): 1533-41. PMID 19815125
21. Yorgun H, Kaya EB, Hazirolan T, et al. Prevalence of incidental pulmonary findings and early follow-up results in patients undergoing dual-source 64-slice computed tomography coronary angiography. J Comput Assist Tomogr. Mar-Apr 2010; 34(2): 296-301. PMID 20351524
22. Gongora CA, Bavishi C, Uretsky S, et al. Acute chest pain evaluation using coronary computed tomography angiography compared with standard of care: a meta-analysis of randomised clinical trials. Heart. Feb 2018; 104(3): 215-221. PMID 28855273
23. Skelly AC, Hashimoto R, Buckley DI, et al. Noninvasive testing for coronary artery disease (Comparative Effectiveness Review No. 171). Rockville, MD: Agency for Healthcare Research and Quality; 2016.
24. Gray AJ, Roobottom C, Smith JE, et al. Early computed tomography coronary angiography in patients with suspected acute coronary syndrome: randomised controlled trial. BMJ. Sep 29 2021; 374: n2106. PMID 34588162
25. Smulders MW, Kietselaer BLJH, Wildberger JE, et al. Initial Imaging-Guided Strategy Versus Routine Care in Patients With Non-ST-Segment Elevation Myocardial Infarction. J Am Coll Cardiol. Nov 19 2019; 74(20): 2466-2477. PMID 31727284
26. Levsky JM, Haramati LB, Spevack DM, et al. Coronary Computed Tomography Angiography Versus Stress Echocardiography in Acute Chest Pain: A Randomized Controlled Trial. JACC Cardiovasc Imaging. Sep 2018; 11(9): 1288-1297. PMID 29909113
27. Hamilton-Craig C, Fifoot A, Hansen M, et al. Diagnostic performance and cost of CT angiography versus stress ECG--a randomized prospective study of suspected acute coronary syndrome chest pain in the emergency department (CT-COMPARE). Int J Cardiol. Dec 20 2014; 177(3): 867-73. PMID 25466568
28. Linde JJ, Kofoed KF, Sorgaard M, et al. Cardiac computed tomography guided treatment strategy in patients with recent acute-onset chest pain: results from the randomised, controlled trial: CArdiac cT in the treatment of acute CHest pain (CATCH). Int J Cardiol. Oct 15 2013; 168(6): 5257-62. PMID 23998546
29. Litt HI, Gatsonis C, Snyder B, et al. CT angiography for safe discharge of patients with possible acute coronary syndromes. N Engl J Med. Apr 12 2012; 366(15): 1393-403. PMID 22449295
30. Hoffmann U, Truong QA, Schoenfeld DA, et al. Coronary CT angiography versus standard evaluation in acute chest pain. N Engl J Med. Jul 26 2012; 367(4): 299-308. PMID 22830462
31. Goldstein JA, Chinnaiyan KM, Abidov A, et al. The CT-STAT (Coronary Computed Tomographic Angiography for Systematic Triage of Acute Chest Pain Patients to Treatment) trial. J Am Coll Cardiol. Sep 27 2011; 58(14): 1414-22. PMID 21939822
32. Goldstein JA, Gallagher MJ, O'Neill WW, et al. A randomized controlled trial of multi-slice coronary computed tomography for evaluation of acute chest pain. J Am Coll Cardiol. Feb 27 2007; 49(8): 863-71. PMID 17320744
33. Linde JJ, Hove JD, Sorgaard M, et al. Long-Term Clinical Impact of Coronary CT Angiography in Patients With Recent Acute-Onset Chest Pain: The Randomized Controlled CATCH Trial. JACC Cardiovasc Imaging. Dec 2015; 8(12): 1404-1413. PMID 26577263
34. Schlett CL, Banerji D, Siegel E, et al. Prognostic value of CT angiography for major adverse cardiac events in patients with acute chest pain from the emergency department: 2-year outcomes of the ROMICAT trial. JACC Cardiovasc Imaging. May 2011; 4(5): 481-91. PMID 21565735
35. Durand E, Bauer F, Mansencal N, et al. Head-to-head comparison of the diagnostic performance of coronary computed tomography angiography and dobutamine-stress echocardiography in the evaluation of acute chest pain with normal ECG findings and negative troponin tests: A prospective multicenter study. Int J Cardiol. Aug 15 2017; 241: 463-469. PMID 28325613
36. Fihn SD, Gardin JM, Abrams J, et al. 2012 ACCF/AHA/ACP/AATS/PCNA/SCAI/STS Guideline for the diagnosis and management of patients with stable ischemic heart disease: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, and the American College of Physicians, American Association for Thoracic Surgery, Preventive Cardiovascular Nurses Association, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons. J Am Coll Cardiol. Dec 18 2012; 60(24): e44-e164. PMID 23182125
37. Haase R, Schlattmann P, Gueret P, et al. Diagnosis of obstructive coronary artery disease using computed tomography angiography in patients with stable chest pain depending on clinical probability and in clinically important subgroups: meta-analysis of individual patient data. BMJ. Jun 12 2019; 365: l1945. PMID 31189617

38. Nielsen LH, Ortner N, Norgaard BL, et al. The diagnostic accuracy and outcomes after coronary computed tomography angiography vs. conventional functional testing in patients with stable angina pectoris: a systematic review and meta-analysis. Eur Heart J Cardiovasc Imaging. Sep 2014; 15(9): 961-71. PMID 24618659
39. Ollendorf DA, Kuba M, Pearson SD. The diagnostic performance of multi-slice coronary computed tomographic angiography: a systematic review. J Gen Intern Med. Mar 2011; 26(3): 307-16. PMID 21063800
40. Medical Advisory Secretariat. Non-invasive cardiac imaging technologies for the diagnosis of coronary artery disease: a summary of evidence-based analyses. Ont Health Technol Assess Ser. 2010; 10(7): 1-40. PMID 23074410
41. De Campos D, Teixeira R, Saleiro C, et al. Computed tomography coronary angiography as the noninvasive in stable coronary artery disease? Long-term outcomes meta-analysis. Future Cardiol. May 2022; 18(5): 407-416. PMID 35119305
42. Foy AJ, Dhruva SS, Peterson B, et al. Coronary Computed Tomography Angiography vs Functional Stress Testing for Patients With Suspected Coronary Artery Disease: A Systematic Review and Meta-analysis. JAMA Intern Med. Nov 01 2017; 177(11): 1623-1631. PMID 28973101
43. Maurovich-Horvat P, Bosserdt M, Kofoed KF, et al. CT or Invasive Coronary Angiography in Stable Chest Pain. N Engl J Med. Apr 28 2022; 386(17): 1591-1602. PMID 35240010
44. Stillman AE, Gatsonis C, Lima JAC, et al. Coronary Computed Tomography Angiography Compared With Single Photon Emission Computed Tomography Myocardial Perfusion Imaging as a Guide to Optimal Medical Therapy in Patients Presenting With Stable Angina: The RESCUE Trial. J Am Heart Assoc. Dec 15 2020; 9(24): e017993. PMID 33283579
45. Newby DE, Adamson PD, Berry C, et al. Coronary CT Angiography and 5-Year Risk of Myocardial Infarction. N Engl J Med. Sep 06 2018; 379(10): 924-933. PMID 30145934
46. Chang HJ, Lin FY, Gebow D, et al. Selective Referral Using CCTA Versus Direct Referral for Individuals Referred to Invasive Coronary Angiography for Suspected CAD: A Randomized, Controlled, Open-Label Trial. JACC Cardiovasc Imaging. Jul 2019; 12(7 Pt 2): 1303-1312. PMID 30553687
47. Rudzinski PN, Kruk M, Kepka C, et al. The value of Coronary Artery computed Tomography as the first-line anatomical test for stable patients with indications for invasive angiography due to suspected Coronary Artery Disease: CAT-CAD randomized trial. J Cardiovasc Comput Tomogr. Nov 2018; 12(6): 472-479. PMID 30201310
48. Douglas PS, Hoffmann U, Patel MR, et al. Outcomes of anatomical versus functional testing for coronary artery disease. N Engl J Med. Apr 02 2015; 372(14): 1291-300. PMID 25773919
49. Newby D, Williams M, Hunter A, et al. CT coronary angiography in patients with suspected angina due to coronary heart disease (SCOT-HEART): an open-label, parallel-group, multicentre trial. Lancet. Jun 13 2015; 385(9985): 2383-91. PMID 25788230
50. McKavanagh P, Lusk L, Ball PA, et al. A comparison of cardiac computerized tomography and exercise stress electrocardiogram test for the investigation of stable chest pain: the clinical results of the CAPP randomized prospective trial. Eur Heart J Cardiovasc Imaging. Apr 2015; 16(4): 441-8. PMID 25473041
51. Adamson PD, Williams MC, Dweck MR, et al. Guiding Therapy by Coronary CT Angiography Improves Outcomes in Patients With Stable Chest Pain. J Am Coll Cardiol. Oct 22 2019; 74(16): 2058-2070. PMID 31623764
52. Hoffmann U, Ferencik M, Udelson JE, et al. Prognostic Value of Noninvasive Cardiovascular Testing in Patients With Stable Chest Pain: Insights From the PROMISE Trial (Prospective Multicenter Imaging Study for Evaluation of Chest Pain). Circulation. Jun 13 2017; 135(24): 2320-2332. PMID 28389572
53. Williams MC, Hunter A, Shah A, et al. Symptoms and quality of life in patients with suspected angina undergoing CT coronary angiography: a randomised controlled trial. Heart. Jul 2017; 103(13): 995-1001. PMID 28246175
54. Berbarie RF, Dockery WD, Johnson KB, et al. Use of multislice computed tomographic coronary angiography for the diagnosis of anomalous coronary arteries. Am J Cardiol. Aug 01 2006; 98(3): 402-6. PMID 16860032
55. Datta J, White CS, Gilkeson RC, et al. Anomalous coronary arteries in adults: depiction at multi-detector row CT angiography. Radiology. Jun 2005; 235(3): 812-8. PMID 15833984
56. Romano S, Morra A, Del Borrello M, et al. Multi-slice computed tomography and the detection of anomalies of coronary arteries. J Cardiovasc Med (Hagerstown). Feb 2008; 9(2): 187-94. PMID 18192814
57. Schmitt R, Froehner S, Brunn J, et al. Congenital anomalies of the coronary arteries: imaging with contrast-enhanced, multidetector computed tomography. Eur Radiol. Jun 2005; 15(6): 1110-21. PMID 15756551
58. Stein PD, Yaekoub AY, Matta F, et al. 64-slice CT for diagnosis of coronary artery disease: a systematic review. Am J Med. Aug 2008; 121(8): 715-25. PMID 18691486
59. Auguadro C, Manfredi M, Scalise F, et al. Multislice computed tomography for the evaluation of coronary bypass grafts and native coronary arteries: comparison with traditional angiography. J Cardiovasc Med (Hagerstown). Jun 2009; 10(6): 454-60. PMID 19395978
60. Tochii M, Takagi Y, Anno H, et al. Accuracy of 64-slice multidetector computed tomography for diseased coronary artery graft detection. Ann Thorac Surg. Jun 2010; 89(6): 1906-11. PMID 20494047
61. McEvoy JW, Blaha MJ, Nasir K, et al. Impact of coronary computed tomographic angiography results on patient and physician behavior in a low-risk population. Arch Intern Med. Jul 25 2011; 171(14): 1260-8. PMID 21606093
62. Muhlestein JB, Lappe DL, Lima JA, et al. Effect of screening for coronary artery disease using CT angiography on mortality and cardiac events in high-risk patients with diabetes: the FACTOR-64 randomized clinical trial. JAMA. Dec 03 2014; 312(21): 2234-43. PMID 25402757
63. Koshy AN, Ha FJ, Gow PJ, et al. Computed tomographic coronary angiography in risk stratification prior to non-cardiac surgery: a systematic review and meta-analysis. Heart. Sep 2019; 105(17): 1335-1342. PMID 31018953
64. 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: Executive Summary: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. J Am Coll Cardiol. Nov 30 2021; 78(22): 2218-2261. PMID 34756652

65. 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: a report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Failure Society of America, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, and Society of Thoracic Surgeons. J Am Coll Cardiol. Feb 04 2014; 63(4): 380-406. PMID 24355759
66. National Institute for Health and Care Excellence (NICE). Chest pain of recent onset: assessment and diagnosis [CG95]. 2016; https://www.nice.org.uk/guidance/CG95. Accessed August 8, 2022
67. Narula J, Chandrashekhar Y, Ahmadi A, et al. SCCT 2021 Expert Consensus Document on Coronary Computed Tomographic Angiography: A Report of the Society of Cardiovascular Computed Tomography. J Cardiovasc Comput Tomogr. May-Jun 2021; 15(3): 192-217. PMID 33303384

POLICY HISTORY - THIS POLICY WAS APPROVED BY THE FEP® PHARMACY AND MEDICAL POLICY COMMITTEE ACCORDING TO THE HISTORY BELOW:

Date	Action	Description
September 2012	New policy	
March 2014	Replace policy	Policy updated with literature review, references 18, 19, 43, 45-48, 57-59 added, others removed. No change to policy statement.
March 2015	Replace policy	Policy updated with literature review through October 16, 2014; references 21, 23-24, 27, and 64 added; reference 65 updated. No change to policy statements.
March 2016	Replace policy	Policy updated with literature review through October 20, 2015; references 19 and 22-28 added. Medically necessary indication added for stable chest pain.
March 2017	Replace policy	Policy updated with literature review; references 12, and 18-19 added. Requirement for invasive angiography prior to computed tomography angiography removed from the policy statement on anomalous coronary arteries. Policy title changed to "Contrast-Enhanced Coronary Computed Tomography Angiography for Coronary Artery Evaluation€ .
December 2017	Replace policy	Policy updated with literature review through July 21, 2017; references 29 and 31 added; reference 60 updated. Policy statements unchanged.
December 2018	Replace policy	Policy updated with literature review through July 10, 2018; references 12, 14, 21-23, and 28-29 added. Policy statements unchanged.
December 2019	Replace policy	Policy updated with literature review through June 26, 2019; references added. Policy statements unchanged.
December 2020	Replace policy	Policy updated with literature review through July 20, 2020; references added. Edits made to Policy section; statements otherwise unchanged.
December 2021	Replace policy	Policy updated with literature review through July 15, 2021; references added. Policy statements unchanged.
December 2022	Replace policy	Policy updated with literature review through August 1, 2022; references added. Minor editorial refinements to policy statements; intent unchanged.