AmeriHealth Caritas Louisiana

National Imaging Associates, Inc.	
Clinical guidelines **MYOCARDIAL PERFUSION IMAGING** **(aka NUCLEAR CARDIAC IMAGING STUDY)**	**Original Date: October 2009**
CPT Codes: 78451, 78452, 78453, 78454, 78466, 78468, 78469, 78481, 78483, 78499, +0742T	**Last Revised Date: ~~February 2022~~May 2023**
Guideline Number: NIA_CG_024	**Implementation Date: January 202~~3~~4**

GENERAL INFORMATION

- *It is an expectation that all patients receive care/services from a licensed clinician. All appropriate supporting documentation, including recent pertinent office visit notes, laboratory data, and results of any special testing must be provided. If applicable: All prior relevant imaging results~~,~~ and the reason that alternative imaging cannot be performed~~,~~ must be included in the documentation submitted.*
- ***Where a specific clinical indication is not directly addressed in this guideline, medical necessity determination will be made based on widely accepted standard of care criteria. These criteria are supported by evidence-based or peer-reviewed sources such as medical literature, societal guidelines and state/national recommendations.***

This guideline is for stress imaging, specifically myocardial perfusion imaging (MPI), with appropriate preference for suitable alternatives, such as stress echocardiography (SE), when more suitable, unless otherwise stated (refer to Overview ~~section~~).

INDICATIONS for MPI[~~1-4~~1-4]

SUSPECTED CORONARY ARTERY DISEASE (CAD)

- **Symptomatic patients without known CAD (use Diamond Forrester Table)**
  - Low or intermediate pretest probability and unable to exercise *(SE diversion not required)*
  - High pretest probability *(SE diversion not required)*
  - Repeat testing in a patient with new or worsening symptoms and negative result at least one year prior AND meets one of the criteria above
- **Asymptomatic patients without known CAD** *(SE diversion not required)*

---

[*] ~~National Imaging Associates, Inc. (NIA) is a subsidiary of Magellan Healthcare, Inc.~~

- Previously unevaluated ECG evidence of possible myocardial ischemia including ischemic ST segment or T wave abnormalities (see Overview section)
- Previously unevaluated pathologic Q waves (see Overview section)
- Previously unevaluated complete left bundle branch block

ABNORMAL CALCIUM SCORES (CAC)[~~4-8~~4-8]

- ASYMPTOMATIC patient with a calcium score > 400, not previously evaluated
- SYMPTOMATIC patient with prior CAC ≥ 100

INCONCLUSIVE CAD EVALUATION ~~WITHIN THE PAST 2 YEARS~~ AND OBSTRUCTIVE CAD REMAINS A CONCERN

- Exercise stress ECG with low-risk Duke treadmill score (≥5), (see section in Overview) but patient's current symptoms indicate an intermediate or high pretest probability *(SE diversion not required* for high pretest probability)
- Exercise stress ECG with an intermediate Duke treadmill score ***(SE diversion not required* for symptoms consistent with high pretest probability)**
- Intermediate coronary computed tomography angiography (CCTA) (e.g., 40 - 70% lesions)
- Non-diagnostic exercise stress test with inability to achieve target heart rate (THR) *(SE diversion not required)*
- An indeterminate (equivocal, borderline, or discordant) evaluation by prior stress imaging (SE or CMR) ~~within the past 2 years~~ *(SE diversion not required)*
- **Coronary stenosis of unclear significance on previous coronary angiography[4]**

FOLLOW-UP OF PATIENT'S POST CORONARY REVASCULARIZATION (PCI or CABG)[4]

- **Asymptomatic follow-up stress imaging** at a minimum of 2 years post coronary artery bypass grafting (CABG) or percutaneous coronary intervention (PCI) (whichever is later) is appropriate for patients with a history of silent ischemia or a history of a prior left main stent.[4] *(SE diversion not required for CABG)*

  OR

  For patients with high occupational risk, associated with public safety, airline and boat pilots, bus and train drivers, bridge and tunnel workers/toll collectors, police officers and firefighters *(SE diversion not required)*
- **New, recurrent, or worsening symptoms post coronary revascularization** is an indication for stress imaging~~),~~[7], if it will alter management **(SE diversion not required for typical anginal symptoms or symptoms documented to be similar to those prior to revascularization).**

FOLLOW-UP OF KNOWN CAD

- **Follow-up of asymptomatic or stable symptoms** when last invasive or non-invasive assessment of coronary disease showed hemodynamically significant CAD (ischemia on stress test or FFR ≤

0.80 or **significant** stenosis ~~≥ 70% of~~**in** a major vessel~~),~~ **(≥ 50% left main coronary artery or ≥ 70 % LAD, LCX, RCA)),** over two years ago, without intervening coronary revascularization is an appropriate indication for stress imaging in patients if it will alter management

SPECIAL DIAGNOSTIC CONDITIONS REQUIRING CORONARY EVALUATION

- Prior acute coronary syndrome (with documentation in MD notes), without invasive or non-invasive coronary evaluation *(SE diversion not required)*
- Newly diagnosed systolic heart failure or diastolic heart failure, *with reasonable suspicion of cardiac ischemia (prior events, risk factors*), unless invasive coronary angiography is immediately planned *(SE diversion not required)*[~~1, 9-11~~1, 9-11]
- LVEF requiring myocardial viability assessment to assist with decisions regarding coronary revascularization[~~9, 10~~9, 12]
- Ventricular arrhythmias
    - Sustained ventricular tachycardia (VT) > 100 bpm, ventricular fibrillation (VF), or exercise-induced VT, when invasive coronary arteriography is not immediately planned[~~12~~13] *(SE diversion not required)*
    - Nonsustained VT, multiple episodes, each ≥ 3 beats at ≥ 100 bpm, or frequent PVCs (defined as greater than or equal to 30/hour on remote monitoring) without known cause or associated cardiac pathology, when an exercise ECG cannot be performed[~~13~~14]
- Prior to initiation of Class IC antiarrhythmic drug initiation (Propafenone or Flecainide), as well as annually in intermediate and high global risk patients *(SE diversion not required)* [14][5]
- Assessment of hemodynamic significance of one of the following documented conditions:
    - Anomalous coronary arteries[~~15~~16]
    - Myocardial bridging of coronary artery
- Coronary aneurysms in Kawasaki's disease[~~16~~7] or due to atherosclerosis
- Following radiation therapy to the anterior or left chest, at 5 years post initiation and every 5 years thereafter[~~17~~18]
- **Cardiac sarcoidosis: as a combination study with Heart PET for the evaluation and treatment of cardiac sarcoidosis.[19]**
- **Cardiac amyloidosis: for the diagnosis of cardiac transthyretin amyloidosis (ATTR). Not to be used for the diagnosis of cardiac light chain amyloidosis (AL)[20]**

PRIOR TO ELECTIVE NON-CARDIAC SURGERY IN ASYMPTOMATIC PATIENT~~S~~

- An intermediate or high risk surgery with of one or more risk factors (see below), AND documentation of an inability to walk (or <4 METs) AND there has not been an imaging stress test within 1 year[~~18-20~~21-23]
    - **Risk factors:** history of ischemic heart disease, history of congestive heart failure, history of cerebrovascular disease, preoperative treatment with insulin, and preoperative serum creatinine >2.0 mg/dL.
    - **Surgical Risk:**

    - **High risk surgery:** Aortic and other major vascular surgery, peripheral vascular surgery, anticipated prolonged surgical procedures associated with large fluid shifts and/or blood loss
    - **Intermediate risk surgery:** Carotid endarterectomy, head and neck surgery, intraperitoneal and intrathoracic surgery, orthopedic surgery, prostate surgery
    - **Low risk surgery**: Endoscopic procedures, superficial procedure, cataract surgery, breast surgery
- Planning for any organ or stem cell transplantation is an indication for preoperative MPI, if there has not been a conclusive stress evaluation, CTA, or heart catheterization within the past year, at the discretion of the transplant service. ~~3, 21~~3, 24

POST CARDIAC TRANSPLANT *(SE diversion not required)*

- Annually, for the first five years post cardiac transplantation, in a patient not undergoing invasive coronary arteriography
- After the first five years post cardiac transplantation, patients with documented transplant coronary vasculopathy can be screened annually unless invasive coronary arteriography is planned

---

BACKGROUND

This guideline is for stress imaging, specifically myocardial perfusion imaging (MPI), with appropriate preference for alternatives, such as stress echocardiography (SE) or stress ECG alone when more suitable (see section below).

Radionuclide myocardial perfusion imaging (MPI) allows for evaluation of cardiac perfusion at rest and at exercise, as well as using pharmacologic agents for the diagnosis and management of coronary artery disease. With radionuclide MPI, pharmacologic stress may be performed with an inotropic agent or vasodilator. These agents are indicated for patients who cannot reach an adequate endpoint with physical exercise stress testing.~~22~~25

Stable patients without known CAD fall into 2 categories~~1, 3, 4~~1, 3, 4:

- **Asymptomatic**, for whom global risk of CAD events can be determined from coronary risk factors, using calculators available online (see Websites for Global Cardiovascular Risk Calculators section).
- **Symptomatic,** for whom we estimate the pretest probability that their chest-related symptoms are due to clinically significant CAD (below):

The 3 Types of Chest Pain or Discomfort

- **Typical Angina (Definite)** is defined as including all **3** characteristics:
    - Substernal chest pain or discomfort with characteristic quality and duration

    - Provoked by exertion or emotional stress
    - Relieved by rest and/or nitroglycerine
- **Atypical Angina (Probable)** has only **2** of the above characteristics
- **Nonanginal Chest Pain/Discomfort** has only **0 - 1** of the above characteristics

The medical record should provide enough detail to establish the type of chest pain. From those details, The Pretest Probability of obstructive CAD is estimated from the ~~**Diamond Forrester Table**~~**Diamond Forrester Table** below, recognizing that in some cases multiple additional coronary risk factors could increase pretest probability[1, 4]:

~~**Diamond Forrester Table**~~

Diamond Forrester Table Age (Years)	**Gender**	**Typical/Definite Angina Pectoris**	**Atypical/Probable Angina Pectoris**	**Nonanginal Chest Pain**
≤ 39	Men	Intermediate	Intermediate	Low
	Women	Intermediate	Very low	Very low
40–49	Men	High	Intermediate	Intermediate
	Women	Intermediate	Low	Very low
50–59	Men	High	Intermediate	Intermediate
	Women	Intermediate	Intermediate	Low
≥ 60	Men	High	Intermediate	Intermediate
	Women	High	Intermediate	Intermediate

- **Very low:** < 5%pretest probability of CAD, usually not requiring stress evaluation
- **Low:** 5 - 10% pretest probability of CAD
- **Intermediate:** 10% - 90% pretest probability of CAD
- **High:** > 90% pretest probability of CAD

OVERVIEW

MPI may be performed without diversion to a SE in any of the following[~~4, 23~~4, 26]:

- Inability to Exercise
    - Physical limitations precluding ability to exercise for at least 3 full minutes of Bruce protocol
    - Limited functional capacity (< 4 METS) **such as one** of the following:
        - Unable to take care of their ADLs or ambulate
        - Unable to walk 2 blocks on level ground
        - Unable to climb 1 flight of stairs
- Other Comorbidities

    - Severe chronic obstructive pulmonary disease (COPD) with pulmonary function test (PFT) documentation, severe shortness of breath on minimal exertion, or requirement of home oxygen during the day
    - Poorly controlled hypertension, with systolic BP > 180 or diastolic BP > 120 (and clinical urgency not to delay MPI)
- ECG and Echo-Related Baseline Findings
    - Prior cardiac surgery (coronary artery bypass graft or valvular)
    - Documented poor acoustic imaging window
    - Left ventricular ejection fraction ≤ 40%
    - Pacemaker or ICD
    - Persistent atrial fibrillation
    - Resting wall motion abnormalities that would make SE interpretation difficult
    - Complete left bundle branch block (LBBB)
- Risk-Related scenarios
    - High pretest probability in suspected CAD
    - Intermediate or high global risk in patients requiring type IC antiarrhythmic drugs (prior to initiation of therapy and annually)
    - Arrhythmia risk with exercise
- Previously unevaluated pathologic Q waves (in two contiguous leads) defined as the following:
    - > 40 ms (1 mm) wide
    - > 2 mm deep
    - > 25% of depth of QRS complex

ECG Stress Test Alone versus Stress Testing with Imaging

Prominent scenarios suitable for an ECG stress test WITHOUT imaging (i.e., exercise treadmill ECG test) require that the patient can exercise for at least 3 minutes of Bruce protocol with achievement of near maximal heart rate **AND** has an interpretable ECG for ischemia during exercise[4]:

- The (symptomatic) low or intermediate pretest probability patient who can exercise and has an interpretable ECG[4]
- The patient who is under evaluation for exercise-induced arrhythmia
- The patient who requires an entrance stress test ECG for a cardiac rehab program or for an exercise prescription
- For the evaluation of syncope or presyncope during exertion[~~24~~][27]

~~Duke Exercise ECG Treadmill Score~~[~~25~~]Duke Exercise ECG Treadmill Score[28]

Calculates risk from ECG treadmill alone**:**

- 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

An uninterpretable baseline ECG includes[1]:

- ST segment depression 1 mm or more; (not for non-specific ST- T wave changes)
- Ischemic looking T waves; at least 2.5 mm inversions (excluding V1 and V2)
- LVH with repolarization abnormalities, pre-excitation pattern such as WPW, ventricular paced rhythm, or LBBB
- Digitalis use with associated ST segment abnormalities
- Resting HR under 50 bpm on a medication, such as beta-blockers or calcium channel blockers, that is required for patient's treatment and cannot be stopped, with an anticipated suboptimal workload

Global Risk of Cardiovascular Disease

Global risk of CAD is defined as the probability of manifesting cardiovascular disease over the next 10 years and refers to **asymptomatic** patients without known cardiovascular disease. It should be determined using one of the risk calculators below. A high risk is considered greater than a 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 exceptions, such as patients requiring IC antiarrhythmic drugs who might require coronary risk stratification prior to initiation of the drug.

- **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%.

Websites for Global Cardiovascular Risk Calculators*~~26-30~~29-33

~~*Patients who have already manifested cardiovascular disease are already at high global risk and are not applicable to the calculators.~~

Risk Calculator	Websites for Online Calculator
Framingham Cardiovascular Risk	https://reference.medscape.com/calculator/framingham-cardiovascular-disease-risk
Reynolds Risk Score Can use if no diabetes Unique for use of family history	http://www.reynoldsriskscore.org/
Pooled Cohort Equation	http://clincalc.com/Cardiology/ASCVD/PooledCohort.aspx?example
ACC/AHA Risk Calculator	http://tools.acc.org/ASCVD-Risk-Estimator/

MESA Risk Calculator With addition of Coronary Artery Calcium Score, for CAD-only risk	https://www.mesa-nhlbi.org/MESACHDRisk/MesaRiskScore/RiskScore.aspx

*Patients who have already manifested cardiovascular disease are already at high global risk and are not applicable to the calculators.

Definitions of Coronary Artery Disease~~1, 3, 6, 31~~1, 3, 6, 34

Percentage stenosis refers to the reduction in diameter stenosis when angiography is the method and can be estimated or measured using angiography or more accurately measured with intravascular ultrasound (IVUS).

- Coronary artery calcification is a marker of risk, as measured by Agatston score on coronary artery calcium imaging. Its incorporation into global risk can be achieved by using the MESA risk calculator.
- Ischemia-producing disease (also called hemodynamically or functionally significant disease, for which revascularization might be appropriate) generally implies at least one of the following:
  - Suggested by percentage diameter stenosis ≥ 70% by angiography; intermediate lesions are 50 – 69%~~32~~35
  - For a left main artery, suggested by a percentage stenosis ≥ 50~~%~~% ~~1, 31, 33~~1, 36, 37
  - FFR (fractional flow reserve) ≤ 0.80 for a major vessel~~31, 33~~36, 37
  - Demonstrable ischemic findings on stress testing (ECG or stress imaging), that are at least mild in degree
- FFR (fractional flow reserve) is the distal to proximal pressure ratio across a coronary lesion. Less than or equal to 0.80 is considered a significant reduction in coronary flow.

Anginal Equivalent~~1, 24~~1, 27

Development of an anginal equivalent (e.g., shortness of breath, fatigue, or weakness) either with or without prior coronary revascularization should be based upon the documentation of reasons to suspect that symptoms other than chest discomfort are not due to other organ systems (e.g., dyspnea due to lung disease, fatigue due to anemia). This may include respiratory rate, oximetry, lung exam, etc. (as well as d-dimer, chest CT(A), and/or PFTs, when appropriate), and then incorporated into the evaluation of coronary artery disease as would chest discomfort. Syncope per se is not an anginal equivalent.

Abbreviations

ADLs	Activities of daily living
BSA	Body surface area in square meters
CABG	Coronary artery bypass grafting
CAD	Coronary artery disease
CMR	Cardiac magnetic resonance imaging
CTA	Computed tomography angiography
ECG	Electrocardiogram
FFR	Fractional flow reserve
IVUS	Intravascular ultrasound
LBBB	Left bundle-branch block
LVEF	Left ventricular ejection fraction
LVH	Left ventricular hypertrophy
MI	Myocardial infarction
MET	Estimated metabolic equivalent of exercise
MPI	Myocardial perfusion imaging
PCI	Percutaneous coronary intervention
PFT	Pulmonary function test
PVCs	Premature ventricular contractions
SE	Stress echocardiography
THR	Target heart rate
VT	Ventricular tachycardia
VF	Ventricular fibrillation
WPW	Wolf Parkinson White

REFERENCES

1. 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. *Circulation*. Dec 18 2012;126(25):e354-471. doi:10.1161/CIR.0b013e318277d6a0
2. Hendel RC, Berman DS, Di Carli MF, et al. ACCF/ASNC/ACR/AHA/ASE/SCCT/SCMR/SNM 2009 Appropriate Use Criteria for Cardiac Radionuclide Imaging: A Report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, the American Society of Nuclear Cardiology, the American College of Radiology, the American Heart Association, the American Society of Echocardiography, the Society of Cardiovascular Computed Tomography, the Society for Cardiovascular Magnetic Resonance, and the Society of Nuclear Medicine. *J Am Coll Cardiol*. Jun 9 2009;53(23):2201-29. doi:10.1016/j.jacc.2009.02.013
3. Montalescot G, Sechtem U, Achenbach S, et al. 2013 ESC guidelines on the management of stable coronary artery disease: the Task Force on the management of stable coronary artery disease of the European Society of Cardiology. *Eur Heart J*. Oct 2013;34(38):2949-3003. doi:10.1093/eurheartj/eht296
4. 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 4 2014;63(4):380-406. doi:10.1016/j.jacc.2013.11.009
5. Gulati M, Levy PD, Mukherjee D, et al. 2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR Guideline for the Evaluation and Diagnosis of Chest Pain: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *J Cardiovasc Comput Tomogr*. Dec 01 2021;doi:10.1016/j.jcct.2021.11.009
6. Patel MR, Calhoon JH, Dehmer GJ, et al. ACC/AATS/AHA/ASE/ASNC/SCAI/SCCT/STS 2017 Appropriate Use Criteria for Coronary Revascularization in Patients With Stable Ischemic Heart Disease: A Report of the American College of Cardiology Appropriate Use Criteria Task Force, American Association for Thoracic Surgery, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, and Society of Thoracic Surgeons. *J Am Coll Cardiol*. May 2 2017;69(17):2212-2241. doi:10.1016/j.jacc.2017.02.001
7. Budoff MJ, Raggi P, Beller GA, et al. Noninvasive Cardiovascular Risk Assessment of the Asymptomatic Diabetic Patient: The Imaging Council of the American College of Cardiology. *JACC Cardiovasc Imaging*. Feb 2016;9(2):176-92. doi:10.1016/j.jcmg.2015.11.011

8. Aguilar-Salinas CA, Rojas R, Gomez-Perez FJ, et al. Analysis of the agreement between the World Health Organization criteria and the National Cholesterol Education Program-III definition of the metabolic syndrome: results from a population-based survey. *Diabetes Care*. May 2003;26(5):1635.
9. Patel MR, White RD, Abbara S, et al. 2013 ACCF/ACR/ASE/ASNC/SCCT/SCMR appropriate utilization of cardiovascular imaging in heart failure: a joint report of the American College of Radiology Appropriateness Criteria Committee and the American College of Cardiology Foundation Appropriate Use Criteria Task Force. *J Am Coll Cardiol*. May 28 2013;61(21):2207-31. doi:10.1016/j.jacc.2013.02.005
10. Yancy CW, Jessup M, Bozkurt B, et al. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol*. Oct 15 2013;62(16):e147-239. doi:10.1016/j.jacc.2013.05.019
11. Doherty John U, Kort S, Mehran R, et al. ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2019 Appropriate Use Criteria for Multimodality Imaging in the Assessment of Cardiac Structure and Function in Nonvalvular Heart Disease. *Journal of the American College of Cardiology*. 2019/02/05 2019;73(4):488-516. doi:10.1016/j.jacc.2018.10.038
12. Heidenreich PA, Bozkurt B, Aguilar D, et al. 2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure: Executive Summary: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation*. May 3 2022;145(18):e876-e894. doi:10.1161/cir.0000000000001062
13. Al-Khatib SM, Stevenson WG, Ackerman MJ, et al. 2017 AHA/ACC/HRS Guideline for Management of Patients With Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. *J Am Coll Cardiol*. Oct 2 2018;72(14):e91-e220. doi:10.1016/j.jacc.2017.10.054
14. Zimetbaum PJ, Wylie JV. Nonsustained ventricular tachycardia: Clinical manifestations, evaluation, and management. Wolters Kluwer. Updated August 26, 2022. Accessed February 2, 2023. https://www.uptodate.com/contents/nonsustained-ventricular-tachycardia-clinical-manifestations-evaluation-and-management
15. Reiffel JA, Camm AJ, Belardinelli L, et al. The HARMONY Trial: Combined Ranolazine and Dronedarone in the Management of Paroxysmal Atrial Fibrillation: Mechanistic and Therapeutic Synergism. *Circ Arrhythm Electrophysiol*. Oct 2015;8(5):1048-56. doi:10.1161/circep.115.002856
16. Gräni C, Buechel RR, Kaufmann PA, Kwong RY. Multimodality Imaging in Individuals With Anomalous Coronary Arteries. *JACC Cardiovasc Imaging*. Apr 2017;10(4):471-481. doi:10.1016/j.jcmg.2017.02.004
17. Newburger JW, Takahashi M, Burns JC. Kawasaki Disease. *J Am Coll Cardiol*. Apr 12 2016;67(14):1738-49. doi:10.1016/j.jacc.2015.12.073
18. Lancellotti P, Nkomo VT, Badano LP, et al. Expert consensus for multi-modality imaging evaluation of cardiovascular complications of radiotherapy in adults: a report from the European Association of Cardiovascular Imaging and the American Society of Echocardiography. *Eur Heart J Cardiovasc Imaging*. Aug 2013;14(8):721-40. doi:10.1093/ehjci/jet123

19. Skali H, Schulman AR, Dorbala S. 18F-FDG PET/CT for the assessment of myocardial sarcoidosis. *Curr Cardiol Rep*. Apr 2013;15(4):352.
20. Gillmore JD, Maurer MS, Falk RH, et al. Nonbiopsy Diagnosis of Cardiac Transthyretin Amyloidosis. *Circulation*. Jun 14 2016;133(24):2404-12. doi:10.1161/circulationaha.116.021612
21. Kristensen SD, Knuuti J, Saraste A, et al. 2014 ESC/ESA Guidelines on non-cardiac surgery: cardiovascular assessment and management: The Joint Task Force on non-cardiac surgery: cardiovascular assessment and management of the European Society of Cardiology (ESC) and the European Society of Anaesthesiology (ESA). *Eur Heart J*. Sep 14 2014;35(35):2383-431. doi:10.1093/eurheartj/ehu282
22. Fleisher LA, Fleischmann KE, Auerbach AD, et al. 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: a report of the American College of Cardiology/American Heart Association Task Force on practice guidelines. *J Am Coll Cardiol*. Dec 09 2014;64(22):e77-137. doi:10.1016/j.jacc.2014.07.944
23. Velasco A, Reyes E, Hage FG. Guidelines in review: Comparison of the 2014 ACC/AHA guidelines on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery and the 2014 ESC/ESA guidelines on noncardiac surgery: Cardiovascular assessment and management. *J Nucl Cardiol*. 02 2017;24(1):165-170. doi:10.1007/s12350-016-0643-8
24. Lentine KL, Costa SP, Weir MR, et al. Cardiac disease evaluation and management among kidney and liver transplantation candidates: a scientific statement from the American Heart Association and the American College of Cardiology Foundation. *J Am Coll Cardiol*. Jul 31 2012;60(5):434-80. doi:10.1016/j.jacc.2012.05.008
25. Pagnanelli RA, Camposano HL. Pharmacologic Stress Testing with MyocardialPerfusion Imaging. *J Nucl Med Technol*. Dec 2017;45(4):249-252. doi:10.2967/jnmt.117.199208
26. Henzlova MJ, Duvall WL, Einstein AJ, Travin MI, Verberne HJ. ASNC imaging guidelines for SPECT nuclear cardiology procedures: Stress, protocols, and tracers. *J Nucl Cardiol*. Jun 2016;23(3):606-39. doi:10.1007/s12350-015-0387-x
27. Shen WK, Sheldon RS, Benditt DG, et al. 2017 ACC/AHA/HRS Guideline for the Evaluation and Management of Patients With Syncope: Executive Summary: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. *J Am Coll Cardiol*. Aug 1 2017;70(5):620-663. doi:10.1016/j.jacc.2017.03.002
28. Mark DB, Hlatky MA, Harrell FE, Jr., Lee KL, Califf RM, Pryor DB. Exercise treadmill score for predicting prognosis in coronary artery disease. *Ann Intern Med*. Jun 1987;106(6):793-800. doi:10.7326/0003-4819-106-6-793
29. McClelland RL, Jorgensen NW, Budoff M, et al. 10-Year Coronary Heart Disease Risk Prediction Using Coronary Artery Calcium and Traditional Risk Factors: Derivation in the MESA (Multi-Ethnic Study of Atherosclerosis) With Validation in the HNR (Heinz Nixdorf Recall) Study and the DHS (Dallas Heart Study). *J Am Coll Cardiol*. Oct 13 2015;66(15):1643-53. doi:10.1016/j.jacc.2015.08.035
30. Arnett DK, Blumenthal RS, Albert MA, et al. 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *J Am Coll Cardiol*. Sep 10 2019;74(10):e177-e232. doi:10.1016/j.jacc.2019.03.010

31. D'Agostino RB, Sr., Vasan RS, Pencina MJ, et al. General cardiovascular risk profile for use in primary care: the Framingham Heart Study. *Circulation*. Feb 12 2008;117(6):743-53. doi:10.1161/circulationaha.107.699579
32. Goff DC, Jr., Lloyd-Jones DM, Bennett G, et al. 2013 ACC/AHA guideline on the assessment of cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation*. Jun 24 2014;129(25 Suppl 2):S49-73. doi:10.1161/01.cir.0000437741.48606.98
33. Ridker PM, Buring JE, Rifai N, Cook NR. Development and validation of improved algorithms for the assessment of global cardiovascular risk in women: the Reynolds Risk Score. *Jama*. Feb 14 2007;297(6):611-9. doi:10.1001/jama.297.6.611
34. Mintz G. IVUS in PCI Guidance. American College of Cardiology. Updated June 13, 2016. Accessed January 27, 2023. https://www.acc.org/latest-in-cardiology/articles/2016/06/13/10/01/ivus-in-pci-guidance
35. Patel MR, Bailey SR, Bonow RO, et al. ACCF/SCAI/AATS/AHA/ASE/ASNC/HFSA/HRS/SCCM/SCCT/SCMR/STS 2012 appropriate use criteria for diagnostic catheterization: a report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, Society for Cardiovascular Angiography and Interventions, American Association for Thoracic Surgery, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Failure Society of America, Heart Rhythm Society, Society of Critical Care Medicine, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, Society of Thoracic Surgeons. *J Thorac Cardiovasc Surg*. Jul 2012;144(1):39-71. doi:10.1016/j.jtcvs.2012.04.013
36. Mintz G. IVUS in PCI Guidance. American College of Cardiology. Updated June 13, 2016. Accessed October 22, 2021. https://www.acc.org/latest-in-cardiology/articles/2016/06/13/10/01/ivus-in-pci-guidance
37. Lotfi A, Davies JE, Fearon WF, Grines CL, Kern MJ, Klein LW. Focused update of expert consensus statement: Use of invasive assessments of coronary physiology and structure: A position statement of the society of cardiac angiography and interventions. *Catheter Cardiovasc Interv*. Aug 1 2018;92(2):336-347. doi:10.1002/ccd.27672

POLICY HISTORY

Date	Summary
May 2023	• Removed time limitation "within past two years" for further evaluation inconclusive prior CAD evaluation • Added coronary stenosis of unclear significance on coronary angiography • Clarified indication for combination PET/MPI in evaluation of cardiac sarcoidosis • Added indication for diagnosis of ATTR amyloidosis • Added statement on clinical indications not addressed in this guideline
February 2022	• Moved the sentence regarding utilization of suitable alternatives such as Stress Echocardiography to the General Information section • Placed Link to Overview Section in General Information • Clarified evaluation of possible ischemia in newly diagnosed heart failure by stating "with reasonable suspicion of cardiac ischemia (prior events, risk factors, or symptoms and signs)" • Clarified "intermediate lesions are 50-69%" for ischemia-producing disease • Added stress imaging approval for calcium score > 100 with low to intermediate probability symptoms • Deleted the requirement for diabetes when calcium score > 400 for stress imaging • Deleted "≤50%" from "LVEF ≤50% requiring myocardial viability assessment to assist with decisions regarding coronary revascularization" • Added Calcium score section: ○ Added stress imaging approval for calcium score > 100 with symptoms consistent with low to intermediate pretest probability • Added reminder *(SE diversion not required for CABG)* • Changed preoperative guideline to include intermediate risk surgery with one or more risk factors AND documentation of an inability to walk (or <4 METs) AND there has not been an imaging stress test within 1 year • Changed solid organ transplant guideline to include stem cell transplant and "any" organ transplant • Added definition of surgical risk to preop guidelines • In Background section clarified the requirement for description of chest pain by adding sentence "The medical record should provide enough detail to establish the type of chest pain." • Added definition of Q waves

	• Deleted sentence regarding calcium scoring within the Global Risk Section • Deleted sentence regarding using calcium score solely for risk stratification • Deleted IFR references
~~March 2021~~	~~• Wording changes for low and intermediate pretest probability patients~~ ~~• Added annual studies for patients on Flecainide~~ ~~• Added indication for Ca score in diabetic > 40 and calcium score > 400 with reference added~~ ~~• Removed BMI > 40 as indication for MPI~~
~~March 2020~~	~~• Added general information section as Introduction which outlines requirements for documentation of pertinent office notes by a licensed clinician, and inclusion of laboratory testing and relevant imaging results for case review~~ ~~• Added clarification of repeat testing in a patient with new or worsening symptoms and negative result at least one year prior to include the statement "AND meets one of the criteria above"~~ ~~• Added clarification of frequent PVCs under ventricular arrhythmias which states defined as greater than or equal to 30/hour to include "on remote monitoring"~~ ~~• Edited indication of planning for solid organ transplantation to remove the requirement of limited functional capacity but maintaining requirement of ≥ 3 listed risk factors~~ ~~• Removed explanation of three vasodilators approved for stress testing from the background~~ ~~• Added edits to the Coronary Artery disease coronary artery disease definition section~~ ~~• Updated and added new references~~ ~~•~~
~~July 2019~~	~~• For special diagnostic consideration, prior acute coronary syndrome (as documented in MD notes), the following clause was added: 'without subsequent invasive or non-invasive coronary evaluation (SE diversion not required)'~~ ~~• For section on prior to elective non-cardiac surgery the following was added: 'There has not been a conclusive stress evaluation, CTA, or heart catheterization within the past year'~~ ~~• For section on prior to elective non-cardiac surgery indication 'Planning for solid organ transplantation is an indication for preoperative MPI, if there has not been a conclusive stress evaluation, CTA, or heart catheterization within the past year'~~

	~~• Added indication for follow-up every 2 years for patients with known CAD in high-risk occupations~~ ~~• Added prior left main stent in asymptomatic patients as follow-up every two years~~ ~~• Clarification of diversion to stress echo in suitable patients' post-revascularization~~ ~~• Clarification of post cardiac transplant~~ ~~• Removed section on Global Risk Calculator~~ ~~• Added "with EKGECG changes," as indication for stress echo in patients on digoxin or with LVH~~ ~~• Removed indication for ETT in asymptomatic patients~~ ~~• Added presyncope and syncope with exercise as an indication for ETT~~ ~~•~~

~~REFERENCES~~

~~1. 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. *Circulation*. Dec 18 2012;126(25):e354-471. doi:10.1161/CIR.0b013e318277d6a0~~

~~2. Hendel RC, Berman DS, Di Carli MF, et al. ACCF/ASNC/ACR/AHA/ASE/SCCT/SCMR/SNM 2009 Appropriate Use Criteria for Cardiac Radionuclide Imaging: A Report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, the American Society of Nuclear Cardiology, the American College of Radiology, the American Heart Association, the American Society of Echocardiography, the Society of Cardiovascular Computed Tomography, the Society for Cardiovascular Magnetic Resonance, and the Society of Nuclear Medicine. *J Am Coll Cardiol*. Jun 9 2009;53(23):2201-29. doi:10.1016/j.jacc.2009.02.013~~

~~3. Montalescot G, Sechtem U, Achenbach S, et al. 2013 ESC guidelines on the management of stable coronary artery disease: the Task Force on the management of stable coronary artery disease of the European Society of Cardiology. *Eur Heart J*. Oct 2013;34(38):2949-3003. doi:10.1093/eurheartj/eht296~~

~~4. 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 4 2014;63(4):380-406. doi:10.1016/j.jacc.2013.11.009~~

~~5. Gulati M, Levy PD, Mukherjee D, et al. 2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR Guideline for the Evaluation and Diagnosis of Chest Pain: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *J Cardiovasc Comput Tomogr*. Dec 01 2021;doi:10.1016/j.jcct.2021.11.009~~

~~6. Patel MR, Calhoon JH, Dehmer GJ, et al. ACC/AATS/AHA/ASE/ASNC/SCAI/SCCT/STS 2017 Appropriate Use Criteria for Coronary Revascularization in Patients With Stable Ischemic Heart Disease: A Report of the American College of Cardiology Appropriate Use Criteria Task Force, American Association for Thoracic Surgery, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, and Society of Thoracic Surgeons. *J Am Coll Cardiol*. May 2 2017;69(17):2212-2241. doi:10.1016/j.jacc.2017.02.001~~

~~7. Budoff MJ, Raggi P, Beller GA, et al. Noninvasive Cardiovascular Risk Assessment of the Asymptomatic Diabetic Patient: The Imaging Council of the American College of Cardiology. *JACC Cardiovasc Imaging*. Feb 2016;9(2):176-92. doi:10.1016/j.jcmg.2015.11.011~~

8. Aguilar-Salinas CA, Rojas R, Gomez-Perez FJ, et al. Analysis of the agreement between the World Health Organization criteria and the National Cholesterol Education Program-III definition of the metabolic syndrome: results from a population-based survey. *Diabetes Care*. May 2003;26(5):1635.
9. Patel MR, White RD, Abbara S, et al. 2013 ACCF/ACR/ASE/ASNC/SCCT/SCMR appropriate utilization of cardiovascular imaging in heart failure: a joint report of the American College of Radiology Appropriateness Criteria Committee and the American College of Cardiology Foundation Appropriate Use Criteria Task Force. *J Am Coll Cardiol*. May 28 2013;61(21):2207-31. doi:10.1016/j.jacc.2013.02.005
10. Yancy CW, Jessup M, Bozkurt B, et al. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol*. Oct 15 2013;62(16):e147-239. doi:10.1016/j.jacc.2013.05.019
11. Doherty John U, Kort S, Mehran R, et al. ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2019 Appropriate Use Criteria for Multimodality Imaging in the Assessment of Cardiac Structure and Function in Nonvalvular Heart Disease. *Journal of the American College of Cardiology*. 2019/02/05 2019;73(4):488-516. doi:10.1016/j.jacc.2018.10.038
12. Al-Khatib SM, Stevenson WG, Ackerman MJ, et al. 2017 AHA/ACC/HRS Guideline for Management of Patients With Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. *J Am Coll Cardiol*. Oct 2 2018;72(14):e91-e220. doi:10.1016/j.jacc.2017.10.054
13. Zimetbaum PJ, Wylie JV. Nonsustained ventricular tachycardia: Clinical manifestations, evaluation, and management. Wolters Kluwer. Updated August 21, 2019. Accessed October 29, 2021. https://www.uptodate.com/contents/nonsustained-ventricular-tachycardia-clinical-manifestations-evaluation-and-management
14. Reiffel JA, Camm AJ, Belardinelli L, et al. The HARMONY Trial: Combined Ranolazine and Dronedarone in the Management of Paroxysmal Atrial Fibrillation: Mechanistic and Therapeutic Synergism. *Circ Arrhythm Electrophysiol*. Oct 2015;8(5):1048-56. doi:10.1161/circep.115.002856
15. Gräni C, Buechel RR, Kaufmann PA, Kwong RY. Multimodality Imaging in Individuals With Anomalous Coronary Arteries. *JACC Cardiovasc Imaging*. Apr 2017;10(4):471-481. doi:10.1016/j.jcmg.2017.02.004
16. Newburger JW, Takahashi M, Burns JC. Kawasaki Disease. *J Am Coll Cardiol*. Apr 12 2016;67(14):1738-49. doi:10.1016/j.jacc.2015.12.073
17. Lancellotti P, Nkomo VT, Badano LP, et al. Expert consensus for multi-modality imaging evaluation of cardiovascular complications of radiotherapy in adults: a report from the European Association of Cardiovascular Imaging and the American Society of Echocardiography. *Eur Heart J Cardiovasc Imaging*. Aug 2013;14(8):721-40. doi:10.1093/ehjci/jet123
18. Kristensen SD, Knuuti J, Saraste A, et al. 2014 ESC/ESA Guidelines on non-cardiac surgery: cardiovascular assessment and management: The Joint Task Force on non-cardiac surgery: cardiovascular assessment and management of the European Society of Cardiology (ESC) and the European Society of Anaesthesiology (ESA). *Eur Heart J*. Sep 14 2014;35(35):2383-431. doi:10.1093/eurheartj/ehu282

19. Fleisher LA, Fleischmann KE, Auerbach AD, et al. 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: a report of the American College of Cardiology/American Heart Association Task Force on practice guidelines. *J Am Coll Cardiol*. Dec 09 2014;64(22):e77-137. doi:10.1016/j.jacc.2014.07.944
20. Velasco A, Reyes E, Hage FG. Guidelines in review: Comparison of the 2014 ACC/AHA guidelines on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery and the 2014 ESC/ESA guidelines on noncardiac surgery: Cardiovascular assessment and management. *J Nucl Cardiol*. 02 2017;24(1):165-170. doi:10.1007/s12350-016-0643-8
21. Lentine KL, Costa SP, Weir MR, et al. Cardiac disease evaluation and management among kidney and liver transplantation candidates: a scientific statement from the American Heart Association and the American College of Cardiology Foundation. *J Am Coll Cardiol*. Jul 31 2012;60(5):434-80. doi:10.1016/j.jacc.2012.05.008
22. Pagnanelli RA, Camposano HL. Pharmacologic Stress Testing with MyocardialPerfusion Imaging. *J Nucl Med Technol*. Dec 2017;45(4):249-252. doi:10.2967/jnmt.117.199208
23. Henzlova MJ, Duvall WL, Einstein AJ, Travin MI, Verberne HJ. ASNC imaging guidelines for SPECT nuclear cardiology procedures: Stress, protocols, and tracers. *J Nucl Cardiol*. Jun 2016;23(3):606-39. doi:10.1007/s12350-015-0387-x
24. Shen WK, Sheldon RS, Benditt DG, et al. 2017 ACC/AHA/HRS Guideline for the Evaluation and Management of Patients With Syncope: Executive Summary: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. *J Am Coll Cardiol*. Aug 1 2017;70(5):620-663. doi:10.1016/j.jacc.2017.03.002
25. Mark DB, Hlatky MA, Harrell FE, Jr., Lee KL, Califf RM, Pryor DB. Exercise treadmill score for predicting prognosis in coronary artery disease. *Ann Intern Med*. Jun 1987;106(6):793-800. doi:10.7326/0003-4819-106-6-793
26. McClelland RL, Jorgensen NW, Budoff M, et al. 10-Year Coronary Heart Disease Risk Prediction Using Coronary Artery Calcium and Traditional Risk Factors: Derivation in the MESA (Multi-Ethnic Study of Atherosclerosis) With Validation in the HNR (Heinz Nixdorf Recall) Study and the DHS (Dallas Heart Study). *J Am Coll Cardiol*. Oct 13 2015;66(15):1643-53. doi:10.1016/j.jacc.2015.08.035
27. Arnett DK, Blumenthal RS, Albert MA, et al. 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *J Am Coll Cardiol*. Sep 10 2019;74(10):e177-e232. doi:10.1016/j.jacc.2019.03.010
28. D'Agostino RB, Sr., Vasan RS, Pencina MJ, et al. General cardiovascular risk profile for use in primary care: the Framingham Heart Study. *Circulation*. Feb 12 2008;117(6):743-53. doi:10.1161/circulationaha.107.699579
29. Goff DC, Jr., Lloyd-Jones DM, Bennett G, et al. 2013 ACC/AHA guideline on the assessment of cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation*. Jun 24 2014;129(25 Suppl 2):S49-73. doi:10.1161/01.cir.0000437741.48606.98
30. Ridker PM, Buring JE, Rifai N, Cook NR. Development and validation of improved algorithms for the assessment of global cardiovascular risk in women: the Reynolds Risk Score. *Jama*. Feb 14 2007;297(6):611-9. doi:10.1001/jama.297.6.611

31. Mintz G. IVUS in PCI Guidance. American College of Cardiology. Updated June 13, 2016. Accessed October 22, 2021. https://www.acc.org/latest-in-cardiology/articles/2016/06/13/10/01/ivus-in-pci-guidance
32. Patel MR, Bailey SR, Bonow RO, et al. ACCF/SCAI/AATS/AHA/ASE/ASNC/HFSA/HRS/SCCM/SCCT/SCMR/STS 2012 appropriate use criteria for diagnostic catheterization: a report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, Society for Cardiovascular Angiography and Interventions, American Association for Thoracic Surgery, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Failure Society of America, Heart Rhythm Society, Society of Critical Care Medicine, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, Society of Thoracic Surgeons. *J Thorac Cardiovasc Surg*. Jul 2012;144(1):39-71. doi:10.1016/j.jtcvs.2012.04.013
33. Lotfi A, Davies JE, Fearon WF, Grines CL, Kern MJ, Klein LW. Focused update of expert consensus statement: Use of invasive assessments of coronary physiology and structure: A position statement of the society of cardiac angiography and interventions. *Catheter Cardiovasc Interv*. Aug 1 2018;92(2):336-347. doi:10.1002/ccd.27672

ADDITIONAL RESOURCES

1. Badano LP, Miglioranza MH, Edvardsen T, et al. European Association of Cardiovascular Imaging/Cardiovascular Imaging Department of the Brazilian Society of Cardiology recommendations for the use of cardiac imaging to assess and follow patients after heart transplantation. *Eur Heart J Cardiovasc Imaging*. Sep 2015;16(9):919-48. doi:10.1093/ehjci/jev139
2. Lee GK, Klarich KW, Grogan M, Cha YM. Premature ventricular contraction-induced cardiomyopathy: a treatable condition. *Circ Arrhythm Electrophysiol*. Feb 2012;5(1):229-36. doi:10.1161/circep.111.963348
3. Davies JE, Sen S, Dehbi HM, et al. Use of the Instantaneous Wave-free Ratio or Fractional Flow Reserve in PCI. *N Engl J Med*. May 11 2017;376(19):1824-1834. doi:10.1056/NEJMoa1700445
4. Denby KJ, Clark DE, Markham LW. Management of Kawasaki disease in adults. *Heart*. Nov 2017;103(22):1760-1769. doi:10.1136/heartjnl-2017-311774
5. Douglas PS, Garcia MJ, Haines DE, et al. ACCF/ASE/AHA/ASNC/HFSA/HRS/SCAI/SCCM/SCCT/SCMR 2011 Appropriate Use Criteria for Echocardiography. A Report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, American Society of Echocardiography, American Heart Association, American Society of Nuclear Cardiology, Heart Failure Society of America, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Critical Care Medicine, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance American College of Chest Physicians. *J Am Soc Echocardiogr*. Mar 2011;24(3):229-67. doi:10.1016/j.echo.2010.12.008
6. Einstein AJ. Effects of radiation exposure from cardiac imaging: how good are the data? *J Am Coll Cardiol*. Feb 7 2012;59(6):553-65. doi:10.1016/j.jacc.2011.08.079

7. Fleisher LA, Fleischmann KE, Auerbach AD, et al. 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: a report of the American College of Cardiology/American Heart Association Task Force on practice guidelines. *J Am Coll Cardiol*. Dec 9 2014;64(22):e77-137. doi:10.1016/j.jacc.2014.07.944
8. Gerhard-Herman MD, Gornik HL, Barrett C, et al. 2016 AHA/ACC Guideline on the Management of Patients With Lower Extremity Peripheral Artery Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *J Am Coll Cardiol*. Mar 21 2017;69(11):e71-e126. doi:10.1016/j.jacc.2016.11.007
9. Götberg M, Christiansen EH, Gudmundsdottir IJ, et al. Instantaneous Wave-free Ratio versus Fractional Flow Reserve to Guide PCI. *N Engl J* Med. May 11 2017;376(19):1813-1823. doi:10.1056/NEJMoa1616540
10. Hirshfeld JW, Jr., Ferrari VA, Bengel FM, et al. 2018 ACC/HRS/NASCI/SCAI/SCCT Expert Consensus Document on Optimal Use of Ionizing Radiation in Cardiovascular Imaging-Best Practices for Safety and Effectiveness, Part 1: Radiation Physics and Radiation Biology: A Report of the American College of Cardiology Task Force on Expert Consensus Decision Pathways Developed in Collaboration With Mended Hearts. *Catheter Cardiovasc Interv*. Aug 1 2018;92(2):203-221. doi:10.1002/ccd.27660
11. McCrindle BW, Rowley AH, Newburger JW, et al. Diagnosis, Treatment, and Long-Term Management of Kawasaki Disease: A Scientific Statement for Health Professionals From the American Heart Association. *Circulation*. Apr 25 2017;135(17):e927-e999. doi:10.1161/cir.0000000000000484
12. Patel AY, Eagle KA, Vaishnava P. Cardiac risk of noncardiac surgery. *J Am Coll Cardiol*. Nov 10 2015;66(19):2140-2148. doi:10.1016/j.jacc.2015.09.026
13. Patel MR, Bailey SR, Bonow RO, et al. ACCF/SCAI/AATS/AHA/ASE/ASNC/HFSA/HRS/SCCM/SCCT/SCMR/STS 2012 appropriate use criteria for diagnostic catheterization: a report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, Society for Cardiovascular Angiography and Interventions, American Association for Thoracic Surgery, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Failure Society of America, Heart Rhythm Society, Society of Critical Care Medicine, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, and Society of Thoracic Surgeons. *J Am Coll Cardiol*. May 29 2012;59(22):1995-2027. doi:10.1016/j.jacc.2012.03.003
14. Pellikka PA, Nagueh SF, Elhendy AA, Kuehl CA, Sawada SG. American Society of Echocardiography recommendations for performance, interpretation, and application of stress echocardiography. *J Am Soc Echocardiogr*. Sep 2007;20(9):1021-41. doi:10.1016/j.echo.2007.07.003
15. Scott-Moncrieff A, Yang J, Levine D, et al. Real-world estimated effective radiation doses from commonly used cardiac testing and procedural modalities. *Can J Cardiol*. Sep-Oct 2011;27(5):613-8. doi:10.1016/j.cjca.2011.01.011
16. Tang K, Wang L, Shi R, et al. The role of myocardial perfusion imaging in evaluating patients with myocardial bridging. *J Nucl Cardiol*. Feb 2011;18(1):117-22. doi:10.1007/s12350-010-9303-6
17. Yao SS, Qureshi E, Sherrid MV, Chaudhry FA. Practical applications in stress echocardiography: risk stratification and prognosis in patients with known or suspected ischemic heart disease. *J Am Coll Cardiol*. Sep 17 2003;42(6):1084-90. doi:10.1016/s0735-1097(03)00923-9

~~18. Zhang Y, Li X, Segars WP, Samei E. Comparison of patient specific dose metrics between chest radiography, tomosynthesis, and CT for adult patients of wide ranging body habitus. *Med Phys*. 2014;41(2):023901-023901. doi:10.1118/1.4859315~~

Reviewed / Approved by NIA Clinical Guideline Committee

~~**Disclaimer:** Magellan Healthcare service authorization policies do not constitute medical advice and are not intended to govern or otherwise influence the practice of medicine. These policies are not meant to supplant your normal procedures, evaluation, diagnosis, treatment and/or care plans for your patients. Your professional judgement must be exercised and followed in all respects with regard to the treatment and care of your patients. These policies apply to all Magellan Healthcare subsidiaries including, but not limited to, National Imaging Associates ("Magellan"). The policies constitute only the reimbursement and coverage guidelines of Magellan. Coverage for services varies for individual members in accordance with the terms and conditions of applicable Certificates of Coverage, Summary Plan Descriptions, or contracts with governing regulatory agencies. Magellan reserves the right to review and update the guidelines at its sole discretion. Notice of such changes, if necessary, shall be provided in accordance with the terms and conditions of provider agreements and any applicable laws or regulations.~~

Disclaimer: ***National Imaging Associates, Inc. (NIA) authorization policies do not constitute medical advice and are not intended to govern or otherwise influence the practice of medicine. These policies are not meant to supplant your normal procedures, evaluation, diagnosis, treatment and/or care plans for your patients. Your professional judgement must be exercised and followed in all respects with regard to the treatment and care of your patients. These policies apply to all Evolent Health LLC subsidiaries including, but not limited to, National Imaging Associates ("NIA"). The policies constitute only the reimbursement and coverage guidelines of NIA. Coverage for services varies for individual members in accordance with the terms and conditions of applicable Certificates of Coverage, Summary Plan Descriptions, or contracts with governing regulatory agencies. NIA reserves the right to review and update the guidelines at its sole discretion. Notice of such changes, if necessary, shall be provided in accordance with the terms and conditions of provider agreements and any applicable laws or regulations.***