National Imaging Associates, Inc.	
Clinical guidelines **HEART CATHETERIZATION**	**Original Date: February 2010**
CPT Codes: 93452, 93453, 93454, 93455, 93456, 93457, 93458, 93459, 93460, 93461, +93462, +93463, +93464, +93565, +93566, +93567, +93568	**Last Revised Date: April 20232~~2~~**
Guideline Number: NIA_CG_065	**Implementation Date: January 2024~~3~~**

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.*
-

~~**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. All prior relevant imaging results and the reason that alternative imaging cannot be performed must be included in the documentation submitted.**~~

INDICATIONS FOR INVASIVE CORONARY ARTERIOGRAPHY[1-5]

General

- Typical angina with new onset or evolving ischemic EKG changes

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

- New onset or worsening of the patient's previously known anginal symptoms in a patient with a history of CABG or PCI
- Symptomatic patients with a high pretest probability
- Unheralded syncope (not near syncope), where the etiology is unclear

Stable Ischemic Heart Disease

- Exercise electrocardiogram (ECG) stress test with high-risk findings, such as Duke Score ≤ -11, ST segment elevation, hypotension, exercise-induced ventricular tachycardia (VT), or several minutes of ST segment depression post exercise[3]
- Stress imaging with high-risk findings (see Background section)
- Stress imaging with intermediate risk findings (see Background section) in a patient with one of the following:
    - Symptoms consistent with ischemia[3]
    - Unsatisfactory quality of life due to angina[2]
    - Ejection fraction (EF) < 50%[2]
- Non-invasive test with low-risk findings with new, worsening, or limiting symptoms with reasonable suspicion of cardiac origin despite optimal medical therapy (OMT) or inability to tolerate OMT[1-3]
- New, worsening, or limiting symptoms, with known unrevascularized obstructive coronary artery disease (CAD), in a patient eligible for revascularization[1, 2]
- Post STEMI with "culprit only" revascularization and plan for further PCI of non-culprit lesion[6]
- Discordant, equivocal, or inconclusive non-invasive evaluation in patients with suspected symptomatic stable ischemic heart disease, including the following[3, 5, 7]:
    - Low risk stress imaging with high-risk stress ECG response or stress induced typical angina[3]
    - Equivocal, uninterpretable, or inconclusive stress imaging due to issues of attenuation or other problems with interpretability[2, 3]

CCTA Abnormalities

- Symptomatic patient with one of the following[2-4]:
    - One vessel with ≥ 50% stenosis
    - A stenosis of 40-90% and FFR-CT ≤0.8[8]
    - ≥ 50% left main stenosis, **even if asymptomatic**

Heart Failure with Left Ventricular Dysfunction

- New heart failure, cardiomyopathy, or wall motion abnormality in patients who are candidates for coronary revascularization; including one of the following[2, 3, 5, 9, 10]:
    - Newly recognized heart failure in patients with known or suspected CAD

- Symptomatic heart failure or ischemia with new, unexplained wall motion abnormality[2, 3]
- Structural abnormality (severe mitral regurgitation or ventricular septal defect) with reason to suspect ischemic origin
- Deterioration in clinical status of heart failure or cardiomyopathy requiring invasive evaluation for guidance or alteration in therapy
- Clarification of the diagnosis of myocarditis versus acute coronary syndrome[11]

Ventricular Arrhythmias

- Ventricular arrhythmias, without identified non-cardiac cause:
  - Following recovery from unexplained sudden cardiac arrest[12]
  - Sustained VT or VF[3]
  - Exercise-induced VT[3]
  -

Prior to Non-Coronary Intervention and Cardiac Surgery

- Evaluation of coronary anatomy, with consideration of coronary revascularization, prior to cardiac surgery in patients with any of the following[13-17]:
  - Symptoms of angina
  - Stress imaging with evidence of ischemia
  - Decreased LV systolic function (EF < 50%)
  - History of CAD
  - Coronary risk factors, including men > 40 and postmenopausal women
  - Non-invasive data that is inconclusive
  - Chronic severe secondary mitral regurgitation
  - Requirement for detailed assessment of coronary artery anatomy prior to aortic valve homograft surgery, pulmonary autograft (Ross procedure), or aortic root procedure
  - Patients undergoing transcatheter aortic valve replacement (TAVR) or other transcatheter valve procedures
  - Can be done pre-organ transplant when required by transplant center protocol in place of, but not in addition to an imaging study

Hypertrophic Cardiomyopathy

- Patients with HCM, who are candidates for SRT, and for whom there is uncertainty of LVOT obstruction on noninvasive imaging studies, invasive hemodynamic assessment with cardiac catheterization is recommended[18]
- In patients with symptoms or evidence of myocardial ischemia (CCTA also allowed)

- Prior to surgical myectomy in HCM patients who are at risk for coronary atherosclerosis (CCTA also allowed)

Post Cardiac Transplantation[19]

- Assessment for allograft vasculopathy annually for the first 5 years, followed by annual assessment in those with documented allograft vasculopathy, if stress imaging has not been performed
- Assessment of change in clinical status, including any of the following, if stress imaging has not been performed:
    - New left ventricular dysfunction
    - Symptoms of ischemia
    - Non-invasive findings of ischemia

Hemodynamic Assessment

- Indications for angiographic and/or hemodynamic assessment of valvular function or shunt physiology[3, 13, 20]
    - Assessment of bioprosthetic valve when transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE) were inadequate, and cardiac magnetic resonance (CMR) or cardiac computed tomography (CCT) are not available
    - Assessment of mechanical valve prostheses when TTE and TEE are inadequate and CCTA is not available
    - Discordance between non-invasive data and clinical impression of severity of valvular disease
    - Evaluation of indeterminate shunt anatomy or shunt flows/ratio
- Indications for hemodynamic assessment only[3, 20]
    - Assessment of constrictive and restrictive physiology
    - Assessment of pulmonary hypertension when non-invasive data provides inadequate information for management, or to evaluate response to intravenous drug therapy
    - Assessment of hemodynamics in heart failure, cardiomyopathy, or adult congenital heart disease, when
        - Non-invasive data is discordant or conflicts with the clinical presentation
        - Non-invasive data is inadequate for clinical management

These guidelines only cover procedures that include left heart catheterization. NIA does not manage right heart catheterization as a stand-alone procedure.

BACKGROUND

Heart catheterization is an invasive angiographic procedure used to evaluate the presence and extent of coronary artery disease (CAD).

In addition to angiography, it can also include ventriculography, aortography, acquisition of hemodynamic data, measurement of cardiac output, detection and quantification of shunts and flows, intravascular ultrasound (IVUS), and fractional flow reserve (FFR)/instantaneous wave free ratio (iFR) for determination of a lesion's hemodynamic severity. CAD stenosis ≥70% (≥50% in the left main coronary artery) is considered clinically significant or obstructive CAD.[2, 5, 7, 21]

This guideline applies to patients with a stable clinical presentation, not to those with acute coronary syndromes or acute valvular abnormalities.

In stable patients, preliminary evaluation with non-invasive cardiac testing is usually indicated prior to a recommendation for cardiac catheterization.

Stable Patients without Known CAD fall into 2 categories[2, 5, 7]:

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

The Three Types of Chest Pain or Discomfort and Pretest Probability of CAD

- **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
- **Non-anginal Chest Pain/Discomfort** has only **0 - 1** of the above characteristics

Once the type of chest pain has been established from the medical record, the pretest probability of obstructive CAD is estimated from the **Diamond Forrester Table** below, recognizing that in some cases multiple additional coronary risk factors could increase pretest probability.[2, 5]

Diamond Forrester Table

Age (Years)	Gender	Typical/Definite Angina Pectoris	Atypical/Probable Angina Pectoris	Non-anginal 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

- **Low:** 5 - 10% pretest probability of CAD
- **Intermediate:** 10% - 90% pretest probability of CAD
- **High:** > 90% pretest probability of CAD

Coronary Risk Categories Derived from Non-invasive Testing[2, 4]

- **High risk (> 3% annual death or MI)**
  - Severe resting left ventricular (LV) dysfunction (LVEF < 35%) not readily explained by non-coronary causes
  - Resting perfusion abnormalities ≥ 10% of the myocardium in patients without prior history or evidence of myocardial infarction (MI)
  - Stress ECG findings including ≥ 2 mm of ST-segment depression at low workload or persisting into recovery, exercise-induced ST-segment elevation, or exercise-induced ventricular tachycardia (VT)/ventricular fibrillation (VF)
  - Severe stress-induced left ventricular (LV) dysfunction (peak exercise EF < 45% or drop in EF with stress ≥ 10%)
  - Stress-induced perfusion abnormalities involving ≥ 10% myocardium or stress segmental scores indicating multiple abnormal vascular territories
  - Stress-induced LV dilation. Transient ischemic dilation (TID) is the ratio of left ventricular area immediately post-exercise divided by the area of the 4-hour redistribution image, with an abnormal ratio defined as > 1.12[22]
  - Inducible wall motion abnormality (involving ≥ 2 segments or ≥2 vascular territories)
  - Wall motion abnormality developing at low dose of dobutamine (≤ 10 mg/kg/min) or at a low heart rate (< 120 beats/min)

- Multivessel obstructive CAD (≥ 70% stenosis) or left main stenosis (≥ 50% stenosis) on CCTA

- **Intermediate risk (1% to 3% annual death or MI)**
  - Mild or moderate resting LV dysfunction (EF 35% to 49%) not readily explained by non-coronary causes
  - Resting perfusion abnormalities in 5% to 9.9% of the myocardium in patients without a history or prior evidence of MI
  - ≥1 mm of ST-segment depression occurring with exertional symptoms
  - Stress-induced perfusion abnormalities involving 5% to 9.9% of the myocardium or stress segmental scores (in multiple segments) indicating 1 vascular territory with abnormalities but without LV dilation
  - Inducible wall motion abnormality involving 1 segment or 1 vascular territory
  - CAC score 100 to 399 Agatston units (only for use in primary prevention, not for heart catheterization decision making)[2, 3, 7, 23]
  - One vessel CAD with ≥ 70% stenosis or moderate CAD stenosis (50% to 69% stenosis) in ≥ 2 arteries on CCTA

- **Low risk (< 1% annual death or MI)**
  - Low-risk treadmill score (score ≥ 5) or no new ST segment changes or exercise-induced chest pain symptoms, when achieving maximal levels of exercise
  - Normal or small myocardial perfusion defect at rest or with stress involving < 5% of the myocardium
  - Normal stress or no change of baseline wall motion abnormalities during stress
  - CAC score < 100 Agatston units (only for use in primary prevention, not for heart catheterization decision making)[2, 3, 7, 23]
  - No coronary stenosis > 50% on CCTA

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**.[24] There are rare exemptions, such as patients requiring I-C 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%

Websites for Global Cardiovascular Risk 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.[23, 25-28]

Definitions of Coronary Artery Disease[2, 4, 7, 29]

- 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~~.~~. It is not a diagnostic tool so much as it is a **risk stratification** tool~~.~~. Its incorporation into global risk can be achieved by using the MESA risk calculator.
- Ischemia-producing disease (also called hemodynamically or functionally significant disease, or obstructive coronary 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%[30]
    - For a left main artery, suggested by a percentage stenosis ≥ 50% or minimum luminal cross-sectional area on IVUS ≤ 6 square mm^2[2, 21, 29]
    - FFR (fractional flow reserve) ≤ 0.80 for a major vessel[21, 29]

    - iFR (instantaneous wave-free ratio) ≤ 0.89 for a major vessel[21, 31-33]
- A major vessel would be a coronary vessel that would be amenable to revascularization, if indicated~~—~~. This assessment is made based on the diameter of the vessel and/or the extent of myocardial territory served by the vessel.
- FFR is the distal to proximal pressure ratio across a coronary lesion during maximal hyperemia induced by either intravenous or intracoronary adenosine~~—~~. Less than or equal to 0.80 is considered a significant reduction in coronary flow~~—~~.
- Instantaneous wave-free ratio (iFR) measures the ratio of distal coronary to aortic pressure during the wave free period of diastole, with a value ≤ 0.89 considered hemodynamically significant.[31-33]

Anginal Equivalent[2, 34, 35]

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 that symptoms other than chest discomfort are not due to other organ systems (e.g., dyspnea due to lung disease, fatigue due to anemia), by presentation of clinical data such as respiratory rate, oximetry, lung exam, etc. (as well as D~~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~~—~~.

Optimal Medical Therapy (OMT)

In general, a trial of OMT includes

- Anti-platelet therapy
- Lipid-lowering therapy
- Beta blocker
- Angiotensin converting enzyme (ACE) inhibitor

Abbreviations

CABG	Coronary artery bypass grafting surgery
CAC	Coronary artery calcium
CAD	Coronary artery disease
CCT	Cardiac computed tomography
CCTA	Coronary computed tomographic angiography
CMR	Cardiac magnetic resonance
CT(A)	Computed tomography (angiography)
ECG	Electrocardiogram
EF	Ejection fraction
FFR	Fractional flow reserve
FFR-CT	Fractional flow reserve – computed tomography
HCM	Hypertrophic cardiomyopathy
iFR	Instantaneous wave-free ratio
IVUS	Intravascular ultrasound
LV	Left ventricular
LVEF	Left ventricular ejection fraction
LVOT	Left ventricular outflow tract
MESA	Multi-Ethnic Study of Atherosclerosis
MI	Myocardial infarction
MR	Mitral regurgitation
OMT	Optimal medical therapy
PCI	Percutaneous coronary intervention
PFT	Pulmonary function test
SRT	Septal reduction therapy
TAVR	Transcatheter aortic valve replacement
TID	Transient ischemic dilation
TTE	Transthoracic echocardiography
TEE	Transesophageal echocardiography
VT	Ventricular tachycardia
VF	Ventricular fibrillation

~~**POLICY HISTORY**~~

~~**Date**~~	~~**Summary**~~
~~February 2023~~	~~Added definition of unstable angina to include ischemic EKG changes~~

	- Added definition in background section on OMT (optimal medical therapy) - Added indication for revascularization of non-culprit lesion post STEMI - Added statement on clinical indications not addressed in this guideline
February 2022	• Added indications to CCTA section regarding left main disease, single vessel disease >50% stenosis • Modified indication for exercise-induced VT removing statement "requiring signs and symptoms of ischemia" • Clarified definition of intermediate findings, non-invasive testing • FFR-CT statement updated • Modified indication for newly diagnosed HF removing statement "requiring signs and symptoms of ischemia"
March 2021	• Added general section discussing indications without requiring prior noninvasive study • Removed statement on newly recognized EF <40% in patients for viability • Added pretransplant indication • Added indications and reference for hypertrophic obstructive cardiomyopathy
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 indication for coronary angiography prior to transcatheter valve procedures in addition to transcatheter aortic valve replacement (TAVR) • Added edits to the Coronary Artery Disease definition section • Updated and added new references
August 2019	• Added indications for new heart failure/ cardiomyopathy/wall motion abnormality, in patients who are candidates and would be eligible for coronary revascularization including one of the following: ○ Newly recognized reduction in ejection fraction to ≤ 50%, with intermediate risk findings on noninvasive testing and symptoms or signs of ischemia ○ Newly recognized reduction in ejection fraction to ≤ 40% with evidence of viability on stress imaging

	~~• Removed indication for diastolic heart failure, when symptoms, signs or stress imaging provides evidence of contributory ischemia~~ ~~• Clarified indication for evaluation of coronary anatomy prior to TAVR~~ ~~• Clarified indication for assessment of allograft vasculopathy if stress imaging has not been performed~~ ~~• Clarified indications for assessment of hemodynamics in heart failure, cardiomyopathy or adult congenital heart disease.~~

REFERENCES

1. Fihn SD, Blankenship JC, Alexander KP, et al. 2014 ACC/AHA/AATS/PCNA/SCAI/STS focused update of the guideline for the diagnosis and management of patients with stable ischemic heart disease: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines, and the American Association for Thoracic Surgery, Preventive Cardiovascular Nurses Association, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons. *J Am Coll Cardiol*. Nov 4 2014;64(18):1929-49. doi:10.1016/j.jacc.2014.07.017
2. 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
3. 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
4. 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
5. 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
6. Mehta SR, Wood DA, Storey RF, et al. Complete Revascularization with Multivessel PCI for Myocardial Infarction. *New England Journal of Medicine*. 2019;381(15):1411-1421. doi:10.1056/NEJMoa1907775
7. 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
8. 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 Am Coll Cardiol*. Nov 30 2021;78(22):e187-e285. doi:10.1016/j.jacc.2021.07.053
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. 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
11. Sarda L, Colin P, Boccara F, et al. Myocarditis in patients with clinical presentation of myocardial infarction and normal coronary angiograms. *J Am Coll Cardiol*. Mar 1 2001;37(3):786-92. doi:10.1016/s0735-1097(00)01201-8
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. Doherty JU, Kort S, Mehran R, Schoenhagen P, Soman P. ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2017 Appropriate Use Criteria for Multimodality Imaging in Valvular 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, 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*. Sep 26 2017;70(13):1647-1672. doi:10.1016/j.jacc.2017.07.732
14. Nishimura RA, Otto CM, Bonow RO, et al. 2017 AHA/ACC Focused Update of the 2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease: A Report of

the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *J Am Coll Cardiol*. Jul 11 2017;70(2):252-289. doi:10.1016/j.jacc.2017.03.011
15. Nishimura RA, Otto CM, Bonow RO, et al. 2014 AHA/ACC guideline for the management of patients with valvular heart disease: executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol*. Jun 10 2014;63(22):2438-88. doi:10.1016/j.jacc.2014.02.537
16. Svensson LG, Adams DH, Bonow RO, et al. Aortic valve and ascending aorta guidelines for management and quality measures. *Ann Thorac Surg*. Jun 2013;95(6 Suppl):S1-66. doi:10.1016/j.athoracsur.2013.01.083
17. Ramee S, Anwaruddin S, Kumar G, et al. The Rationale for Performance of Coronary Angiography and Stenting Before Transcatheter Aortic Valve Replacement: From the Interventional Section Leadership Council of the American College of Cardiology. *JACC Cardiovasc Interv*. Dec 12 2016;9(23):2371-2375. doi:10.1016/j.jcin.2016.09.024
18. Ommen SR, Mital S, Burke MA, et al. 2020 AHA/ACC Guideline for the Diagnosis and Treatment of Patients With Hypertrophic Cardiomyopathy: Executive Summary: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *J Am Coll Cardiol*. Dec 22 2020;76(25):3022-3055. doi:10.1016/j.jacc.2020.08.044
19. Costanzo MR, Dipchand A, Starling R, et al. The International Society of Heart and Lung Transplantation Guidelines for the care of heart transplant recipients. *J Heart Lung Transplant*. Aug 2010;29(8):914-56. doi:10.1016/j.healun.2010.05.034
20. Stout KK, Daniels CJ, Aboulhosn JA, et al. 2018 AHA/ACC Guideline for the Management of Adults With Congenital Heart Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *J Am Coll Cardiol*. Apr 2 2019;73(12):e81-e192. doi:10.1016/j.jacc.2018.08.1029
21. 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
22. Weiss AT, Berman DS, Lew AS, et al. Transient ischemic dilation of the left ventricle on stress thallium-201 scintigraphy: a marker of severe and extensive coronary artery disease. *J Am Coll Cardiol*. Apr 1987;9(4):752-9. doi:10.1016/s0735-1097(87)80228-0
23. 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. *J Am Coll Cardiol*. Jul 1 2014;63(25 Pt B):2935-2959. doi:10.1016/j.jacc.2013.11.005
24. Douglas PS, De Bruyne B, Pontone G, et al. 1-Year Outcomes of FFRCT-Guided Care in Patients With Suspected Coronary Disease: The PLATFORM Study. *J Am Coll Cardiol*. Aug 2 2016;68(5):435-445. doi:10.1016/j.jacc.2016.05.057
25. 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

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. 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
28. 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
29. 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
30. 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
31. 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
32. Götberg M, Cook CM, Sen S, Nijjer S, Escaned J, Davies JE. The Evolving Future of Instantaneous Wave-Free Ratio and Fractional Flow Reserve. *J Am Coll Cardiol*. Sep 12 2017;70(11):1379-1402. doi:10.1016/j.jacc.2017.07.770
33. 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
34. Moya A, Sutton R, Ammirati F, et al. Guidelines for the diagnosis and management of syncope (version 2009). *Eur Heart J*. Nov 2009;30(21):2631-71. doi:10.1093/eurheartj/ehp298
35. 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

~~**ADDITIONAL RESOURCES**~~

~~1. Otto CM, Kumbhani DJ, Alexander KP, et al. 2017 ACC Expert Consensus Decision Pathway for Transcatheter Aortic Valve Replacement in the Management of Adults With Aortic Stenosis: A Report of the American College of Cardiology Task Force on Clinical Expert Consensus Documents. *J Am Coll Cardiol*. Mar 14 2017;69(10):1313-1346. doi:10.1016/j.jacc.2016.12.006~~

~~2. Wunderlich NC, Beigel R, Ho SY, et al. Imaging for Mitral Interventions: Methods and Efficacy. *JACC Cardiovasc Imaging*. Jun 2018;11(6):872-901. doi:10.1016/j.jcmg.2018.02.024~~

POLICY HISTORY

Date	Summary
April 2023	• Added definition of unstable angina to include ischemic EKG changes • Added definition in background section on OMT (optimal medical therapy) • Added indication for revascularization of non-culprit lesion post STEMI • Added statement on clinical indications not addressed in this guideline
February 2022	• Added indications to CCTA section regarding left main disease, single vessel disease >50% stenosis • Modified indication for exercise-induced VT removing statement "requiring signs and symptoms of ischemia" • Clarified definition of intermediate findings, non-invasive testing • FFR-CT statement updated • Modified indication for newly diagnosed HF removing statement "requiring signs and symptoms of ischemia"

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.*