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Cohere Medical Policy -Myocardial Perfusion Imaging Single Photon Emission Computed Tomography (MPI-SPECT)

Clinical Policy for Medical Necessity Review

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Important Notices

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Policy Information:

Specialty Area: Diagnostic Imaging **Policy Name:** Cohere Medical Policy - Myocardial Perfusion Imaging Single Photon Emission Computed Tomography (MPI-SPECT) **Type:** [X] Adult (18+ yo) | [X] Pediatric (0-17 yo)

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Medical Necessity Criteria

Service: Myocardial Perfusion Imaging Single Photon Emission Computed Tomography (MPI-SPECT)

Description

Myocardial perfusion imaging single-photon emission computed tomography (MPI-SPECT) of the heart is a nuclear medicine test that uses gamma rays to assess blood flow and heart function. During the procedure, a small amount of a radioactive tracer is injected into the bloodstream. This tracer is taken up by healthy heart tissue, allowing gamma cameras to capture detailed, three-dimensional images of the heart. These images help medical professionals detect areas of reduced blood flow, evaluate damage from a previous heart attack, and determine whether coronary artery disease (CAD) is present. MPI-SPECT imaging can be performed at rest or after stress (either physical exercise or medication-induced) to identify regions of the heart affected by ischemia or limited blood supply due to narrowed coronary arteries.¹²

Medical Necessity Criteria

Indications

Myocardial perfusion imaging single-photon emission computed tomography (MPI-SPECT) is considered appropriate if ANY of the following is TRUE³⁻⁴:

- The patient has angina (or an anginal equivalent^A) with ANY of the following⁴:
 - No known coronary artery disease (CAD) with an intermediate or high pre-test probability (PTP) (as indicated by the <u>CAD Consortium</u> <u>Calculator</u> or coronary calcium score greater than or equal to 100 Agatston); **OR**
 - No known CAD with **ANY** of the following:
 - ECG abnormalities that interfere with the ECG diagnosis of ischemia and ANY of the following⁵:

- An inability to achieve the target heart rate with a standard exercise treadmill test (greater than or equal to 85% of age-predicted maximal heart rate); **OR**
- Ventricular pre-excitation (Wolff-Parkinson-White pattern); OR
- Ventricular-paced rhythm; OR
- Left bundle branch block (LBBB); OR
- LBBB or pacemaker; OR
- Greater than 1 mm ST depression at rest; OR
- Left ventricular hypertrophy with ST-T abnormalities; **OR**
- The patient takes digoxin; **OR**
- Prior stress testing with ANY of the following:
 - Plain exercise treadmill test that was equivocal (heart rate that did not reach 85% of age-predicted maximum heart rate, significant chest pain or anginal equivalent during the study, less than or equal to 3 METS); **OR**
 - Previous stress echocardiography had poor echocardiographic windows; **OR**
- No known CAD with prior testing and **ALL** of the following³:
 - Symptoms of angina (or an anginal equivalent^A); **AND**
 - **ANY** of the following:
 - Inconclusive routine stress ECG; OR
 - Abnormal routine stress ECG; OR
 - Coronary computed tomographic angiography (CCTA) with moderate stenosis 50 to 69%; OR
 - Inconclusive CCTA; OR
 - Invasive coronary angiography with intermediate severity (maximal coronary diameter stenosis is 40% to 69%) or invasive physiological testing not done; OR
- Newly diagnosed heart failure with preserved ejection fraction (HFpEF), heart failure with reduced ejection fraction (HFrEF), or asymptomatic low EF less than 45%, and **ALL** of the following are **TRUE**[®]:
 - No previous evaluation for CAD; **AND**
 - No planned cardiac catheterization; **OR**
- Screening for transplant vasculopathy without a prior MPI in the previous year; **OR**
- Evaluation of (NEW) ventricular arrhythmias without prior cardiac evaluation for ischemia as indicated by **ANY** of the following:
 - Frequent premature ventricular contractions (PVCs) greater than 30 per hour; OR

- Non-sustained ventricular tachycardia (greater than or equal to 3 consecutive beats at greater than 100 beats per minute)²; OR
- Exercise-induced ventricular tachycardia; OR
- Sustained ventricular tachycardia; **OR**
- Ventricular fibrillation; **OR**
- Before initiation of antiarrhythmic therapy (such as flecainide), and the patient has intermediate or high PTP of CAD (as indicated by the <u>CAD</u> <u>Consortium Calculator</u>); OR
- Syncope without an ischemic equivalent^A and the initial evaluation suggests a CV abnormality (e.g., abnormal EKG or echo); OR
- Known coronary heart disease (CHD) with a history of prior myocardial infarction (MI) or coronary revascularization and **ANY** of the following³:
 - Surveillance testing and **ANY** of the following is **TRUE**:
 - Percutaneous coronary intervention (PCI) performed at least 2 years ago and no testing within the last 2 years; OR
 - Coronary artery bypass graft (CABG) performed at least 5 years ago and no testing within the last 5 years; OR
 - The patient has prior myocardial infarction or documented incomplete revascularization and is at high-risk for silent ischemia or has a history of silent ischemia as indicated by ANY of the following:
 - Diabetes mellitus with known accelerated progression of CAD; OR
 - Chronic kidney disease (CKD Stage 3 or above eGFR 15-59 mL/min/1.73 m2 with or without albuminuria that is not treated with dialysis or kidney transplantation); OR
 - Symptoms of ischemia with a change in clinical or functional status on guideline-directed medical therapy (GDMT) (or documented intolerance to GDMT); OR
- Preoperative testing before intermediate or high-risk surgery (Table 1)⁸ and ANY of the following:
 - Planned solid organ transplant (renal, pancreas, combined renal pancreas, liver, lung, or intestinal); OR
 - No known or suspected $CHD^{C,\underline{8}}$ and **ALL** of the following:
 - No recent (3-8 months) testing; **AND**
 - New or worsening possible cardiac symptoms; AND
 - Functional status less than 4 METS and **ANY** of the following:
 - High-risk vascular surgery (Table 1); OR
 - High-risk nonvascular surgery (Table 1); OR
 - Intermediate risk vascular surgery (Table 1); OR

- Intermediate risk non-vascular surgery (Table 1) with at least an intermediate (16% or greater) pre-test probability of obstructive CAD by the CAD Consortium Calculator; OR
- Known or suspected CHD^{D,8} and **ANY** of the following:
 - No recent (3-8 months) stress testing and **ANY** of the following:
 - High-risk vascular surgery (Table 1) **OR**
 - High-risk nonvascular surgery (Table 1) **OR**
 - Intermediate risk vascular surgery and **ANY** of the following:
 - Greater than 4 METS and **ALL** of the following:
 - Without new or worsening possible cardiac symptoms; AND
 - Revised Cardiac Risk Index of 3 or greater (intermediate or high-risk); OR
 - Less than 4 METS with or without new or worsening possible cardiac symptoms; OR
 - Greater than 4 METS with new or worsening possible cardiac symptoms **OR**
 - Intermediate nonvascular surgery (Table 1) and **ANY** of the following:
 - Less than 4 METS with or without possible cardiac symptoms;
 OR
 - Greater than 4 METS with new or worsening possible cardiac symptoms; OR
 - Low-risk vascular or nonvascular surgery (Table 1) planned and ANY of the following:
 - New or worsening possible cardiovascular symptoms; **OR**
 - Revised Cardiac Risk Index of 3 or greater (intermediate or high-risk).

^A Anginal equivalent: Any constellation of clinical findings that the physician believes is consistent with CAD manifestations. Examples of such findings include, but are not limited to: pain, pressure, tightness, or discomfort in the chest, shoulders, arms, neck, back, upper abdomen, or jaw, new ECG abnormalities, or other symptoms/findings suggestive of CAD. Clinical presentations in the absence of chest pain (e.g., dyspnea with exertion, fatigue, or reduced/worsening effort tolerance) consistent with a high risk of CAD may be considered an ischemic equivalent.⁹ ^B Likely or typical anginal symptoms: Chest/epigastric/shoulder/arm/jaw pain, chest pressure/discomfort, when occurring with exertion or emotional stress and relieved by rest, nitroglycerin, or both.

^c No known or suspected heart disease by history, exam, or electrocardiogram⁸: Heart disease is not suspected based on the history of no prior cardiac event, lack of cardiac risk factors, or prior cardiac testing indicating no ischemic heart disease, VHD, or HF. The exam does not suggest underlying heart disease by lack of murmurs, other than functional, and no signs of cardiac decompensation (e.g., rales, edema not explained by other causes, or S3 gallop). ECG does not show prior myocardial infarction, left ventricular hypertrophy, LBBB, or atrial fibrillation. B-type natriuretic peptide (BNP) or proBNP, if measured, is normal.

^D Known or suspected heart disease by history, exam, or electrocardiogram⁸: PCI, coronary artery bypass graft (CABG), prior infarct, cardiac risk factors (HTN, HLD, DM, tobacco use, FHx premature CAD), disease conditions associated with atherosclerosis (PAD, carotid disease, abdominal aneurysm, stroke due to atherosclerosis), prior cardiac testing showing CAD, heart failure, moderate or severe valvular disease, rales, old infarct on EKG, LVH with repolarization changes, LBBB, or atrial fibrillation. There may be prior evidence of biomarker elevation (troponin, proBNP) in the absence of other explanatory findings. B-type natriuretic peptide (BNP) or proBNP, if measured, is more than 3x the upper limit of normal.

Non-Indications

Myocardial perfusion imaging single-photon emission computed tomography (MPI-SPECT) is not considered appropriate if **ANY** of the following is **TRUE**^{3-4.9}:

- The patient has undergone advanced imaging of the same body part and for the same indication within 3 months, without being on treatment; **OR**
- The patient is pregnant; **OR**
- Vasodilators (e.g., adenosine, regadenoson, and dipyridamole) are contraindicated in patients with hypotension, sinus node dysfunction, high-degree atrioventricular (AV) block (in the absence of back up pacemaker capability), and reactive airway disease; OR
- An active cardiac condition that has not been stabilized (e.g., uncontrolled hypertension, uncontrolled arrhythmias, undiagnosed chest pain, unstable angina); **OR**

- An active pulmonary condition that has not been stabilized (e.g., difficulty breathing, the possibility of pulmonary embolism); **OR**
- Normal coronary angiogram or CCTA with no stenosis or plaque within the last two years, and the patient has not had a significant change in symptoms⁴; OR
- Normal stress test (given adequate stress) without a significant change in symptoms within the last year⁴; OR
- HD (anatomic imaging may be indicated).

Disclaimer on Radiation Exposure in Pediatric Population

Due to the heightened sensitivity of pediatric patients to ionizing radiation, minimizing exposure is paramount. At Cohere, we are dedicated to ensuring that every patient, including the pediatric population, has access to appropriate imaging following accepted guidelines. Radiation risk is dependent mainly on the patient's age at exposure, the organs exposed, and the patient's sex, though there are other variables. The following technical guidelines are provided to ensure safe and effective imaging practices:

Radiation Dose Optimization: Adhere to the lowest effective dose principle for pediatric imaging. Ensure that imaging protocols are specifically tailored for pediatric patients to limit radiation exposure.¹⁰⁻¹¹

Alternative Modalities: Prioritize non-ionizing imaging options such as ultrasound or MRI when clinically feasible, as they are less likely to expose the patient to ionizing radiation. For instance, MRI or ultrasound should be considered if they are more likely to provide an accurate diagnosis than CT, fluoroscopy, or radiography.¹⁰⁻¹¹

Cumulative Dose Monitoring: Implement systems to track cumulative radiation exposure in pediatric patients, particularly for those requiring multiple imaging studies. Regularly reassess the necessity of repeat imaging based on clinical evaluation.¹⁰⁻¹¹

CT Imaging Considerations: When CT is deemed the best method for achieving a correct diagnosis, use the lowest possible radiation dose that still yields reliable diagnostic images.¹⁰⁻¹¹

Cohere Imaging Gently Guideline

The purpose of this guideline is to act as a potential override when clinically indicated to adhere to Imaging Gently and Imaging Wisely guidelines and As Low As Reasonably Possible (ALARA) principles.

Level of Care Criteria

Outpatient

Procedure Codes (CPT/HCPCS)

CPT/HCPCS Code	Code Description
78451	Single-photon emission computed tomography (SPECT) myocardial perfusion imaging study with stress
78452	Multiple single-photon emission computed tomography (SPECT) myocardial perfusion imaging studies with stress
78453	Myocardial perfusion imaging, planar (including qualitative or quantitative wall motion, ejection fraction by first pass or gated technique, additional quantification, when performed); single study, at rest or stress (exercise or pharmacologic)
78454	Myocardial perfusion imaging, planar (including qualitative or quantitative wall motion, ejection fraction by first pass or gated technique, additional quantification, when performed); multiple studies, at rest and/or stress (exercise or pharmacologic) and/or redistribution and/or rest reinjection

Definitions

Pre-Test Probability (of Obstructive CAD): Pre-test probability (PTP) of CAD is the likelihood that the patient has CAD, calculated before the test result is known. These guidelines reference the 2019 European Society of Cardiology (ESC) Guidelines for the diagnosis and management of chronic coronary syndromes model to calculate the PTP based on age, sex, and type of chest pain.^{4,13-15} Additional information such as a coronary artery calcium (CAC) score or risk factors for CAD (e.g., diabetes mellitus, smoking, family history of premature CAD [first-degree relative: male less than 55 years old or female less than 65 years old], hypertension, or dyslipidemia) can be used to improve the identification of obstructive CAD as indicated by the <u>CAD</u> <u>Consortium Calculator</u>.

<u>Tables</u>

Table 1. Definitions of Low, Intermediate, and High-Risk Surgery ³			
	Surgical Risk Level		
Specialty	Low	Intermediate	High
Vascular	 Carotid stenting (monitored anesthesia care) Renal artery stenosis angioplasty or stent Vein stripping 	 Infra-inguinal peripheral angioplasty/stent Carotid stenting (carotid approach, general anesthesia) Open carotid endarterectomy Above or below-knee amputation 	 Abdominal aortic aneurysm repair Aorto-femoral bypass graft Thoracic aortic aneurysm repair Infra-inguinal open peripheral revascularization
General	 Laparoscopic appendectomy Hemorrhoidectomy 	 Open appendectomy Ostomy procedures Inguinal/umbilical hernia repair Laparoscopic lysis of adhesions/obstruction Laparoscopic cholecystectomy Laparoscopic colon resection, segmental, for tumor 	 Laparoscopic bariatric surgery Open cholecystectomy Hepatic radiofrequency ablation tumor ablation Splenectomy Open colonic segmental resection tumor Laparoscopic colonic abdominal perineal resection Dpen lysis of adhesions/bowel obstruction Esophageal Heller myotomy Nissen fundoplication Cancer resection (gastric pull-through) Open bariatric surgery Pancreatic/Whipple resection

			 13. Gastric resection (tumor/ulcer) 14. Hepatic segmental resection 15. Colonic open abdominal perineal resection
Endocrine	 Thyroidectomy Parathyroidectomy 	 Adrenalectomy Pheochromocytoma resection 	-
Ortho.	 Shoulder arthroscopy Knee arthroscopy Ankle arthroscopy Closed joint reduction 	 Shoulder arthroplasty Hip fracture pinning 	1. Hip/ankle/knee arthroplasty
Thoracic	_	 Pleural procedures (decortication, pleurodesis) VATS lung biopsy VATS wedge/lobe resection Thymectomy 	 Open wedge/lobe resection Tracheal surgery Lung reduction Pneumonectomy
Neuro- functional	 Deep brain stimulator placement Seizure mapping procedures 	-	-
Neuro- intracranial		 Hydrocephalus shunt/repair Subdural drainage Transsphenoidal resection 	 Intracranial tumor resection Open intracranial aneurysm resection Acoustic neuroma/cranial nerve tumor resection
Neuro/ Ortho. Spine	-	1. Laminectomy	 Spinal fusion Extreme lateral interbody fusion procedures (abdominal)

Genito- urinary	 Transurethral prostate resection Transurethral bladder tumor resection Ureteral stents Nephrostomy Extracorporeal shock wave lithotripsy 	1. Bladder repair	 Radical retropubic prostatectomy Nephrectomy Cystectomy
Gyn.	 Vaginal hysterectomy Diagnostic gynecologic procedures (laparoscopy) 	 Total abdominal hysterectomy Bilateral salpingo-oophorectomy 	-
Breast	 Diagnostic breast surgery (lumpectomy, node dissection) Simple mastectomy 	1. Complex breast surgery	-
Plastic Surgery	 Hand Cosmetic procedures 	 Reconstructive flaps Post-bariatric repair abdominoplasty 	-
Ear, Nose, Throat	 Diagnostic laryngoscopy Diagnostic esophagoscopy 	 Nasal septal procedures Functional endoscopic sinus surgery 	1. Head/neck cancer dissection (with/without laryngectomy)
Oral & Maxillofacial Surgery	1. Jaw reduction	1. Temporomandibular procedures/osteotomy	-
Podiatry	 Arthroplasty Toe amputation Bunion procedure 	-	-
Eye	 Cataract repair Retinal surgery Eye muscle surgery 		
Organ Transplant	-		 Renal Transplant Pancreas Transplant Kidney-Pancreas Combined Transplant Liver Lung Intestinal

Medical Evidence

Huck et al. (2024) conducted a retrospective study to evaluate patients post-kidney transplant due to the risk of major adverse cardiovascular events (MACEs). The population is also at higher risk of developing cardiovascular disease (CVD). Single-photon emission computed tomography (SPECT) myocardial perfusion imaging (MPI), and pretransplant positron emission tomography (PET) were utilized in the study of 393 patients. Results were taken from a follow-up period of 5.9 years. Overall, PET MPI was more effective than SPECT-MPI in predicting MACEs in patients post-kidney transplant. Future research should include the effectiveness of normal PET versus SPECT when evaluating low-risk patients.¹⁶

Kelderman et al. (2022) performed a systematic review on using MPI SPECT to diagnose CVD in patients assessed for kidney transplantation. Thirteen studies that focused on MPI SPECT were identified and included in the meta-analysis of 1245 MPI SPECT scans. The pooled sensitivity was 0.66 (95% CI 0.53 to 0.77), pooled specificity was 0.75 (95% CI 0.63 to 0.84), and the area under the curve (AUC) was 0.76. The authors note that while the accuracy is not high with MPI SPECT for the diagnosis of coronary artery disease (CAD), it is recommended to screen patients at-risk.¹⁷

Patel et al. (2019) conducted a single-center randomized control trial (RCT) to determine the clinical efficacy of pharmacological MPI-SPECT and PET MPI in patients with CAD and ischemia. A total of 322 symptomatic patients were included. The following pharmacologic agents were given to patients: aspirin therapy (88.8%), beta-blockers (76.7%), and statin therapy (77.3%). Seven patients (2.2%) had a diagnostic failure at 60 days, however, no major differences in diagnostic failure rates were observed overall. Decreased utilization of coronary angiography or revascularization was noted. (ClinicalTrials.gov Identifier NCT00976053).¹⁸

A number of recent articles provided recommendations for a number of clinical scenarios. Gulati et al. (2021) provided insights into the evaluation and diagnosis of chest pain, Winchester et al. (2023) provided appropriate use criteria (AUC) for the detection and risk assessment of chronic CAD, and Doherty et al. (2024) updated a previous AUC document for the cardiovascular evaluation for nonemergent, non-cardiac surgery, focusing more on ischemic heart disease (HD), valvular HD, and heart failure (rather than CVD in general) and their relation to the risks associated with various types of surgery (solid organ transplant, vascular, non-vascular).³⁻⁴⁸

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Clinical Guideline Revision History/Information

Original Date: April 29, 2022			
Review History			
Version 2	11/17/2023	Policy criteria reviewed and updated per medical literature.	
Version 3	8/2/2024	Annual review and policy restructure.	
Version 4	10/29/2024	Edited repeat imaging criteria language.	
Version 5	1/16/2025	Annual review.	
		Added indications for preoperative clearance.	
		Major reorganization of the boolean logic and indication order throughout the medical necessity criteria.	
		Literature review - Medical Evidence section updated (including references).	
Version 6	5/22/2025	Combined indications regarding intermediate or high pre-test probability and coronary calcium score of greater than or equal to 100 Agatston.	
		Updated "The patient has chest pain (or an ischemic equivalent)" to "The patient has angina (or an anginal equivalent)" and associated footnote.	