# ASNC INFORMATION STATEMENT

# American Society of Nuclear Cardiology review of the ACCF/ASNC appropriateness criteria for single-photon emission computed tomagraphy myocardial perfusion imaging (SPECT MPI)

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## BACKGROUND

The American College of Cardiology Foundation (ACCF) and the American Society of Nuclear Cardiology (ASNC) have published criteria for the appropriate use of single photon emission computed tomography (SPECT) myocardial perfusion imaging (MPI) with regard to a variety of clinical indications and scenarios.[1,2] In determining the appropriate use of MPI for a given clinical indication, evidence-based information and clinical consensus were the key components considered. By use of the 2003 American College of Cardiology (ACC)/American Heart Association (AHA)/ASNC Guidelines for the Clinical Use of Cardiac Radionuclide Imaging as the major background reference,[3] additional literature searches were conducted to compile a complete list of evidence-based information for the use of MPI. The literature search findings for a given indication were the data provided to each Technical Panel member to assist in the determination of the appropriateness "score" for that indication.

It is important to note that MPI SPECT was the first cardiovascular diagnostic test or procedure to be analyzed. As such, it was anticipated that, as the appropriateness criteria (AC) outline was adopted in clinical practice and as the other cardiovascular imaging AC documents were completed, the list of indications would require revision. It was also recognized by the ACC and ASNC that, as more clinical evidence-based data were presented, some indications would need to be updated.

The goal of this review was (1) to evaluate the current list of indications to recommend changes based on the use of the AC criteria from the past 2 years, (2) to objectively review indications for which there was uncertainty about the level of appropriateness in reference to new published data to identify indications that should be reviewed, and (3) to provide a summary of evidence and recommendation opinion from ASNC for those indications that are recommended for review. In totality, this evaluation is intended to be an outline to expedite the review of the AC criteria for MPI by the ACCF.

## METHODS

The ASNC Quality Assurance (QA) Committee reviewed the AC for MPI and supporting data in the following manner:

1. The AC document was reviewed as a whole based on clinical application since its publication to identify inconsistencies or gaps that impact a large number of individual indications.
2. A literature search was performed to provide a current list of all new literature that might impact the appropriateness of SPECT MPI.
3. Potential new indications that are supported by new data and/or evolving clinical consensus, and yet are not represented in the AC for SPECT MPI, were identified.
4. Individual indications were reviewed based on new evidence, and a consensus opinion regarding the level of appropriateness in the AC for SPECT MPI was formed.

**Table 1.** Agreement of panelist rankings for each indication

| Agreement | Indication |
|---|---|
| Good (n = 33) | 1, 4, 6, 7, 8, 9, 10, 15, 16, 17, 19, 20, 23, 25, 27, 28, 29, 30, 31, 32, 33, 35, 37, 38, 39, 40, 41, 44, 45, 49,* 50, 51, 52 |
| Poor (n = 19) | 2, 3, 5, 11, 12, 13, 14, 18, 21, 22, 24, 26, 34, 36, 42, 43, 46, 47, 48 |

*Indication 49 was the only indication to receive an "uncertain" classification with good agreement.

**Table 2.** List of indications with poor agreement between review panelists

| Classification | Indication |
|---|---|
| Appropriate (n = 5) | 3, 5, 12, 22, 24 |
| Uncertain (n = 11) | 2, 11, 13, 14, 18, 26, 34, 42, 43, 46, 48 |
| Inappropriate (n = 3) | 21, 36, 47 |

To facilitate the review of individual indications, this process focused its review to those indications that received an "uncertain" grade or indications where there was disagreement in the ranking process. To this end, the indications in the AC document were divided into 2 groups based on the level of agreement of the initial individual Technical Panel members. "Good agreement" indications were defined as those where less than 3 reviewers rated the indication in the opposite extreme category (eg, inappropriate or appropriate). "Poor agreement" indications were those where 3 or more reviewers rated the indication in the opposite extreme category. These data are summarized in the Online Appendix for the Appropriateness Criteria for SPECT MPI.[2] The results of this division are summarized in Table 1.

The appropriateness classification of "poor agreement" indications is listed in Table 2. These indications were identified for review and are addressed individually in this document. This review includes a summary statement and a consensus recommendation. The summary statement is meant to succinctly highlight the relevant issues and recent data so as to clarify issues that may have led to the "poor agreement" among panel members. The recommendations were made as follows:

1. "No revision necessary" (indicating that the level of appropriateness is supported by the current evidence available)
2. "Request review/revision" (indicating that the level of appropriateness for an indication did not reflect exist-

ing evidence or current appropriate routine clinical practice)

This evaluation was performed based on the conclusion of the QA Committee that a detailed evidence-based explanation of consensus opinion may be useful, given the wide range of opinions for these indications.

## REVIEW OF DEFINITIONS AND CLASSIFICATION STRUCTURE

As part of this review, 2 systemic issues in the way in which patients are characterized by the current AC for SPECT MPI were identified. These issues would be expected to impact multiple individual indications. These are considered by the Society to be high-priority areas for revision of the AC for SPECT MPI.

### Definition of chest pain syndrome

**Summary.** The AC for SPECT MPI defines a chest pain syndrome as "any constellation of symptoms that the physician believes may represent a complaint consistent with obstructive CAD [coronary artery disease]. Examples of such symptoms include, but are not exclusive to, chest pain, chest tightness, burning, dyspnea, shoulder pain, and jaw pain." Focusing only on symptoms excludes other clinical findings (eg, new electrocardiographic [ECG] changes) that may suggest to a physician that obstructive CAD is present and prompt SPECT MPI. Other consensus guidelines, such as the ACC/AHA Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery,[4] use the phrase "signs or symptoms of ischemia" when discussing usefulness of stress testing. In the current version of the AC for SPECT MPI, patients with "signs" of ischemia, such as new ECG changes, would be considered under "asymptomatic" indications, with lower levels of appropriateness.

**Recommendation.** A chest pain syndrome should be redefined as "any constellation of signs or symptoms that the physician believes may represent a complaint consistent with obstructive CAD. Examples of such symptoms include, but are not exclusive to, chest pain, chest tightness, burning, dyspnea, shoulder pain, jaw pain, and new ECG abnormalities." In the absence of this change, "signs" of ischemia, such as new ECG changes, should be evaluated as a new indication for SPECT MPI testing.

### Definition of high CHD risk

**Summary.** In the AC for SPECT MPI, high coronary heart disease (CHD) risk is "defined as the presence of diabetes mellitus or the 10-year absolute CHD risk of

greater than 20%." This definition does not specifically mention known coronary risk equivalents other than diabetes, such as peripheral arterial disease, abdominal aortic atherosclerotic disease, and so on, as defined in the National Cholesterol Education Program Clinical Practice Guidelines for Cholesterol Management in Adults (ATP III).[5]

**Recommendation.** The definition of high CHD risk should be revised to be "defined as the presence of diabetes mellitus, peripheral arterial disease or other coronary risk equivalents, or the 10-year absolute CHD risk greater than 20%."

## SUGGESTED NEW INDICATIONS FOR SPECT MPI BASED ON NEW DATA

After review of the current indications in the AC for SPECT MPI and recent literature, the QA Committee identified several potential new indications that are common referral indications for SPECT MPI. ASNC would propose that these new indications be evaluated with methodology similar to that used for the initial indication to determine their level of appropriateness for SPECT MPI testing. These new indications and data to support them are as follows:

**Syncope.** In the evaluation of unexplained syncope, the recently published AHA/ACCF Scientific Statement on the Evaluation of Syncope considers an ischemia evaluation "appropriate in patients at risk for or with a history of coronary artery disease."[6] Although the role of MPI in patients with syncope has not been clearly defined, SPECT MPI is frequently the initial diagnostic test obtained for evaluation of ischemia in patients with unexplained syncope. Unexplained syncope should be an appropriate indication for SPECT MPI testing.

**Troponin elevation.** As currently constructed, the AC for SPECT MPI does not account for elevations of cardiac enzyme levels, yet patients with mild troponin elevations in the absence of other markers of an acute coronary syndrome are commonly referred to SPECT MPI. Recent data suggest that even low levels of troponin elevation identify a patient at increased risk of future cardiovascular events.[7,8] Additional new data suggest that among patients with an atypical clinical presentation and elevated cardiac troponin levels, SPECT MPI may help to stratify risk and guide management,[9] as well as that SPECT MPI may identify low-risk patients who may not need to undergo invasive angiography.[10]

**Use of type 1C antiarrhythmic drugs.** The recently published ACC/AHA/European Society of Cardiology 2006 Guidelines for the Management of Patients With Atrial Fibrillation endorse the use of type 1C antiarrhythmic agents in appropriately selected patients with atrial fibrillation.[11] However, given the documented proarrhythmic risks of type 1C agents in patients with ischemic heart disease or left ventricular dysfunction, testing to exclude ischemia before initiating therapy in selected patients at risk for ischemic heart disease is appropriate.[11] Although the role of SPECT MPI in this setting has not been established, it may be reasonable to perform before initiating type 1C antiarrhythmic agents in patients at risk for ischemic heart disease.

**ECG abnormalities (as an alternative to adopting a new definition of a chest pain syndrome described previously).** Newly recognized ECG abnormalities such as ST-T–wave changes are common referral indications for SPECT MPI and yet are not addressed in the current AC for SPECT MPI. It has been established that ST-T–segment changes on the electrocardiogram carry important prognostic implications.[12,13] Resting ST depression is a marker for a higher prevalence of CAD and is associated with an adverse cardiovascular prognosis. It is also well known that transient myocardial ischemia and myocardial infarction can occur in the absence of chest pain (silent ischemia). Furthermore, resting ECG abnormalities frequently preclude routine ECG stress testing alone. In asymptomatic patients SPECT MPI could be considered in those with an intermediate to high risk of CAD and newly recognized ECG abnormalities.

**Incomplete revascularization.** Patients referred for revascularization for acute coronary syndromes or stable angina frequently undergo target or culprit vessel revascularization. The target or culprit vessel may be determined from prior stress tests and acute ECG changes, in addition to angiographic anatomy. Frequently, additional disease is noted in other vessels that is of unclear clinical significance. Such patients are commonly referred for follow-up SPECT MPI testing to assess the functional significance of this disease. These patients may be asymptomatic in the interval between revascularization and follow-up SPECT MPI. This represents a common and widely used indication for SPECT MPI that is not addressed in the current AC document. Although there is little evidence addressing this situation, clinical consensus would suggest that SPECT MPI testing would be appropriate in post-revascularization patients in whom there is a residual stenosis of unclear clinical significance.

**End-stage renal disease.** End-stage renal disease is associated with multiple cardiovascular risk factors and a high cardiovascular mortality rate. Recent studies have shown that patients with end-stage renal disease have a high prevalence of abnormal SPECT MPI studies and that perfusion defects on SPECT MPI are associated with an adverse cardiovascular prognosis.[14-17] Furthermore, SPECT MPI has been shown to have a high

sensitivity and specificity for detection of disease in this population.[16-19] End-stage renal disease should be evaluated as an additional indication for SPECT MPI imaging.

## UPDATED LITERATURE SEARCH

The rankings for each indication in the AC document were based on evidence-based information compiled by the ACC librarian. The ACC librarian and a cardiovascular fellow conducted independent searches for literature published from 2001 to January 2005.

The QA Committee expanded this search to include articles published between January 2005 and April 2007, as well as those that may be missing from the ACC librarian's list. The list was generated from a combined search of "single photon emission tomography myocardial perfusion imaging" and the following fields:

- chest pain
- viability
- ejection fraction
- hypertensive heart failure
- hypertrophic heart failure
- electron beam computed tomography
- adenosine
- technetium 99m (Tc-99m)
- antimyosin
- dipyridamole
- glucarate
- risk stratification
- prognosis
- non–Q-wave infarction
- gamma camera imaging
- positron emission tomography
- acute myocardial infarction
- heart failure
- ischemia
- ventricular volumes
- left ventricular function
- angina
- hypertensive heart disease
- acute coronary syndrome
- coronary artery disease
- percutaneous coronary intervention
- coronary artery bypass

All duplicate references from the search and those already in the ACC list were removed. The results of this search are in the Appendix.

## REVIEW OF INDIVIDUAL INDICATIONS

The detailed review for each of the indications in Table 2 is as follows.

## Indication 2: Detection of CAD: symptomatic. Evaluation of chest pain syndrome. Low pre-test probability of CAD, ECG uninterpretable OR unable to exercise.

Median score, 6.5 (uncertain).

**Summary.** The incremental benefit of SPECT MPI over exercise testing in patients with complete left bundle branch block, pre-excitation, paced rhythm, or ST depression of greater than 1 mm on the baseline electrocardiogram has been established.[20,21] There is also evidence for an incremental prognostic benefit of pharmacologic MPI testing in subgroups of elderly and diabetic patients who are unable to exercise,[22-24] and in this group exercise is not an option for evaluation of a chest pain syndrome. It should also be mentioned that patients undergoing digoxin therapy should be included among those with an uninterpretable electrocardiogram for the purpose of exercise testing. The score of 6.5 (uncertain) likely results from the uncertainty regarding the value of testing individuals with a low pretest likelihood. The decision for testing in a patient with a low pretest probability of CAD hinges on the clinical characteristics of the patient.

**Recommendation.** No revision necessary.

## Indication 3: Detection of CAD: symptomatic. Evaluation of chest pain syndrome. Intermediate pre-test probability of CAD, ECG interpretable AND able to exercise.

Median score, 7.0 (appropriate).

**Summary.** The superior sensitivity and specificity of MPI compared with exercise testing are well documented.[25-27] Thus the post-test probability of detecting CAD in patients with an intermediate pretest probability of disease by use of MPI compared with exercise testing would be improved.

**Recommendation.** No revision necessary.

## Indication 5: Detection of CAD: symptomatic. Evaluation of chest pain syndrome. High pre-test probability of CAD, ECG interpretable AND able to exercise.

Median score, 8.0 (appropriate).

**Summary.** This symptomatic, high–pretest likelihood group could potentially proceed directly to coronary imaging, but cost-effective studies show that selective catheterization for those with abnormal or high-risk scans is favored.[26,28,29]

**Recommendation.** No revision necessary.

## Indication 11: Detection of CAD: asymptomatic (without chest pain syndrome). Moderate CHD risk (Framingham).

Median score, 5.5 (uncertain).

**Summary.** MPI is highly accurate for the detection of CAD in patients with a moderate CHD risk based on the Framingham score, and the superior sensitivity and specificity of MPI testing compared with routine exercise testing have been established.[25,26] However, at this time, there is not clear evidence that routine MPI for asymptomatic patients in a moderate risk category is beneficial.[30]

**Recommendation.** No revision necessary. Randomized studies would be useful to fully determine the value of SPECT MPI testing in asymptomatic patients with a moderate CHD risk (Framingham).

## Indication 12: Detection of CAD: asymptomatic (without chest pain syndrome). New-onset or diagnosed heart failure or LV systolic dysfunction without chest pain syndrome. Moderate CHD risk (Framingham), no prior CAD evaluation AND no planned cardiac catheterization.

Median score, 7.5 (appropriate).

**Summary.** MPI for the detection of ischemic versus nonischemic cardiomyopathy has a high sensitivity, although specificity is limited.[23,24] MPI is a reasonable initial test in this category where coronary angiography is not planned.

**Recommendation.** No revision necessary.

## Indication 13: Detection of CAD: asymptomatic (without chest pain syndrome). Valvular heart disease without chest pain syndrome. Moderate CHD risk (Framingham), to help guide decision for invasive studies.

Median score, 5.5 (uncertain).

**Summary.** MPI is highly accurate for the detection of CAD in patients with a moderate CHD risk based on the Framingham score.[31,32] MPI testing would be reasonable to guide the decision to perform invasive studies in patients with valvular heart disease without a chest pain syndrome.[3]

**Recommendation.** No revision necessary. Randomized studies would be useful to fully determine the value of SPECT MPI testing in asymptomatic patients with a moderate CHD risk (Framingham).

## Indication 14: Detection of CAD: asymptomatic (without chest pain syndrome). New-onset atrial fibrillation. Low CHD risk (Framingham), part of the evaluation.

Median score, 3.5 (uncertain).

**Summary.** Low–CHD risk patients with new-onset fibrillation will be younger and with few atherosclerotic risk factors. Although there is no evidence for routine use of MPI in this setting, MPI would be reasonable if an ischemic etiology of atrial fibrillation is suspected. In addition, MPI testing may be indicated before starting type 1C antiarrhythmic drug therapy.[11]

**Recommendation.** No revision necessary.

## Indication 18: Risk assessment: general and specific patient populations. Asymptomatic. Moderate CHD risk (Framingham).

Median score, 4.0 (uncertain).

**Summary.** MPI is highly accurate for the detection of CAD in patients with a moderate CHD risk based on the Framingham score, and the superior sensitivity and specificity of MPI testing compared with routine exercise testing have been established.[25,26] However, there is not clear evidence that routine MPI for asymptomatic patients in a moderate risk category is beneficial.[30]

**Recommendation.** No revision necessary.

## Indication 21: Risk assessment with prior test results. Asymptomatic OR stable symptoms, normal prior SPECT MPI study. Normal initial RNI study, high CHD risk (Framingham), annual SPECT MPI study.

Median score, 3.0 (inappropriate).

**Summary.** There have been multiple studies demonstrating that the risk of a cardiovascular event after a normal nuclear scan in the overall population is less than 1% per year,[33-35] and several studies have demonstrated that this risk can be extended out to at least 2 years.[27,36] Therefore, regardless of pretest Framingham risk, repeating a nuclear stress test at 1 year in asymptomatic patients with a normal MPI study cannot be justified. It should be noted, however, that the risk among patients with diabetes, despite a negative MPI study, approaches 1.2% to 2% per year.[27,37]

**Recommendation.** No revision necessary.

### Indication 22: Risk assessment with prior test results. Asymptomatic OR stable symptoms, normal prior SPECT MPI study. Normal initial RNI study, high CHD risk (Framingham), repeat SPECT MPI study after 2 years or greater.

Median score, 7.0 (appropriate).

**Summary.** This category directly assesses the warranty period of a normal MPI scan. Few data are available regarding serial testing and the temporal pattern of converting from a normal scan to an abnormal scan. However, Hachamovitch et al[38] have defined clinical variables associated with a variably shortened warranty period or increased risk over the subsequent 2 to 3 years. In particular, the risks among patients without established CAD include advancing age; presence of diabetes, particularly in women; and an inability to exercise (ie, referral for pharmacologic stress testing).[27,38] These data support the clinical opinion that a repeat scan for risk assessment 2 or more years after a normal scan in high–CHD risk patients is appropriate.

**Recommendation.** No revision necessary.

### Indication 24: Risk assessment with prior test results. Asymptomatic OR stable symptoms, abnormal catheterization OR prior SPECT MPI study. Known CAD on catheterization OR prior SPECT MPI study in patients who have not had revascularization procedure, greater than or equal to 2 years to evaluate worsening disease.

Median score, 7.5 (appropriate).

**Summary.** The ability of an abnormal MPI study to predict coronary events is well established.[33,39] Increasing quantitative severity of perfusion defects on myocardial perfusion scans is associated with an increased relative risk of nonfatal myocardial infarction, cardiac deaths, and the need for coronary artery bypass grafting (CABG) surgery or percutaneous coronary intervention (PCI).[33] Severity of disease on MPI testing also stratifies patients into those who benefit from an invasive versus conservative (medical) management strategy.[33] Thus patients with mild to moderate CAD by MPI or angiography would be reasonable candidates for serial studies at greater than or equal to 2 years, although the most useful timing is unknown.

**Recommendation.** No revision necessary.

### Indication 26: Risk assessment with prior test results. Asymptomatic, CT coronary angiography. Stenosis of unclear significance.

Median score, 6.5 (uncertain).

**Summary.** Coronary computed tomography (CT) angiography is evolving as an alternative method of defining coronary anatomy. The limited data available suggest that when using significant stenosis on traditional invasive coronary angiography as the gold standard, coronary CT angiography has a high negative predictive value but also a high false-positive rate (low specificity and low positive predictive value).[40-42] This would suggest that proceeding directly to invasive angiography would not be appropriate for equivocal lesions on CT angiography, particularly in patients without symptoms in whom the benefits of revascularization are not established. Similarly, one small study has shown a poor positive predictive value (29%) of obstructive findings by CT angiography for finding ischemia on MPI, suggesting that MPI in these patients may obviate the need for an invasive procedure.[43] Finally, indication 27, a coronary calcium score of greater than 400, is considered an "appropriate" indication for MPI testing, although this indication is "uncertain." As these 2 findings have a similarly poor positive predictive value for finding obstructive coronary stenosis on invasive angiography, MPI would be the appropriate first step in both cases.

**Recommendation.** Request review/revision. On the basis of new and evolving data described previously, this should now be considered an appropriate indication for MPI testing.

### Indication 34: Risk assessment: preoperative evaluation for non-cardiac surgery. High-risk surgery. Minor perioperative risk predictor, normal exercise tolerance (greater than or equal to 4 METS).

Median score, 4.0 (uncertain).

**Summary.** The low incidence of adverse perioperative cardiovascular events among patients with minor clinical predictors and good exercise tolerance suggests that routine MPI in these patients would not be useful.[4] MPI might be considered before very high-risk surgeries in patients with multiple minor clinical predictors.

**Recommendation.** No revision necessary.

### Indication 36: Risk assessment: preoperative evaluation for non-cardiac surgery. High-risk surgery. Asymptomatic up to 1 year post normal catheterization, non-invasive test, or previous revascularization.

Median score, 3.0 (inappropriate).

**Summary.** The cardiovascular event rates 1 year after a normal MPI study are less than 1%.[33,35] There is no evidence that MPI testing for asymptomatic patients in this category would be useful.

**Recommendation.** No revision necessary.

## Indication 42: Risk assessment: post-revascularization (PCI or CABG). Asymptomatic. Asymptomatic prior to previous revascularization, less than 5 years after CABG.

Median score, 6.0 (uncertain).

## Indication 43: Risk assessment: post-revascularization (PCI or CABG). Asymptomatic. Symptomatic prior to previous revascularization, less than 5 years after CABG.

Median score, 4.5 (uncertain).

**Summary for indications 42 and 43.** Data addressing the prevalence or prognostic impact of both symptomatic and silent ischemia less than 5 years after CABG demonstrate that MPI abnormalities are potent predictors of nonfatal and fatal coronary events.[44-46] These data suggest that SPECT MPI has value within the first 5 years after CABG and that the absence of symptoms after CABG may limit the ability to track patients on clinical grounds alone. Furthermore, there is no clear evidence addressing the importance of symptoms before the initial CABG; thus it is not clear that symptoms before the initial CABG are useful in determining the appropriateness of MPI after CABG.

**Recommendation.** Request review/revision. Recommend changing level of appropriateness for both indication 42 and 43 from "uncertain" to "appropriate" based on current evidence.

## Indication 46: Risk assessment: post-revascularization (PCI or CABG). Asymptomatic. Asymptomatic prior to previous revascularization, less than 2 years after PCI.

Median score, 6.5 (uncertain).

**Summary.** (See also summary for indication 47.) Many studies have demonstrated that asymptomatic or silent ischemia is commonly found on stress MPI performed within the first 2 years after revascularization, as well as that silent ischemia on stress MPI in this setting is a potent predictor of future cardiovascular events.[47-50] However, the role of routine SPECT MPI testing in this group has not been clearly defined.

The presence of symptoms before the initial PCI has a very poor correlation with recurrence of symptoms resulting from restenosis;[51-53] thus this evidence does not support using symptoms before the initial PCI to differentiate appropriateness of stress MPI imaging.

**Recommendation.** No revision necessary. However, given the poor correlation of symptoms before previous revascularization with symptoms resulting from restenosis, the level of appropriateness should not differ between indications 46 and 47.

## Indication 47: Risk assessment: post-revascularization (PCI or CABG). Asymptomatic. Symptomatic prior to previous revascularization, less than 2 years after PCI.

Median score, 3.0 (inappropriate).

**Summary.** (See also summary for indication 46.) Many studies have demonstrated that asymptomatic or silent ischemia is commonly found on stress MPI performed within the first 2 years after revascularization, as well as that silent ischemia on stress MPI in this setting is a potent predictor of future cardiovascular events.[47-50] However, the role of routine SPECT MPI testing in this group has not been clearly defined.

The presence of chest pain before PCI does not correlate with the recurrence of symptoms resulting from restenosis.[51-53] Thus this evidence does not support using symptoms before the initial PCI to differentiate appropriateness of stress MPI imaging.

**Recommendation.** Request review/revision. Given the poor correlation of symptoms before previous revascularization with symptoms resulting from restenosis, the level of appropriateness should not differ between indications 46 and 47. Given data suggesting prognostic benefit of SPECT MPI in this setting, we recommend changing the level of appropriateness to "uncertain."

## Indication 48: Risk assessment: post-revascularization (PCI or CABG). Asymptomatic. Asymptomatic prior to previous revascularization, greater than or equal to 2 years after PCI.

Median score, 6.5 (uncertain).

## Indication 49: Risk assessment: post-revascularization (PCI or CABG). Asymptomatic. Symptomatic prior to previous revascularization, greater than or equal to 2 years after PCI.

Median score, 5.5 (uncertain).

**Summary for indications 48 and 49.** Multiple studies have found that stress MPI testing even in the first 2 years after PCI identifies patients with silent

ischemia, as well as that silent ischemia on stress MPI after PCI provides potent prognostic information.[47-50] These data suggest that follow-up surveillance testing is useful. Furthermore, the absence of symptoms after PCI may limit the ability to track patients on clinical grounds alone. SPECT MPI is widely used clinically for this indication based on this evidence and clinical consensus, particularly for patients considered to be at high risk for restenosis based on anatomic or procedural factors.

There appear to be very few data to support the use of symptoms before the initial revascularization procedure in the decision tree for repeat MPI testing, although they are commonly used clinically as a reason for or against testing of asymptomatic patients. The data that do exist appear to suggest that this distinction is not useful. The presence of chest pain before PCI does not correlate with the recurrence of symptoms resulting from restenosis;[51-53] thus, using symptoms before initial revascularization as a determinant of testing for asymptomatic patients after revascularization is not supported by the literature.

**Recommendation.** Request review/revision. We recommend changing the level of appropriateness for indications 48 and 49 from "uncertain" to "appropriate" based on the current evidence available.

## CONCLUSION

The ACCF/ASNC AC for SPECT MPI provides recommendations for the appropriate use of SPECT MPI. After the publication of the AC document in 2005, the AC has been used by nuclear cardiology practices with many clinical studies evaluating the list of indications in routine clinical practice. From these data, ASNC recommends minor but important changes to the indication list, suggesting the addition of 6 new indications and the modification of the definitions for "chest pain syndrome" and "CHD high risk." An objective review of existing indications focused on only those indications that had significant variability among the reviewers (n = 20). These indications were reviewed in the presence of existing and new evidence-based data, and ASNC recommends that the grades for 6 indications be re-evaluated.

The AC for SPECT MPI will require periodic review as new evidence becomes available or as clinical practice evolves. ASNC recognizes the importance of these criteria to improve the quality of patient care, and it will continue to play a key role in assembling the information for this ongoing review. From the current summary of evidence, ASNC consensus opinions, and ASNC recommendations in this document, ASNC strongly recommends that the AC guidelines be reviewed by the ACCF to provide the cardiovascular imaging community the most accurate data for the use of MPI.

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