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ASNC POSITION STATEMENT

Clinical indications for positron emission tomography myocardial perfusion imaging and myocardial blood flow quantification: An American Society of Nuclear Cardiology position statement

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INTRODUCTION

Since the publication of the 2016 Position Statement on the Clinical Indications for Myocardial Perfusion PET [1], a growing body of evidence has reinforced the expanding role of positron emission tomography (PET) in the diagnosis and management of coronary artery disease (CAD). This momentum derives from an enhanced understanding of the unique capabilities of PET myocardial perfusion imaging (MPI) and the use of dynamic PET acquisitions to quantify myocardial blood flow (MBF). Extensive and convincing evidence on its excellent diagnostic accuracy and valuable risk stratification has been demonstrated in multiple clinical studies. As a result, major national and international multi-societal clinical guidelines now classify it as the preferred test, if available.

This updated Position Statement expands on the previous indications to now recommend, if available, the use of cardiac PET MPI as the preferred modality for CAD evaluation for all patients who meet criteria for MPI. It reflects a broader international consensus on the value of cardiac PET MPI in routine clinical care, informed by the expanding body of research and clinical experience worldwide. It aims to reaffirm and clarify the role of PET MPI as a powerful and excellent tool for assessment of CAD and related symptoms, supporting broader implementation in clinical practice. This document is not intended to be an extensive scientific review of the literature but to detail the position of the American Society of Nuclear Cardiology (ASNC) regarding the use of cardiac PET MPI and MBF for the assessment of CAD.

MULTI-SOCIETAL GUIDELINE RECOMMENDATIONS

Based on its many advantages and a robust scientific literature, PET MPI with MBF is now prominently and explicitly recommended in major U.S.

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ABBREVIATIONS

ASNC	American Society of Nuclear Cardiology
CAC	Coronary artery calcium
CAD	Coronary artery disease
CT	Computed tomography
MPI	Myocardial perfusion imaging
MBF	Myocardial blood flow
PET	Positron emission tomography
SPECT	Single-photon emission computed tomography

and European multi-societal clinical guidelines, including the 2021 Multi-societal Chest Pain Guidelines [2], the 2023 Multi-societal Chronic Coronary Disease Guidelines [3], and the 2024 European Society of Cardiology Guidelines for Chronic Coronary Syndromes [4]. These are mainstream cardiovascular clinical guidelines developed by broad coalitions of societies—not limited to nuclear cardiology organizations—underscoring the growing recognition of PET MPI's clinical value across disciplines.

Across these guidelines, PET MPI is consistently preferred over single-photon emission computed tomography (SPECT) MPI. In the U.S. guidelines [2], this preference is reflected as a class 2a recommendation, while the European guidelines elevate it to class 1—recognizing cardiac PET's superior diagnostic accuracy, risk stratification, image quality, and ability to quantify MBF [3,4]. In both U.S. and European guidelines, PET is favored for the evaluation of intermediate- to -high-risk patients with stable or acute chest pain (Class 1), enhanced risk stratification (Class 1), and microvascular assessment when MBF is included (Class 2A) (Figure 1).

ADVANTAGES OF PET MPI

PET offers numerous important advantages that make it the preferred modality, as extensively documented in the ASNC Model Coverage Policy [5], Table 1.

1. High diagnostic accuracy

PET MPI demonstrates high and, when compared to SPECT MPI, superior sensitivity and specificity for detecting and evaluating obstructive epicardial CAD [5]. Its diagnostic performance has been validated in numerous retrospective and prospective

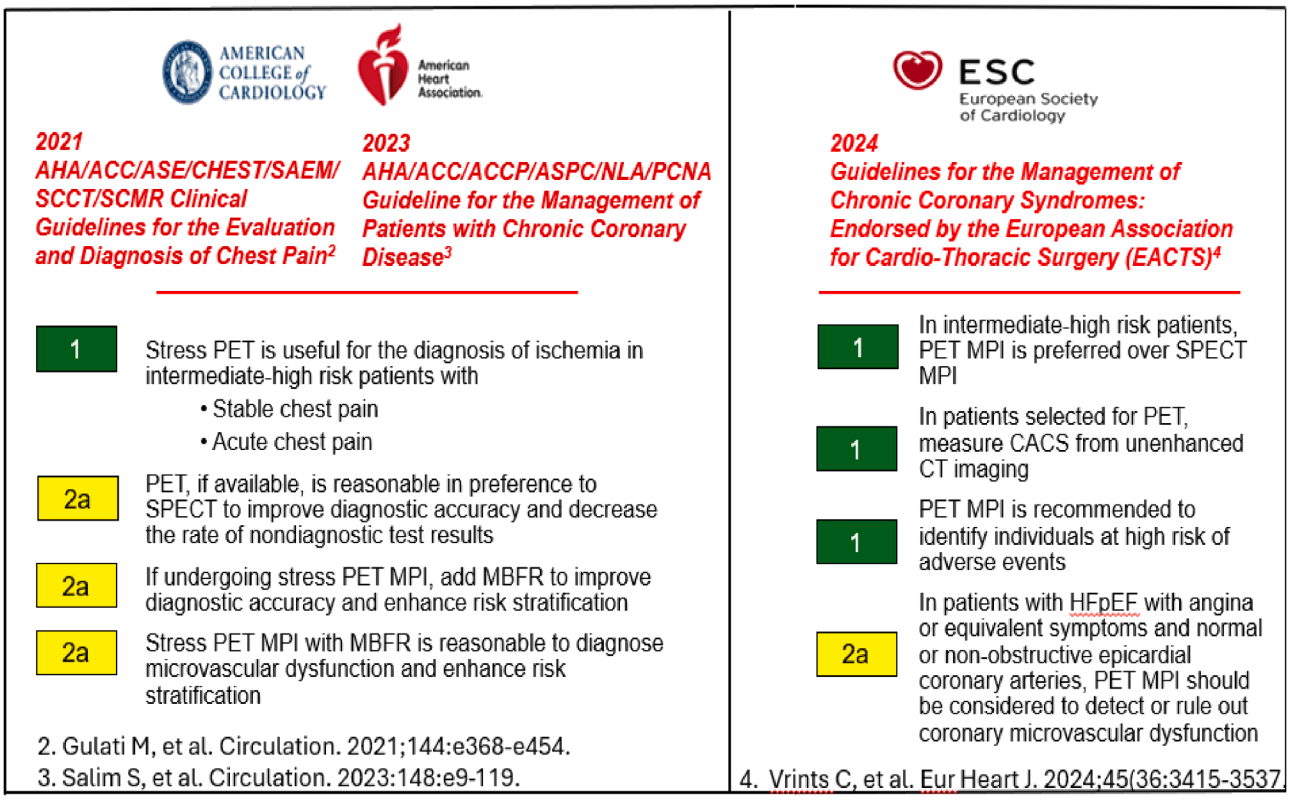

Figure 1. Recommendations for PET MPI in major US and European cardiology guidelines [2–4]. Green box = class 1 recommendation. Yellow box = class 2a recommendation. *MPI*, myocardial perfusion imaging; *PET*, positron emission tomography.

Table 1. Clinical advantages of cardiac PET MPI

Diagnostic accuracy
- ➢ Reduces unnecessary downstream testing.
- ➢ Identifies CAD in absence of perfusion defects.

Risk stratification
- ➢ Perfusion, myocardial-blood-flow, and cardiac function measurements provide independent information about risk.

Robust and reproducible quantification of MBF
- ➢ Requires no additional acquisition time or radiation exposure.
- ➢ Confirms adequacy of vasodilator effectiveness.
- ➢ Enhances diagnostic precision and prognostication.
- ➢ Identifies coronary microvascular dysfunction.

Equitable across diverse patient populations
- ➢ Body habitus, sex, and very high calcium score
- ➢ Arrhythmias, contrast allergies, and implanted devices
- ➢ Feasible in virtually all patients.

Rapid acquisitions
- ➢ Important for patient satisfaction.
- ➢ Minimizes patient motion with associated artifacts.

Low radiation exposure
- ➢ Key consideration for serial imaging.

High image quality
- ➢ Excellent spatial and contrast resolution.
- ➢ High myocardial count density.
- ➢ Superior tracer kinetics.
- ➢ Routine attenuation and scatter correction.

CAD, coronary artery disease; *MBF*, myocardial blood flow; *MPI*, myocardial perfusion imaging; *PET*, positron emission tomography.

studies and confirmed in large meta-analyses [6,7]. The combination of high-quality, high-spatial-resolution perfusion imaging with attenuation correction, rest-and-stress functional assessment (regional/global wall motion and ejection fraction), MBF, MBF reserve, and coronary artery calcium [CAC] when combined with computed tomography [CT] evaluation provides the following:

- Identification of very-low-risk patients, reducing unnecessary downstream testing.
- Identification of coronary-artery-disease in the absence of relative perfusion defects, including microvascular disease.
- More accurate identification of multi-vessel disease-related balanced flow reduction.

2. Improved risk stratification

- Perfusion, blood flow, and function measurements each provide independent information about risk, permitting more precise decisions about medical management and interventions for coronary-artery-disease.

3. Robust and reproducible quantification of MBF

PET is the gold standard, non-invasive modality for the assessment of MBF:

- Performed routinely without added acquisition time or radiation exposure
- Provides confirmation of vasodilator effectiveness
- Enhances diagnostic accuracy and prognostication
- Enables identification of coronary microvascular dysfunction, a key contributor to angina without obstructive CAD [8].
- Identifies the true extent of CAD, enhancing diagnosis of left main or multi-vessel disease and eliminates the concern of false negative perfusion results in the setting of “balanced ischemia” [9,10].

Quantitative assessment of MBF with PET offers substantial added value beyond relative perfusion imaging and gated MPI. By providing absolute measures of perfusion, MBF quantification improves diagnostic accuracy for epicardial CAD and enhances assessment of its extent and severity [9,10]. Myocardial blood flow provides incremental risk stratification information, refining prediction for future cardiovascular events [9,10]. Importantly, MBF quantification provides more informed decision-making to assess the need for coronary revascularization and/or intensified medical therapy [11,12]. In addition, it enables the identification of coronary microvascular dysfunction, in the presence of or in the absence of obstructive epicardial CAD [8]. Quantitative MBF also confirms the effectiveness of pharmacologic stress, adding a layer of confidence to study interpretation. Finally, it is valuable in patients with known CAD, prior PCI or CABG, and cardiac transplant, providing insights into disease progression, response to therapy, and detection of new or evolving disease [9–13].

4. Equitable across diverse patient populations

- Utility unaffected by sex or body habitus or amount of CAC making it equally effective in women, overweight patients, and those with very high CAC scores.
- Feasible in all patients including those capable of exercise, irrespective of cardiac rhythm, implanted devices, iodinated contrast allergy, and virtually all comorbidities.

- Offers robust performance even in those patients with multi-vessel disease or prior revascularization.

5. Comparatively rapid acquisitions

- PET acquisitions can be completed quickly, which is important to patient satisfaction, and minimize patient motion with associated artifacts that can erode accuracy.

6. Low radiation exposure

- PET MPI protocols typically result in low total-body effective dose, well below current societal recommendations [14]. This is a particularly important consideration for serial imaging in chronic CAD or transplant patients who are likely to undergo numerous radiation-exposing procedures in the course of their disease.

7. High image quality

PET MPI provides consistently high-quality images even in challenging patient populations due to:

- Excellent spatial and contrast resolution
- High myocardial count density
- Excellent tracer kinetics
- Routine attenuation and scatter correction

ADDED VALUE OF PET/CT

When available, adjunctive CT should be routinely used to provide additional important anatomic insights, particularly regarding the presence, extent, and severity of CAC. If ECG-gated CT is performed, a CAC score can be measured; in the absence of electrocardiographic gating, visual estimation of CAC remains informative [15]. Detection of CAC has important prognostic implications and can guide preventive and therapeutic medical management. In addition, the CT component may reveal relevant cardiac, vascular, and non-cardiovascular findings that can further inform patient care beyond MPI findings [15].

CONCLUSION

PET MPI with MBF quantification has several strengths that make it ideal for CAD evaluation—high diagnostic accuracy of both epicardial and microvascular disease, low radiation exposure, and powerful risk stratification. Therefore, the ASNC recommends that PET MPI, if available, be the preferred modality for all patients who meet criteria for MPI. There are no clinical scenarios or patient subgroups in which the use of PET MPI should be excluded, given its diagnostic accuracy, risk stratification, and unique quantitative capabilities.

DISCLOSURES

The authors declare the following financial interests/personal relationships, which may be considered as potential competing interests.
Dr. Bateman reports research grants from Bracco, GE HealthCare, and Spectrum Dynamics, is a consultant for GE HealthCare and Synektik, and has ownership in Cardiovascular Imaging Technologies. Dr. Al-Mallah reports research grants from Siemens and GE HealthCare and is a consultant for Jubilant Pharma, Pfizer, Phillips, Medtrace, Synektik, and GE HealthCare. Dr. Arumugam is a speaker for Blue Earth Diagnostics, Ltd. and IBA Radio Pharma Solutions. Dr. Chareonthaitawee is a consultant for GE HealthCare and Synektik is receiving royalty payments from UpToDate. Dr. Di Carli is consultant for Medtrace Pharma, Sanofi, Valo Health, Bitteroot Bio, and IBA Radio Pharma Solutions and reports an institutional research support from Sun Pharma and Gilead Sciences and an in-kind institutional grant from Amgen. Dr. Heller is on the Advisory Board of Molecular Imaging Services. Dr. Soman has received grant support from Pfizer and is receiving consulting fees from Alnylam, Eidos, Pfizer, Spectrum Dynamics, and Synektik is receiving royalty. Dr. Abuzaid is a consultant for BridgeBio. Dr. Osborne is a consultant for WCG Imaging. Dr. Patel reports research grants from the NIH and Jubilant Radiopharma. Dr. Phillips is a consultant for Novo Nordisk. Dr. Sanghani is a consultant and speaker for GE HealthCare.
The following contributors have nothing to disclose: Dr. Alnabelsi, Dr. Calnon, and Dr. Divakaran.

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