



The right test for the right patient at the right time

Merrill Thomas,^a and Randall C. Thompson^a

^a Saint Luke's Mid America Heart Institute, The University of Missouri, Kansas City, MO

Received Mar 22, 2022; accepted Mar 22, 2022

doi:10.1007/s12350-022-02973-y

See related article, pp. 3281–3290

Chest pain accounts for more than 6.5 million visits to the emergency department (ED) in the United States (U.S.) annually.¹ Diagnostic evaluation of chest pain in the ED is challenging. While a majority of patients do not have a cardiac etiology for their symptoms, chest pain is the most common presenting symptom of coronary artery disease (CAD), which is highly prevalent and the leading cause of death for men and women in the U.S.^{2,3} Therefore, a missed diagnosis of ischemic heart disease can result in patient morbidity and mortality and malpractice litigation.³⁻⁵ Accurate and efficient testing for patients presenting to the ED with chest pain is necessary to properly triage and treat these patients.

Positron emission tomography (PET) myocardial perfusion imaging (MPI) has particular advantages in this setting (Table 1). PET MPI has high diagnostic accuracy, a relatively low radiation dose, and short imaging time. In the COVID-19 era, it allows for the enhancement of social distancing. Additionally, PET MPI can quantify myocardial ischemia and infarction, coronary calcium assessment, left ventricular ejection fraction at rest and with stress, and myocardial blood flow reserve. It would appear to be very advantageous to have PET MPI available for the evaluation of ED patients with chest pain.

In this issue of the journal, Shaukat Ali, et al present findings from a single-center retrospective study aimed at assessing the impact of PET MPI availability on the

management of ED patients with non-acute coronary syndrome (ACS) chest pain.⁶ A total of 21,242 patients presenting to the ED with non-ACS chest pain were included. The authors found that the availability of PET increased referrals for MPI over the time that PET was available, and when PET was available, more patients underwent PET as compared to SPECT MPI. The proportion of patients undergoing coronary angiography did not differ in the timeframe when PET was available compared to not available; however, when PET was available, median length of stay in the ED was shorter. Patients undergoing PET MPI compared to SPECT were less likely to have non-obstructive CAD on coronary angiography and had less downstream testing in the following 3 months.

There are a few important points to consider when evaluating this study. First, while ED length of stay and downstream testing are certainly important outcomes, the authors were unable to include outcomes that are most important to patients and providers—downstream major adverse cardiovascular events. Although cost is not a direct outcome in the current study, it can be inferred that expenditure is less with PET given the shorter ED length of stay and lower rates of downstream testing. Second, the study presents all comers presenting to the ED with chest pain who do not have ACS. However, risk stratifying patients into low, intermediate, and high pre-test likelihood of CAD is important in selecting diagnostic testing and could provide valuable insight to the authors' findings.⁷ Third, the study has somewhat limited generalizability in the sense that PET MPI is not widely available at all centers, although the authors certainly provide a strong argument for increased the availability of PET MPI.

Other imaging modalities have been studied in the ED setting. For example, in the Rule Out Myocardial Infarction/Ischemia Using Computer Assisted Tomography (ROMICAT-II) trial, early use of coronary computed tomographic angiography (CCTA) was compared to standard of care in patients presenting to the ED

Reprint requests: Merrill Thomas, Saint Luke's Mid America Heart Institute, The University of Missouri, 4401 Wornall Rd, Kansas City, MO 64111; methomas1@saint-lukes.org

J Nucl Cardiol 2022;29:3291–2.

1071-3581/\$34.00

Copyright © 2022 The Author(s) under exclusive licence to American Society of Nuclear Cardiology

Table 1. Advantages of PET-CT MPI in ED patients with possible ACS and intermediate risk

Shortens time to discharge compared with SPECT
Shorter exam/facilitates social distancing compared to SPECT
Less downstream testing compared with SPECT
Greater accuracy and referring physician confidence compared to SPECT
Better identification of high-risk disease than SPECT
Significant prognostic power from quantitative coronary flow measurement
Lower radiation dose compared to most SPECT and CCTA cases, especially in the obese
More likely to be informative in patients with known CAD than CCTA
Fewer contraindicated cases than CCTA

with chest pain.⁸ CCTA also resulted in reduced length of stay; however, compared to the standard evaluation group, downstream testing and radiation exposure were higher in the CCTA group. This highlights two important benefits of PET in the ED setting. First, the lower radiation exposure with PET MPI is an advantage, especially if patients are obese and lower dose SPECT or CTA protocols are impractical. Second, due to its diagnostic accuracy, providers have high confidence in PET MPI findings. Shaukat Ali, et al demonstrated a decrease in downstream testing following PET MPI and showed a change in provider behavior associated with access to PET, such that over the time that PET was available there was an increase in referrals for testing. ED providers need to be confident in the testing modality chosen to feel secure in the subsequent management of the patient.

Recently the long awaited AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR Guideline for the Evaluation and Diagnosis of Chest Pain were published.⁷ For patients presenting to the ED with acute chest pain who are at intermediate risk for CAD, anatomic or functional testing is recommended. The study by Shaukat Ali, et al highlights the benefits of PET MPI in this setting compared to other cardiac testing. Additionally, the guideline document highlights the importance of patient-centered testing. With its high accuracy, less

radiation exposure, and association with shorter length of stay, PET MPI offers key benefits for the patient. While Shaukat Ali, et al have laid the groundwork, future study should compare cardiac testing in intermediate-risk patients presenting to the ED with chest pain.

For patients presenting to the ED with chest pain, the right test at the right time leads to more efficient care and ultimately, lower expenditures. This study is a good example of the right test for the right patient at the right time. PET MPI is highly accurate and efficient, and providers have a high confidence in PET, making it an ideal modality for evaluating many ED patients who have chest pain.

References

1. Rui P, Kang K. National Hospital Ambulatory Medical Care Survey: 2017 emergency department summary tables. National Center for Health Statistics. Available at: https://www.cdc.gov/nchs/data/nhamcs/web_tables/2017_ed_web_tables-508.pdf. Accessed March 5, 2021.
2. Virani SS, Alonso A, Aparicio HJ, et al. Heart disease and stroke statistics-2021 update: A report from the American Heart Association. *Circulation* 2021;143:e254-743.
3. Pope JH, Aufderheide TP, Ruthazer R, et al. Missed diagnoses of acute cardiac ischemia in the emergency department. *N Engl J Med* 2000;342:1163-70.
4. Katz DA, Williams GC, Brown RL, et al. Emergency physicians' fear of malpractice in evaluating patients with possible acute cardiac ischemia. *Ann Emerg Med* 2005;46:525-33.
5. Studdert DM, Mello MM, Sage WM, et al. Defensive medicine among high-risk specialist physicians in a volatile malpractice environment. *JAMA* 2005;293:2609-17.
6. Shaukat Ali A, Finnerty V, Harel F, Marquis-Gravel G, Vadeboncoeur A, Pelletier-Galarneau M. Impact of rubidium imaging availability on management of patients with acute chest pain. *J Nucl Cardiol* 2022. <https://doi.org/10.1007/s12350-022-02923-8>.
7. 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. *Circulation* 2021;144:e368-454.
8. Hoffmann U, Truong QA, Schoenfeld DA, et al. Coronary CT angiography versus standard evaluation in acute chest pain. *N Engl J Med* 2012;367:299-308.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.