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EDITORIAL

Cardiac Noninvasive Diagnostic Testing for Outpatient Chest Pain: Rethinking "Less Is More"

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New-onset, stable chest pain is a common clinical complaint seen in outpatient clinics, but coronary artery disease is responsible for only a minority of these cases.[1,2] Major professional society guidelines differ on the optimal evaluation strategy for patients with stable chest pain.[3] US and European guidelines recommend that patients with at least an intermediate probability of coronary artery disease be evaluated with cardiac noninvasive diagnostic testing,[4–6] whereas in the United Kingdom and Canada, noninvasive testing is recommended only if chest pain symptoms are considered anginal.[7,8]

See Article by Roifman et al.

The yield of noninvasive testing in outpatients with stable chest pain is low and has been decreasing over time.[9,10] This situation has led some researchers to question current recommendations in favor of more refined criteria for testing in order to minimize potentially unnecessary tests, procedures, and costs.[11–13] However, ruling out a coronary cause of chest pain with noninvasive testing can also be helpful for patient management and prognosis should other noncoronary causes of chest pain be identified. Compared with patients who were diagnosed with noncoronary chest pain, patients presenting with chest pain who were not diagnosed had greater incidence of cardiovascular events over 5 years.[14] In addition, nearly one third of patients who present with chest pain and subsequently die or develop acute coronary syndrome are initially diagnosed with noncardiac chest pain.[15] Therefore, whether noninvasive testing itself can improve outcomes for patients remains a rich area for inquiry.

In this issue of the *Journal of the American Heart Association* (*JAHA*), Roifman and colleagues leveraged a large multidimensional database to evaluate whether noninvasive testing was associated with any change in cardiovascular outcomes for patients undergoing chest pain evaluation in Ontario, Canada.[16] They found that 21% of patients underwent noninvasive testing, of whom 59% had an exercise stress test, 27% had myocardial perfusion imaging, 14% had a stress echo, and 0.3% had coronary computed tomography angiography. Relative to no testing, receipt of noninvasive testing was associated with a 25% reduction in risk of a composite outcome of unstable angina, acute myocardial infarction, and cardiovascular mortality over a median of 4 years of follow-up. Interestingly, they found that rates of downstream invasive coronary angiography and revascularization were numerically similar for these 2 groups. However, patients receiving noninvasive testing were significantly more likely to be on several guideline-recommended cardiovascular medications after testing.

These findings mirror results from the SCOT-HEART (Scottish Computed Tomography of the Heart) trial, which showed that the addition of coronary computed tomography angiography to usual care led to a significantly lower rate of nonfatal myocardial infarction or

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death from coronary heart disease at 5 years.[17] Once again, rates of invasive coronary angiography and revascularization were similar between these groups, but more cardiovascular preventive therapies were initiated in the computed tomography angiography group. Notably, SCOT-HEART recruited higher risk individuals who were thought to have a 50% chance of having coronary heart disease,[18] whereas the present study by Roifman and colleagues considered a lower risk group of all comers with chest pain in an outpatient setting. In addition, the vast majority of patients in SCOT-HEART who were randomized to usual care received an exercise stress test, whereas the current study by Roifman and colleagues consolidated these patients in the "noninvasive testing" cohort.

Taken together, the current study by Roifman and colleagues and the SCOT-HEART trial point to a similar mechanism of how more thorough cardiac evaluation of can lead to improvement in outcomes by changing cardiovascular medical management. The study by Roifman and colleagues demonstrates that the benefit of such an evaluation may also exist upstream of the clinical decision examined in SCOT-HEART (ie, which testing strategy to choose), with the benefit of further testing potentially extending to the clinical decision of whether to test at all. The lack of differences in outcomes attributable to differences in coronary angiography or revascularization is consistent with the ISCHEMIA (International Study of Comparative Health Effectiveness With Medical and Invasive Approaches) trial, which did not find a reduction in risk of cardiac events with an invasive strategy in patients with stable coronary artery disease.[19]

A major strength of this study is the ability to capture many dimensions of care in a very large cohort of >1.5 million patients through linkage of billing, laboratory, health status, registry, citizenship, drug benefit, and death databases. This study is well powered to detect an absolute risk difference of 1.1% between patients who received noninvasive testing and patients who did not receive noninvasive testing, which is a small but clinically meaningful difference when applied across a large low-risk population encountered in routine clinical practice. Moreover, the authors undertake substantial sensitivity analyses and show that the results are robust to a propensity-matched approach.

Nevertheless, this article has some limitations. Because this study is observational in nature, the possibility of residual confounding exists. One might expect that selection of patients with more convincing anginal symptoms for noninvasive testing would lead to worse outcomes for this group, and thus it is possible that the estimated effect size of noninvasive testing on outcomes in this study is biased to the null. Alternatively, it is possible that providers who order more frequent noninvasive testing may also be more likely to follow other guideline-recommended care for coronary heart disease or to pursue more aggressive evaluation of noncoronary etiologies, which could bias these results toward a larger effect size. Although the authors control for an array of covariates, it is likely that some subtleties that are not captured, particularly for a syndrome such as chest pain, for which the clinical history is integral to clinical management. Nevertheless, a randomized controlled trial to answer the question addressed in this article may be ethically challenging to conduct, given the lack of clinical equipoise in randomizing a patient with chest pain to no testing.

This study demonstrates the potential value of noninvasive testing in improving outcomes for patients presenting with stable chest pain. The authors should be commended for addressing an important question with a large, multidimensional database. Recommendations for more widespread testing for patients presenting with stable chest pain come with substantial societal cost and resource-use implications. As such, given the observational nature of this study, it will be important to replicate these findings in other settings with different guideline recommendations and practice patterns to understand the marginal benefit of different testing strategies for patient outcomes.

ARTICLE INFORMATION

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Disclosures

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