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EDITORIAL

All Models Are Right But Some Are More Useful

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In the past decades, efforts have been made to establish accurate models for the assessment of probability of obstructive coronary artery disease (CAD), according to different patients' parameters such as age, sex, cardiovascular risk factors, and symptoms.[1,2] Increasing evidence supports a pretest probability (PTP)-guided application of diagnostic testing. This may on the one hand improve diagnostic utility, deferring unnecessary testing, and reducing health costs; on the other hand, however, it may lead to underdiagnosed patients without appropriate workup and management.

See Article by Winther et al.

Various suggested models emphasize the importance of collaboration of multiple variables for better stratification of patients with suspected obstructive CAD according to their observed prevalence of disease in contemporary cohorts. A high-quality prediction model is one able to deliver patient-tailored medicine, by estimating individual probabilities of illness, demonstrating correlation between predicted values that are consistent with the observed prevalence of the disease, and therefore refines the risk patients of assumed to be in the intermediate category where management is less evidence-based.

In the current issue of the *Journal of the American Heart Association* (*JAHA*), Winther et al used the Western Denmark Heart Registry, to examine the accuracy of various PTP models. The authors successfully calculated and compared values of the American Heart Association/American College of Cardiology-PTP (AHA/ACC-PTP) based on sex and age[3] with the 2019 European Society of Cardiology guideline PTP values based on sex, age, and symptoms[4] constructed on the updated Diamond–Forrester score,[1,2] as well as the risk factor–weighted clinical likelihood values based on sex, age, symptoms, and risk factors.[5] The AHA/ACC-PTP maximum values overestimated by a factor of 2.6 the actual prevalence of CAD. Compared with the AHA/ACC-PTP model (AUC, 71.5 [70.7–72.2]), inclusion of typicality of symptoms in the European Society of Cardiology-PTP improved discrimination of CAD (AUC, 75.5 [74.7–76.3]). Inclusion of both symptoms and risk factors in the risk factor–weighted clinical likelihood further improved discrimination (AUC, 77.7 [77.0–78.5]).[3]

The cut-off recommended for deferring further evaluation is 5% in the European Society of Cardiology guidelines and further testing with PTP of 5% to 15% could be considered based on individual assessment. In the AHA/ACC guidelines, coronary assessment was recommended in patients with PTP >15% and can be considered with PTP ≤15% based on clinical discretion.[4,6]

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Using the AHA/ACC-PTP, only 5% of patients are classified in the very low probability category (PTP≤5%), 31% of patients are in the intermediate category (PTP 5%–15%), and 65% are categorized as PTP >15% based on the maximum values before downgrading. As opposed to AHA/ACC-PTP, in the risk factor–weighted clinical likelihood model, 48.6% of patients would be categorized to a likelihood ≤5% and only 15.7% of patients to a likelihood >15%.[3] Thus, the 2021 AHA/ACC guideline on chest pain recommended PTP models based on age and sex overestimate the probability of CAD when using the given "maximal" values. Hence, clinicians should significantly downgrade these values to ensure accurate evaluation of the probability of obstructive CAD.

Among additional strategies used to identify patients with stable chest pain at low risk is coronary artery calcium score–weighted clinical likelihood, which allows an increased discrimination of obstructive CAD.[7,8]

Moreover, even when a lesion of 50% or more is discovered, physiological testing such as fractional flow reserve (FFR) and resting nonhyperemic indices can differentiate between significant hemodynamic stenoses and nonischemia-inducing lesions and lead to a percutaneous coronary intervention reduction of ≈30% compared with angiography guidance alone.[9] Therefore, higher utilization of invasive physiology may lead to an even lower rate of observed obstructive CAD.

Trials correlating FFR measurement with imaging studies of the vessel walls have demonstrated that only vulnerable, lipid-rich, large necrotic core plaques are associated with reduced FFR independent of the degree of luminal stenosis.[10–12]

The latter strategy along with exercise-stress testing and myocardial perfusion scintigraphy are useful for clinical decision-making and risk stratification in patients with CAD. However, even with preknown anatomy, whether every stenotic lesion bears at least moderate ischemia, an invasive strategy still might not be beneficial compared with optimal medical therapy.[13–16] Unfortunately, the clinical outcome as a result of application of any PTP model, which is of utmost importance, is scarce and requires further research.

Although there are many clinical tools for guidance of optimal PTP models, clinicians should also take into consideration in their decision-making process that there are other distinguishing factors between patients aside from traditional parameters such as age, sex, and cardiovascular risk factors. These include cultural and linguistic features, which bear significance with respect to the quality of the information conveyed by patients to the physicians when describing their symptoms. Thus, the clinician must account for and integrate these factors when consulting a patient with suspected CAD. Because of this delicate balance that physician must maintain, the practice of medicine is, as William Osler said, the science of uncertainty and the art of probability, which encompasses not only the models but also the patient.

ARTICLE INFORMATION

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Disclosures

None.

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