Story from the Front Lines:
The task of providing a wide range of services to patients is one that many primary care providers see as a welcome challenge. One particularly challenging aspect of their job is to perform a ‘preoperative evaluation’ upon request by a referring specialist. While there are many different classifications and scoring systems that can be used to help predict a patient’s cardiac risk preoperatively, no algorithm is perfect, thus we are left with some degree of uncertainty in every evaluation. This vignette aims to highlight the importance of understanding the evidence as applied to preoperative noninvasive cardiac stress testing.

I recently had the opportunity to administer treadmill testing, including observing the test and interpreting the tracings. This gave me the unique perspective of putting a face, body habitus, and clinical history to those funny squiggly lines we call EKG tracings. Very quickly, the patient became all too familiar to me; aside from differing faces and names… an overweight, highly functioning male in his 60s without reports of chest pain, shortness of breath or claudication, presenting for a preoperative exercise treadmill test prior to non-cardiac surgery. And while the tracings differed in their own ways, and the interpretations ranged from normal to abnormal, I couldn’t help but think… now what? Is the result of this test going to prevent any of these patients from getting their new hip or knee? Will the test result change what we ultimately do for the patient in a way that improves their health or quality of life? The answer often seemed an alarming “no.” None of the several examinations that I witnessed warranted further cardiopulmonary evaluation or delaying of the planned procedure. So, I turned to the evidence.

Teachable Moment:
The American College of Cardiology/American Heart Association Task Force 2007 updates to the 2002 practice guidelines for perioperative cardiovascular evaluation prior to non-cardiac surgery has a very clear-cut, easy to use algorithm to help sort through the abundance of literature that exists on this topic. While working through this algorithm it becomes immediately apparent that many arrows ultimately lead to proceeding with elective non-cardiac surgery after performing an appropriate history and physical exam - without the need for additional testing. When further testing is indicated based on the algorithm, they specify that such testing should only be pursued if the results will change management.1

Such recommendations have been made based on a several studies showing low utility of noninvasive stress testing preoperatively. Carliner et al aimed to evaluate the prognostic value of noninvasive stress testing on patients undergoing elective surgical procedures. The study found a 33% sensitivity, a 82% specificity, and a 27% positive predictive value (PPV) of an abnormal preoperative stress test (defined as 1mm horizontal or downsloping ST depression) in predicting death or acute myocardial infarction postoperatively.2 In other words, 73% of the positive tests by these criteria were falsely positive. On the other hand, and indicative of the generally low perioperative event rates in asymptomatic patients, the negative predictive value was 86%. In a separate study performed by McPahil et al, patients were evaluated prior to vascular surgery with noninvasive stress testing. The results showed no statistically significant association between the degree of ST segment depression and major cardiac complications.

To Stress or Not To Stress
Alyssa Nash, MD

(defined as acute myocardial infarction, acute congestive heart failure, malignant ventricular arrhythmias or cardiac death).³

We must always consider the ability of a test to reliably answer the question at hand, that is, how likely is it that an exercise stress test will correctly identify both low and high-risk patients prior to a surgical procedure? On close review of the evidence, it becomes apparent that the positive predictive value of preoperative noninvasive stress testing is suboptimal, while the negative predictive is appreciably better given the low pretest probability of significant cardiovascular disease in asymptomatic patients. Ideally, diagnostic tests would be in employed in a sufficiently high risk population and have adequate sensitivity and specificity to move us from a given pre-test probability to a substantially higher or lower post test probability in order to guide next steps.⁴ Lastly, it is of utmost importance to highlight the potential risks of subjecting patients to testing that ultimately does not add useful information and has the potential to cause harm. Going back to our vignette, would an abnormal stress test warrant further evaluation in the absence of symptoms? What would the next step be in such a case – cardiac catheterization? What would the tradeoff between benefits and harms be in that scenario?

The preoperative stress testing performed on the particular patients I saw did not alter their course. It did however prove to be both an inconvenience to the patient and a financial burden on the system. The ‘preoperative evaluation’ is an important step to ensure patient safety but we should be judicious in our use of pre-operative testing in patients who feel well given the risk of false positives and the potentially harmful evaluations that may follow.