Letter to the Editor

Standardizing Predictive Values in Diagnostic Imaging Research

Pilz et al (1) should be congratulated on their research looking at the negative predictive value in patients with a normal adenosine-stress cardiac magnetic resonance imaging (MRI). However, the data they present is incomplete. The crux of the matter is this: Does the negative predictive value have any clinical usefulness when it is derived from a population where only negative tests are evaluated? The answer is no. We need to know the overall prevalence of disease in the entire population undergoing the test before making a judgment as to its diagnostic utility.

Predictive values vary strongly with disease prevalence (2). Even for poorly accurate tests, when the prevalence of disease is very low, the negative predictive value is high. On the other hand, the sensitivity and specificity of a test are resistant to changes in disease prevalence. The authors do not supply prevalence data in their population of all patients undergoing cardiac MRI (ie, both those with positive and negative results). The surrogate risk calculator that looked at overall mortality cannot substitute for hard numbers of patients with obstructive disease.

Just as an exercise, building on their data, let us suppose the following: 1) the same number of people have a positive test as a negative test; 2) the prevalence of disease in those with a negative test is 3.8% (6/158); and 3) the prevalence of disease in those with a positive test is more than 5 times greater, at 20% (32/158). This means that the test would have a sensitivity of 84%, a specificity of 55%, a negative predictive value of 96%, and an overall population prevalence of obstructive disease of 12%. Now, change prevalence of disease to 75% while keeping the sensitivity and specificity fixed (since they are resistant to changes in prevalence). The negative predictive value is now only 54% and the odds of having no obstructive disease given a negative test is only about 1-to-1. This example demonstrates Baye's Theorem: altering the pretest probability affects the posttest probability.

A better way to present a predictive value would be to include the value based on the sample population, and also the value calculated at a 50% disease prevalence (the "standardized predictive value"). To calculate the standardized predictive value, first accurately determine test sensitivity and specificity. Then, set the prevalence of disease to 50% while keeping the sensitivity and specificity fixed. Now, calculate the predictive value. This standardized predictive value would allow readers to reduce prevalence bias when comparing one diagnostic test with another. It would enable readers to more rapidly grasp the true clinical value of a test, without any need for further calculation.

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