Abstract

Using Benefit-Risk Measure to Evaluate Alzheimer's Disease Biomarkers: A Collapsing Net Benefit Approach

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Clinicians may be skeptical of using accuracy measures alone to compare diagnostic tests or biomarkers. In clinical settings, diagnostic test accuracy is usually assessed using classification accuracy or predictive values. The drawback of these metrics is that one test may have higher sensitivity but worse specificity than another. Another method is to compare tests or biomarkers using a benefit-risk measure, which entails quantifying test benefits and clinical consequences of diagnostic errors by putting benefits and harms on the same scale. As a result, weighing the benefits and risks of diagnostic testing necessitates considering both the test's accuracy and the clinical context. For a clinical condition, diagnostic tests are commonly classified into positive and negative categories (diseased or non-diseased). Some diseases, such as Alzheimer's, have more than two stages. The benefit to cost values may fluctuate depending on the stage of the disease. This study demonstrate the application of the net benefit approach to evaluating biomarkers for the diagnosis of Alzheimer's disease (AD) based on a clinical performance study and external data on clinical effects. As a result, we present a diagnostic yield table for AD, a multi-stage clinical condition. Consequently, we develop a decision theory based on net benefit for analyzing biomarkers, which provides additional interpretation for rule-in or rule-out clinical demands, as well as the negative repercussions of superfluous workup.