

Methodology

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New patient-oriented summary measure of net total gain in certainty for dichotomous diagnostic tests

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Abstract

Objectives: To introduce a new, patient-oriented predictive index as a measure of gain in certainty.

Study design: Algebraic equations.

Results: A new measure is suggested based on error rates in a patient population. The new Predictive Summary Index (PSI) reflects the true total gain in certainty obtained by performing a diagnostic test based on knowledge of disease prevalence, i.e., the overall additional certainty. We show that the overall gain in certainty can be expressed in the form of the following expression: $PSI = PPV + NPV - I$. PSI is a more comprehensive measure than the post-test probability or the Youden Index (J). The reciprocal of J is interpreted as the number of persons with a given disease who need to be examined in order to detect correctly one person with the disease. The reciprocal of PSI is suggested as the number of persons who need to be examined in order to correctly predict a diagnosis of the disease.

Conclusion: PSI provides more information than J and the predictive values, making it more appropriate in a clinical setting.

Background

The main justification for performing a diagnostic test is to gain new information [1-3], beyond the existing probability (the prevalence) obtained from a positive test, i.e., prevalence minus the positive predictive value (PPV) and from a negative test, i.e., (1-prevalence) minus the negative predictive value (NPV). We introduce a predictive summary index (PSI), a new measure that summarizes the total gain in certainty, i.e., the overall additional certainty, expressed as $PSI = PPV + NPV - I$. We show that the reciprocal of PSI can be interpreted as the number of persons needed to be examined in order to correctly predict a diag-

nosis of the disease (NNP). We compare the PSI with a less informative summary measure of a test in a limited study population, the Youden Index (J), proposed by Youden [1] as a measure of the goodness of a diagnostic test.

The terminology of diagnostic test characteristics [4-29]

Performance assessment of a dichotomous diagnostic test is usually based on assessing test performances in two different populations.