Backward approach for estimating physician-specific diagnostic test characteristics: a unified approach in analytical epidemiology and clinical epidemiology

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Background: Predictive values (PV) are commonly estimated indirectly, assuming standard diagnostic tests with no variations of sensitivity and specificity and known prevalence. Such estimates do not consider the physician's skills and knowledge and are often inappropriate in the clinical setting. The authors propose obtaining the PV values *directly* in a physician-specific patient population and estimating physician-specific sensitivity, specificity, and prevalence of the clinic population, based on the predictive values and rate of positive diagnostic tests for a specific clinic. Methods: PV and the overall detection rate of a medical condition, i.e., the rate of positive tests, are used to calculate the sensitivity and specificity based on Bayes' Theorem. Results: An experienced physician's positive predictive value (PPV) was 0.913 and his negative predictive value (NPV) was 0.918. Thus, the estimated prevalence of his patient population was 0.574 and the sensitivity and specificity of his clinical judgment are 0.942 and 0.878, respectively. A less experienced physician's PPV was 0.765 and his NPV was 0.963. Thus, the estimated prevalence was 0.468 and the sensitivity and specificity of his clinical judgment were 0.968 and 0.739, respectively. These characteristics were different from their sensitivity and specificity, had those been calculated directly. Conclusions: Relying on stable sensitivity, specificity and prevalence may be inappropriate when these statistics are not available for a specific physician. The indirectly calculated physician's specific sensitivity or specificity may be used to measure changes in clinical skills over time.