Interpretation of diagnostic information given patient characteristics

Akademisk avhandling

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av
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This thesis is based on the following papers:

I.   Gellerstedt M. Partitioning reference values of several Gaussian subpopulations with unequal prevalence – a procedure with computer program support.
     Accepted for publication in Clin Chem Lab Med 2006;44(10): xx-xx.

II. Sterner B, Gellerstedt M, Sjöström A. Accommodation and the relationship to subjective symptoms with near work for young school children.
     Ophthal. Physiol. Opt. 2006 26: 148–155.

III. Gellerstedt M, Magnusson J, Gråsjö U, Ahlstedt S, Bengtsson U. Interpretations of subjective symptoms in double blind placebo controlled food challenges – Inter-observer-relibility.
     Allergy 2004;59:354-356.

IV. Gellerstedt M. Accounting for interactions in diagnostic research.
     In manuscript.

V.   Gellerstedt M, Bång A, Herlitz J. Could a computer based system including a prevalence function support emergency medical system and improve allocation of life support level?
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Abstract

The aim with this thesis was to describe, exemplify and develop theory for reference values and diagnostic tests, especially focusing on the variability between individuals. To facilitate interpretation of medical information it is common to establish some kind of limit. There are several different rationales for the choice of such a limit. Reference values are intended to be solely descriptive, while medical decision limits are used for identification of a present or future disorder.

The frequently used bimodal model can be used not only for discrimination between healthy vs diseased but for separation of other conditions as well. Reference values for amplitude of accommodation among school children were suggested based on a bimodal model discriminating between children with vs without symptoms occurring at near work.

If the variability between individuals is high compared to the variability found within an individual or if the diagnostic information is subjective, it may be favorable to use the individual as its own reference. The diagnosis of food-hypersensitivity for patients with subjective symptoms was used as an illustration. A pre-defined approach for interpretation of case records gave high inter-observer reliability, and gave different diagnoses than a previously used approach.

To harmonize the sensitivity and specificity of reference values across subpopulations, partitioning of reference values is one possibility. Existing criteria are limited to the consideration of only two subpopulations. A computer assisted procedure for considering partitioning of several subpopulations was developed.

The potential relationship between diagnostic accuracy of a test and other factors are highlighted in diagnostic theory. However, there is no advice regarding how to adjust for this relationship. Two possibilities have been presented; to use a multivariate model including interactions or to use different thresholds for different subpopulations.

Diagnostic information could be individually adjusted by using a prevalence function which estimate probability of target disorder, given patient characteristics. A computer based decision support system including such a prevalence function was shown to have potential benefits for assisting medical decisions.

Key words: reference values, diagnostic theory, diagnostic tests, partitioning, prevalence function