Validity of electrocardiographic classification of left ventricular hypertrophy across adult ethnic groups with echocardiography as a standard

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CRD summary
This study found that electrocardiography was more sensitive for detection of left ventricular hypertrophy in African-origin populations than in white populations. One set of criteria was less specific in people of African origin. Potential limitations in the analysis, failure to consider study quality and potential weaknesses in the review process mean that these findings should be interpreted with some caution.

Authors' objectives
To determine the validity of the electrocardiogram (ECG) for the diagnosis of left ventricular hypertrophy for different ethnic groups.

Searching
MEDLINE, EMBASE, BIOSIS Previews and The Cochrane Library were searched to July 2007. Search terms were reported and did not include a diagnostic filter. Bibliographies of retrieved articles were screened. Recently published articles and articles in press were identified by searching 12 relevant journals. Health surveys were screened and advice was sought from experts in the field. Only English-language studies were included.

Study selection
Studies that evaluated ECG compared to the reference standard of echocardiography in at least 50 adults per group from at least two ethnic groups were eligible for inclusion. ECG criteria for the diagnosis of left ventricular hypertrophy had to be either Cornell voltage, Sokolow-Lyon voltage or modifications of these criteria. Studies had to report sufficient data to allow comparisons between ethnic groups.

Included studies compared white people with people of African origin and were conducted in Europe, Scandinavia and the United States. All studies used 12-lead ECG and M-mode echo as the reference standard. The proportion of men ranged from 36 to 76 per cent. Mean age ranged from 44 to 73 years.

The authors stated neither how the papers were selected for the review nor how many reviewers performed the selection.

Assessment of study quality
The authors did not state that they assessed study quality.

Data extraction
Data were extracted on sensitivity and specificity, together with 95% confidence intervals, for the different definitions of left ventricular hypertrophy. If data were not reported on confidence intervals for sensitivity and specificity, then these were calculated by the review authors. The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
Pooled sensitivity and specificity were calculated using simple pooling weighted on sample size. The authors did not state that they assessed heterogeneity.

Results of the review
Five studies (n=5,619) were included in the review.

Pooled sensitivity was generally poor, but was higher for black populations (31.2%, 95% CI: 28 to 34.8 based on the Cornell criteria and 32.9%, 95% CI: 29.5 to 36.4 based on the Sokolow-Lyon criteria) than for white populations.
(26.5%, 95% CI: 25.2 to 27.8 based on the Cornell criteria and 18.2%, 95% CI: 17.2 to 19.3 based on the Sokolow-Lyon criteria). Specificity was higher in the white populations (87.4%, 95% CI: 86.4 to 88.4 based on the Cornell criteria and 88.9%, 95% CI: 88 to 90 based on the Sokolow-Lyon criteria) than in the black populations (86.2%, 95% CI: 83.4 to 88.5 based on the Cornell criteria and 72.1%, 95% CI: 68.7 to 75.3 based on the Sokolow-Lyon criteria). Heterogeneity was not formally assessed, but forest plots suggested considerable heterogeneity across studies.

Authors' conclusions
Both types of ECG criteria were more sensitive in African-origin populations. The Sokolow-Lyon criteria were less specific for left ventricular hypertrophy in people of African origin.

CRD commentary
The review addressed a focused question. Inclusion criteria were defined in terms of index test and reference standard, but were less clear for population, study design and outcome. A detailed literature search was conducted and did not include a diagnostic filter making it more sensitive and less likely to miss relevant studies. However, the review was restricted to English-language studies and it appeared that no specific attempts were made to locate unpublished studies. Details on the review methodology were not reported, so it was not possible to determine whether appropriate steps were taken to minimise bias and error in the review process. No formal quality assessment was undertaken, so the reliability of the findings was unclear. Heterogeneity was not discussed or investigated. However, the inclusion of forest plots helped illustrate differences between studies. Findings related to differences between populations in terms of sensitivity and specificity were based on pooled estimates with no formal statistical comparison of these differences. This, together with the apparent heterogeneity, means that reliability of the pooled estimates is uncertain. The authors' conclusions were supported by the data presented, but should be interpreted with some caution due to potential limitations in the analysis, failure to consider study quality and potential weaknesses in the review process.

Implications of the review for practice and research
Practice: The authors stated that the Sokolow-Lyon and Cornell criteria were useful for eliminating suspected left ventricular hypertrophy in white people, but were too imprecise for identifying most cases. People of African origin were at risk of being given inappropriate medication or subjected to unnecessary further investigation if evaluated using ECG.

Research: The authors stated that further research was needed to adapt ECG criteria to take into account ethnicity. The issue needed to be assessed in a broader ranged of ethnic groups.

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