Accuracy and reliability of using computerized interpretation of electrocardiograms for routine examinations

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Authors’ objectives
To examine the diagnostic accuracy and reliability of using computerised interpretations of resting electrocardiograms (ECGs) to detect normal heart activity in healthy or asymptomatic adults, during routine medical examinations.

Searching
The following sources were searched: PubMed to April 19, 2001; EMBASE from 1994 to December 2000; Best Evidence from 1994 to December 2000; NHS Centre for Reviews and Dissemination databases (HTA, NHS EED and DARE); the Cochrane Library (Issue 4, 2000); HealthSTAR from 1994 to January 2000; ISI Web of Science (SSI) from 1994 to 2001; and the National Guideline Clearinghouse. In addition, the ECRI (Emergency Care Research Institute) website, publications of the Canadian Coordinating Office for Health Technology Assessment, and software company websites were searched. A list of search terms was provided in an appendix. The bibliographies of the retrieved papers were examined and cardiologists were contacted for additional references. The search was restricted to publications in the English language. Studies published only in abstract form were excluded from the review.

Study selection

Study designs of evaluations included in the review
Prospective controlled trials (randomised and non-randomised), or other prospective or retrospective comparative studies with series larger than ten patients, were eligible for inclusion.

Specific interventions included in the review
Eligible studies had to report the use of computerised or automated interpretation of ECGs, which were performed at rest in an ambulatory setting, i.e. an out-patient clinical setting such as medical clinics, doctors’ offices and hospital outpatient departments. Studies were not eligible if they reported tests other than resting ECG, e.g. stress exercise ECG and 24-hour continuing ECG.

Reference standard test against which the new test was compared
Studies had to compare computerised or automated ECG interpretation with a ‘gold’ standard used to diagnose normality (not specified in the inclusion and exclusion criteria).

Participants included in the review
Eligible studies had to include participants greater than 18 years of age, with no apparent or suspected heart dysfunction or disease (no symptoms, abnormal physical findings, or previous abnormal ECG).

Outcomes assessed in the review
Eligible studies had to report on the diagnostic accuracy or reliability of the intervention (no further details were given). Studies were not eligible if they reported on only one or more ECG parameters (waveforms, complexes and segments), and not of the overall ECG pattern, including the identification of the heart rhythm.

How were decisions on the relevance of primary studies made?
The author does not state how the papers were selected for the review, or how many of the reviewers performed the selection.

Assessment of study quality
There was no need of a validity assessment since no studies met the inclusion criteria.
Data extraction
As no studies were eligible for inclusion, the author does not state how the data were extracted for the review, or how many of the reviewers performed the data extraction.

Methods of synthesis
How were the studies combined?
The author described two comparative studies, which were conducted to evaluate the diagnostic accuracy and reliability of the computerised interpretation of normal 12-lead ECGs when compared with ECG-independent evidence. These did not meet the inclusion criteria but were considered relevant to the review question.

How were differences between studies investigated?
As no studies were eligible for inclusion, this is not applicable.

Results of the review
No studies met the inclusion criteria.

No studies meeting the inclusion criteria were located in the literature search.

Two comparative studies examined diagnostic accuracy. One study reported that the specificity ranged from 99.8 to 100% for ECGs diagnosed by computer analysis when compared with the cardiologist's assessment, while the sensitivity ranged from 55.6 to 100%. In the other study, the specificity was 94.8% for both a computer programme and an experienced electrocardiographer. The methodological flaws of these studies were described in detail.

Authors' conclusions
The question whether computerised ECG interpretation can be used as an automated test for screening normal ECGs in asymptomatic adults during routine clinical examinations (without consulting with an expert in ECG interpretation) has yet to be answered.

CRD commentary
The review question was clearly stated, although the inclusion and exclusion criteria could have been more clearly presented within one section of the review. For example, the inclusion criteria regarding the 'gold' standard were not specified, although in another section of the review, two types of 'gold' standards (e.g. human interpretation and ECG-independent evidence) were described. There was a fairly good effort to search for relevant literature, and the author provided justification for the relatively narrow search dates. However, the search was restricted to English language publications, and it is unclear whether unpublished data was sought. It is possible, therefore, that some studies may have been missed, thus introducing retrieval bias. The conclusion reflects the absence of identified studies.

Implications of the review for practice and research
Practice: The author did not state any implications for practice relating to the systematic review objective.

Research: The author did not state any implications for research relating to the systematic review objective.

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.