Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
Exercise electrocardiography (ECG) and stress myocardial perfusion imaging with planar, single photon emission computed tomographic (SPECT) or positron emission tomographic (PET) (nuclear cardiology techniques) in patients with suspected coronary artery disease (CAD).

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
A hypothetical cohort of patients with suspected CAD.

Setting
Secondary care. The study was carried out in Los Angeles, California, USA.

Dates to which data relate
The primary studies for the effectiveness data were published between 1967 and 1996. The dates for resource use data were not clearly reported. The price year was not reported. Relative prices were used.

Source of effectiveness data
Effectiveness data were derived by a synthesis of previously completed studies, including one meta-analysis published in 1989 (see other publications of related interest).

Modelling
A decision tree model was used to calculate expected costs and outcomes from six diagnostic strategies.

Outcomes assessed in the review
The pretest likelihood (prevalence) of CAD and the sensitivity and specificity of each diagnostic test.

Study designs and other criteria for inclusion in the review
Not stated.
Sources searched to identify primary studies
Not stated.

Criteria used to ensure the validity of primary studies
Not stated.

Methods used to judge relevance and validity, and for extracting data
Not stated.

Number of primary studies included
One meta-analysis of 147 studies (comprising 150 study groups) was included to analyse the exercise treadmill electrocardiographic test, whilst eight studies were included for the SPECT method, and eight for the PET imaging technique. This made up a total of 163 studies included in the analysis.

Methods of combining primary studies
Meta-analysis. No details about the combination method were provided.

Investigation of differences between primary studies
Not reported.

Results of the review
The pretest likelihood of CAD was only reported in a diagram by age, sex, and symptoms. The sensitivity and specificity estimates were 68% (range 23-100%, SD 16%) and 77% (range 17-100%, SD 17%) for the exercise treadmill electrocardiography, 91% and 70% (normalcy rate 89%) for the SPECT method, and 92% and 89% (normalcy rate 95%) for the PET imaging, respectively.

Measure of benefits used in the economic analysis
The measure of benefits was the proportion of correctly diagnosed patients. This was derived using a decision model and calculating the accuracy rate (ratio of true positives plus true negatives to total number of patients tested) for each strategy.

Direct costs
The diagnostic procedural costs were measured as a proportion of the costs of the coronary angiography and averaged across institutions. Neither the monetary costs nor the resource use were reported. The source of the costs data was not provided. The price year was not given.

Currency
Not stated (relative value only).

Sensitivity analysis
A one-way simple sensitivity analysis was carried out by varying pretest likelihood (prevalence) of CAD. This improves the generalisability of the results to populations with different pretest risk levels.

Estimated benefits used in the economic analysis
Coronary angiography was assumed to be 100% accurate, regardless of the prevalence rate of CAD.

For CAD prevalence of 20%, 50% and 80% the accuracy rates were:

PET: 99%, 93%, 93%;
SPECT: 98%, 91%, 91%;
ECG plus PET: 93%, 73%, 73%;
ECG plus SPECT: 93%, 72%, 72%;
ECG alone: 94%, 78%, 78%.

Cost results
Given a 20%, 50% and 80% prevalence of CAD, the relative costs were:

PET: 63%, 89%, 114%;
SPECT: 67%, 89%, 109%;
ECG plus PET: 40%, 64%, 84%;
ECG plus SPECT: 40%, 62%, 80%;
ECG alone: 49%, 62%, 71%.

Synthesis of costs and benefits
Not combined.

Authors' conclusions
Patients with a low likelihood of CAD (determined according to age, sex and symptoms) should initially undergo exercise electrocardiographic testing, and the positive responders would require nuclear cardiology testing. Coronary angiography would follow if the latter yielded a positive result. The most cost-effective strategy for patients with an intermediate likelihood of CAD is direct referral to nuclear cardiology testing, performed in conjunction with exercise electrocardiography, and then referral to coronary angiography if a positive nuclear test result is obtained. For the patients most likely to have CAD, direct referral to coronary angiography appears to be the most cost-effective option for diagnosis of CAD.

CRD COMMENTARY - Selection of comparators
A justification for the comparators used was given. Exercise ECG, SPECT and PET methods are non-invasive diagnostic tests commonly used in selecting suspected CAD patients for coronary angiography, a definitive but invasive test. These tests were assumed to be used alone or in combination to design the following alternative diagnostic strategies.a) direct referral to angiography; b) PET and coronary angiography if the former is found positive (PET strategy); c) SPECT and coronary angiography if the former yields a positive result (SPECT strategy); d) exercise electrocardiography and PET testing for those patients with positive results, followed by coronary angiography for positive cases (ECG plus PET); e) exercise electrocardiography with subsequent SPECT testing performed for positive cases, followed by coronary angiography for positive cases (ECG plus SPECT); f) exercise electrocardiography followed by coronary angiography for positive cases (ECG alone). You, as a user of this database, should consider whether these are relevant alternatives in your setting.
Validity of estimate of measure of benefit
The validity of the study results is unclear due to the lack of information regarding the design of the primary studies included in the analysis and the lack of any relevant methodological information related to the conduct of the review. The authors reported that referral biases may affect the specificity figures for SPECT and PET and used the 'normalcy' rates as proxies for true specificity parameters. Since this improves the specificity estimates for these tests, it should be considered as a potential source of bias.

Validity of estimate of costs
Adequate details of estimation methods, sources of cost data, or price date were not provided.

Other issues
The justification for the conclusions reached by the authors is subject to several concerns. The study did not provide a synthesis of costs and effectiveness of the different strategies, and therefore the authors' conclusions regarding the cost effectiveness should be treated with caution. The main outcome measure was the accuracy of the diagnostic strategy and no allowance was made for the consequences of treatment choices based on each diagnostic in terms of life-expectancy and quality of life. The effects on quality of life or inconvenience of different tests were not taken into account. The real value of diagnostic strategy is not independent of the severity of associated health consequences. The partial analysis taken out of the full decision context is only of limited value in practice, and cannot be compared with other cost-effectiveness studies reporting more appropriate effectiveness measures such as quality adjusted life-years gained. The results of the current study were compared with other studies mainly with regard to diagnostic outcomes. The only cost-effectiveness study used in comparison reported somewhat different conclusions. The generalisability of the study results to other populations with different prevalence of CAD was addressed in the sensitivity analysis. Estimated costs, even though reported as relative to costs of coronary angiography, may not be directly generalisable to other countries. The results were not reported selectively.

Source of funding
None stated.

Bibliographic details

PubMedID
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Other publications of related interest

Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Aged; Coronary Angiography /economics; Coronary Disease /economics /radiography /radionuclide imaging; Cost-Benefit Analysis; Decision Trees; Electrocardiography; Exercise Test; Female; Heart /radionuclide imaging; Humans; Male; Middle Aged; Models, Theoretical; Myocardial Revascularization; Patient Selection; Prognosis; Referral and Consultation; Risk Factors; Sensitivity and Specificity; Tomography, Emission-Computed /economics; Tomography, Emission-Computed, Single-Photon /economics; United States

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