Exercise echocardiography is an accurate and cost-efficient technique for detection of coronary artery disease in women


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 echocardiography in the detection of coronary artery disease.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The study population consisted of women in the age range 33 to 82 years with a mean age of 60 (standard deviation, 8 years) who had been investigated for the diagnosis of cardiac symptoms within a 12-month period. The patients had no previous Q wave infarction records.

Setting
Hospital; one in Brussels, Belgium, and the other in London, England. The economic analysis was conducted in Cleveland, Ohio, USA.

Dates to which data relate
The dates for the effectiveness and resource data were not explicitly stated. The article to which the study relates was published in 1995. The price year was not stated.

Source of effectiveness data
Single study.

Link between effectiveness and cost data
Cost and effectiveness data were derived from the same patient sample.

Study sample
The study sample consisted of 161 women. No power calculations were performed in determining the sample size.

Study design
Case series, multi-centre study (two centres). The analyses of results from the echocardiography were blinded from the results of coronary angiography. Patients were stratified into three groups: high, intermediate and
Analysis of effectiveness
The study was based on treatment completers. The effectiveness of each strategy was expressed in terms of its ability to diagnose accurately or rule out the presence of coronary artery disease in women, namely the sensitivity, specificity and accuracy of each strategy.

Effectiveness results
For patients with >50% coronary artery diameter narrowing, the sensitivity (mean +/- SD) of exercise echocardiography was 80 +/- 3%. In patients with interpretable ECG, the sensitivity of exercise echocardiography was 81 +/- 4%, and that of exercise ECG was 77 +/- 3% (p = 0.50). In patients without coronary artery disease, the overall specificity of exercise echocardiography was 81 +/- 4%. In patients with an interpretable ECG, the specificity of exercise echocardiography (80 +/- 3%) exceeded that of the ECG (56 +/- 4%, p < 0.0004). The accuracy of echocardiography was also greater than exercise electrocardiography (81 +/- 5% vs 64 +/- 6%, p < 0.005). Exercise echocardiography stratified significantly more patients of intermediate (20% to 80%) pretest probability into the high (>80%) or low (<20%) posttest probability group. In women without a previous exercise ECG, the specificity of echocardiography continued to exceed that of exercise electrocardiography (80 +/- 3% vs 64 +/- 3%, p = 0.05).

Clinical conclusions
The sensitivities of the two methods were comparable, but exercise echocardiography was more specific and accurate than exercise electrocardiography in the diagnosis of coronary artery disease in women.

Measure of benefits used in the economic analysis
The measure of benefits was the number of unnecessary angiographies performed.

Direct costs
Direct costs included the cost of tests used in seven test strategies: 1) Angiography alone; 2) Exercise ECG; 3) Exercise echocardiography; 4) Selective ECG/echocardiography; 5) Stepwise ECG/echocardiography; 6) Bayesian ECG; 7) Bayesian echocardiography. Costs were based on the reimbursement levels applied by Medicare in the Cleveland area on a cost per case diagnosis. Price year was not stated. Discounting was not applied.

Indirect Costs
Not assessed.

Currency
US dollars ($).

Sensitivity analysis
Monte Carlo simulation was carried out on costs to address variability in the results based on a normal distribution of sensitivity and specificity.

Estimated benefits used in the economic analysis
The use of echocardiography would result in fewer unnecessary angiographies being carried out on women patients (for example 56 +/- 4% and 29 +/- 5% for exercise ECG and exercise echocardiography respectively).
Cost results
For each of the seven strategies the cost per patient was calculated as follows:

(1) Angiography alone = $1,434;
(2) Exercise ECG = $1,023 +/- $43;
(3) Exercise echocardiography = $828 +/- $44;
(4) Selective ECG/echocardiography = $836 +/- $45;
(5) Stepwise ECG/echocardiography = $663 +/- $36;
(6) Bayesian ECG = $740 +/- $29;
(7) Bayesian echocardiography = $641 +/- $24.

Synthesis of costs and benefits
The study showed that exercise echocardiography was the dominant strategy for use in the diagnosis of coronary artery disease in women.

Authors' conclusions
The study confirmed the superiority of exercise echocardiography in comparison with exercise ECG with respect to the accuracy and specificity of the tests, sensitivity being comparable. The results were further confirmed after the exclusion of patients with referral bias. The greater specificity of this procedure in women resulted in avoiding unnecessary angiography which was invasive and costly. The use of exercise echocardiography as an initial test for coronary artery disease was therefore justifiable on cost analysis.

CRD Commentary
The study was well documented and confirmed the results of previous findings. The authors, however, acknowledged the following limitation: Patients used in the study had been referred to a cardiologist for further diagnostic evaluation which may have caused some selection bias when compared with the primary care setting. However, as the prevalence of coronary artery disease would likely be lower in primary care situations the increased specificity of echocardiography would yield greater benefits in ruling out more accurately those who did not have the disease.

Further, the analysis of costs was partly based on Medicare reimbursement levels which may or may not reflect true costs. A sensitivity analysis, therefore on costs of diagnostic procedures could have been useful.

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