Use of contrast for image enhancement during stress echocardiography is cost-effective and reduces additional diagnostic testing

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
The use of contrast agents for image enhancement during stress echocardiography. The contrast agent used was Optison, a second-generation echocardiographic contrast agent. It was administered as multiple intravenous boluses of 0.5 mL at rest and during peak stress (total dose 1 to 2 mL).

Type of intervention
Management care.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients who underwent stress echocardiograms and who had sub-optimal image quality at rest.

Setting
The setting was an institution. The economic analysis was conducted in the USA.

Dates to which data relate
The effectiveness and resource data related to 1998. The price year was 1998.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was carried out on the same sample of patients as that used in the effectiveness study.

Study sample
Power calculations to determine the sample size were not reported. Eligible patients were identified from the authors' institution. Among the 2,594 patients who underwent stress echocardiography, 315 (12%) had sub-optimal images at baseline. Of these 315 patients, 277 received contrast enhancement (group I) and 38 did not (group II). A supervising physician decided on the use of contrast enhancement. Patients had the need for contrast enhancement explained to them and could refuse. The patients in group II did not receive contrast enhancement because they refused intravenous line placement, they declined to receive the contrast agent, or they had contraindications for contrast enhancement.
Study design
The study was a prospective observational study that was conducted in a single centre. The duration of follow-up was 3 weeks. No loss to follow up was reported.

Analysis of effectiveness
Not all of the patients included in the study were considered at analysis. The primary outcome used was left ventricular endocardial visualisation. The clinical characteristics of the patients in groups I and II were similar. There were no differences in the number and distribution of the myocardial segments that were inadequately visualised. However, no statistical analysis was reported.

Effectiveness results
Contrast enhancement improved left ventricular endocardial visualisation in 96% of patients with baseline sub-optimal images. All of the patients in group II had persistent sub-optimal images during the 3-week period.

Clinical conclusions
An appropriate use of contrast enhancement substantially improves image quality.

Measure of benefits used in the economic analysis
No summary benefit measure was used in the economic evaluation. The evaluation was, in effect, a cost-consequences analysis.

Direct costs
The perspective adopted was not stated. The costs included were for stress echocardiography and stress nuclear testing. The costs of stress echocardiography covered transthoracic echocardiography, cardiovascular stress test, Doppler exam and colour flow Doppler. The costs of stress nuclear testing were for SPECT myocardial perfusion, heart wall motion, and left ventricular function. National averages of Medicare allowed charges, including professional and technical components, were used. The market price of Optison was used to estimate the cost of contrast enhancement. The resource quantities and the costs were reported separately. Year 1998 prices were used. The costs were not discounted since the follow-up was less than one year.

Statistical analysis of costs
No statistical analysis of the costs was carried out.

Indirect Costs
The indirect costs were not included.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was carried out.

Estimated benefits used in the economic analysis
See the 'Effectiveness Results' section.
Cost results
During the 3 weeks after echocardiography, 53% of patients from group II (20 out of 38) and 3% of patients from group I (9 out of 277) underwent additional nuclear testing, (p<0.0001).

The average additional cost for each patient was $131 in group I and $369 in group II.

The use of contrast enhancement would result in estimated savings of $238.

Synthesis of costs and benefits
Not applicable.

Authors’ conclusions
The use of contrast enhancement is cost-effective because it substantially improves image quality and it impacts favourably on the practice of performing additional tests for the same clinical indication.

CRD COMMENTARY - Selection of comparators
The reason for the choice of the comparator, no contrast enhancement, was clear. You should decide if this choice is justified and relevant in your own setting.

Validity of estimate of measure of effectiveness
The use of an observational study design will have introduced a number of methodological issues, which will limit the validity of the effectiveness measure. A double-blinded, randomised controlled trial would have been more appropriate for the study question. The patients in each group were shown to be comparable at analysis. However, in observational studies, this is often not enough to eliminate confounding. The internal validity of the study is likely to be quite low. The choice of the effectiveness measure appears to have been valid. However, the accuracy of stress testing was not estimated in the absence of angiographic correlative data. This fact may limit the impact of the study.

Validity of estimate of measure of benefit
No summary benefit measure was used in the economic evaluation, which was effectively a cost-consequences analysis.

Validity of estimate of costs
The perspective adopted was not stated. Only the charges were reported; the charge-to-cost ratio was not reported. These do not reflect opportunity costs and limit the generalisability of the results. The resource quantities and the unit costs were not reported separately and only limited details were given of the cost items included in the analysis. These issues would hinder the replication of the analysis in other settings. The cost analysis is likely to be specific to Missouri.

Other issues
The authors did not address the generalisability of the results, nor compare their findings with those from other studies. The authors highlighted some limitations of their study and do not appear to have reported the results selectively.

Implications of the study
The authors did not report any recommendation or need for further research. However, you should consider this analysis as preliminary.

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None stated.
Bibliographic details

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Other publications of related interest

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Subject indexing assigned by NLM

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