The role of transthoracic echocardiography in the management of patients seen in an outpatient cardiology clinic
Waggoner A D, Harris K M, Braverman A C, Barzilai B, Geltman E M

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
Transthoracic, two-dimensional (2D) Doppler echocardiography to manage patients seen in an outpatient cardiology clinic.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The patient population studied consisted of male and female patients (112 men and 88 women) in whom 2D echocardiography was requested as part of the clinical evaluation.

Setting
University based outpatient cardiac clinic, Washington University School of Medicine, USA.

Dates to which data relate
The data for the effectiveness analysis were collected in 1995. No resource use data were provided. Prices used were based on charges and no year for the charges was reported.

Source of effectiveness data
The estimate for the final study was derived from a single study.

Link between effectiveness and cost data
The costing was undertaken retrospectively on the same patient sample as that used in the effectiveness analysis.

Study sample
The study was based on 200 consecutive outpatients in whom 2D echocardiography was requested. One inadequate 2D echocardiography was registered. The results were analysed separately for new clinic patients (56); follow-up patients after intervention (after coronary artery bypass, valve repair or replacement, or coronary angioplasty) (38); and follow-up patients with known disease (coronary artery disease, cardiomyopathy, valve disease pericardial effusion, or congenital disease) (106). 122 patients were evaluated for the assessment of left ventricular (LV) systolic function, 44 for valvular disease, and 34 for suspected (or known) hypertrophic cardiomyopathy, congenital heart disease, pericardial diseases, or cardiac masses. 176 patients (83%) had a history of cardiac abnormality. An attending
cardiologist saw 64% of patients and the cardiology fellow and an attending physician saw the remainder 73 patients. Due to the study design the patients acted as their own controls.

**Study design**
This was a cohort study using a before and after (pretest-posttest) study design with data collected through questionnaires completed by the physician ordering 2D echocardiography before the test and after the test. Results were analysed by the attending cardiologist as normal, mildly impaired and severely impaired and returned to the ordering doctor if necessary. The pretest portion of the questionnaire included information on patient age, sex, and indication for the study, clinical diagnosis, and any history of heart disease. Clinical assessment of LV systolic function was based on the patient's history and the physician's physical examination: presence of S_3 gallop, displaced apical impulse, auscultation of the lung fields for presence of rales, and evidence of jugular venous distention or pedal edema. LV function was stated as normal, mildly impaired or severely impaired.

**Analysis of effectiveness**
The primary outcomes evaluated were the degree of concordance of diagnosis based on clinical assessment without and with 2D echocardiography (overall and by disease), the additional or new information provided by 2D echocardiography, and the change in patient management due to 2D echocardiography results.

**Effectiveness results**
The effectiveness results were as follows:

2D echocardiography confirmed the clinical diagnosis in 182 patients (91%).

14 (82%) of the remaining 17 patients were new to the clinic and of those patients, 9 were thought to have a heart abnormality, but 2D echocardiography revealed normal heart structure and function.

2D echocardiography provided additional or new information in 94 patients (47%). This was of minimal significance in 34 patients, and was of major significance in 60 patients.

Differences between results of 2D echocardiography and clinical examination or history were similar (and not statistically significantly different) among the groups of patients.

Clinical assessment, compared with 2D echocardiograph, was concordant in 154 (77%) of 199 patients with regard to LV systolic function but in only 22 (50%) of 44 with valve disease.

Alterations in management based on results of 2D echocardiography were instituted in 73 patients (36%), most often resulting in changes in pharmacological therapy (45 patients, 62%) or avoiding further cardiac evaluation, surgery or procedures (30 patients).

No statistically significant differences in outcomes between attending cardiologists and cardiology fellows were observed.

**Clinical conclusions**
2D echocardiography provides new or additional information in nearly one half of the studied patients that resulted in changes in management strategy in one third of studied patients.

**Measure of benefits used in the economic analysis**
The number of management changes was the benefit considered in the economic analysis. The data for the management changes were extracted from the pretest-posttest patients’ questionnaires (completed by the doctor ordering the test).
Direct costs
Discounting was not undertaken due to the short period of follow-up (less than 1 year). The number of additional tests/procedures avoided (in 30 patients) or additional tests/procedures needed (in 32 patients) and their charges were reported separately. Resources and quantities were reported separately along with total charges. The charges for 2D echocardiography tests were also included. The charge data sources and dates were not reported.

Statistical analysis of costs
No statistical analysis of costs was performed.

Indirect Costs
No indirect costs were included in the analysis.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was performed.

Estimated benefits used in the economic analysis
The total number of patients with changes in management was 73. Alterations in pharmacologic therapy were reported in 45 patients (discontinued medications in 15, altered medications in 15 and new medications in 15 patients). The results of 2D echocardiography led to alterations in management regarding test/procedures as follows: further tests/procedures avoided, 30 patients; additional tests required, 32 patients.

Cost results
The additional charges avoided were estimated at $125,754, the additional charges needed at $70,860 and the total charges for 2D echocardiography (for 200 patients) at $158,000, a difference of $34,426. The total incremental costs due to 2D echocardiography were estimated at $103,286.

Synthesis of costs and benefits
The resultant charge per management change per patient was estimated at $1,415.

Authors' conclusions
The results of the study suggest a positive financial impact of 2D echocardiography in adverse patient population. 2D echocardiography offers relative cost savings by avoiding additional procedures.

CRD COMMENTARY - Selection of comparators
The choice of a treatment strategy (physician examination) without 2D echocardiography was justified by the objectives of the study. However, the authors acknowledge that the intervention could appropriately have been compared with another standard (radionuclide ventriculography or LV angiography) but postulated that other studies had shown similar results with regard to management changes.

Validity of estimate of measure of benefit
The pretest-posttest design of the study could result in overestimating patient benefits from testing as stated by the authors. Thus, the results provided from the study should be regarded as exploratory. In addition, the consecutive choice
of patients could result in a sample that was non-representative of the patient population. The users of this review should also consider whether the clinical assessment for these patients is similar in their setting. The comparability of competence and experience of the participating study doctors with those at the setting of interest should also be analysed.

**Validity of estimate of costs**
The analysis was reported to have been based on charges. No cost estimates for the employed pharmacologic treatment and no indirect costs were analysed. The estimation of costs was acknowledged to be an area requiring further research. The use of charges, the lack of a price year, and the absence of statistical/sensitivity analyses limited the generalisability of the cost results. The users of the database should consider the cost consequences in their own settings.

**Other issues**
The authors made good comparisons of their results with other studies. An additional intangible benefit of the intervention was the reassurance it gave clinicians regarding the accuracy of diagnoses. The issue of generalisability was not discussed. The study sample appears to have been representative of the study population. The study results need to be verified in additional research that addresses the limitations of the pretest-posttest study design.

**Implications of the study**
The study provides tentative estimates of the benefits of using 2D echocardiography in patient assessment at university outpatient cardiac clinic.

**Source of funding**
None stated.

**Bibliographic details**

**PubMedID**
8943435

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Adolescent; Adult; Aged; Aged, 80 and over; Clinical Competence; Costs and Cost Analysis; Decision Making; Echocardiography, Doppler; Female; Heart Diseases /economics /therapy /ultrasonography; Heart Valve Diseases /ultrasonography; Humans; Male; Middle Aged; Outpatient Clinics, Hospital; Physical Examination; Ventricular Function, Left

**AccessionNumber**
21997007320

**Date bibliographic record published**
31/05/2001

**Date abstract record published**
31/05/2001