A cost effective approach to the investigation of syncope: relative merit of different diagnostic strategies


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
Patients with syncope were given a series of diagnostic tests to establish a diagnosis. These tests could be carried out in a different order. Hypothetical patients were generated in order to assess the best order in which the tests should be performed. The tests included in the test schedule were external loop recorder (ELR), implantable loop recorder (ILR), the tilt test (HUT), Holter monitoring, electrophysiological study (EPS) and echocardiography. The tests were performed until a diagnosis could be established.

The comparator, although not explicitly reported, was a conventionally used test order (model 1), viz.: Holter, echocardiography, HUT, ELR and EPS.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised a hypothetical cohort of 100 patients with a first episode of unexplained syncope. The cohort was derived from the general syncope population using typical diagnostic yield data.

Setting
The setting was tertiary care. The economic study was conducted in Canada.

Dates to which data relate
The effectiveness data were derived from papers published between 1987 and 1999. The price year was 1997.

Source of effectiveness data
The effectiveness data were derived from a review and synthesis of completed studies.

Modelling
A simulation model was used to determine the diagnostic yield and costs of each test order.

Outcomes assessed in the review
The outcomes assessed in the review were the diagnostic yield of six common cardiac tests and the incidence of SHD among syncopal patients.
Study designs and other criteria for inclusion in the review
The studies had to provide estimates of the diagnostic yield from investigations for syncope.

Sources searched to identify primary studies
MEDLINE was searched for primary studies.

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

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

Number of primary studies included
Fourteen primary studies were included in the review.

Methods of combining primary studies
Primary studies were combined using the weighted average of the diagnostic yield described in published studies. The weights were not given.

Investigation of differences between primary studies
Not investigated.

Results of the review
The diagnostic yields were 38% for ELR, 58% for HUT, 21% for Holter, 52% for EPS with SHD, 88% for ILR, 3% for echocardiography, and 5% for EPS with no SHD.

Forty per cent of the patients with syncope had significant SHD.

The individual diagnostic yields were combined to determine the diagnostic yields of the different models. The diagnostic yields were 85% for model 1, 98.2% for model 2, 98.1% for model 3, 98.1% for model 4, 98.1% for model 5, and 98.9% for model 6.

ILR, which was included in all the models except model 1, improved the rate of diagnosis.

Measure of benefits used in the economic analysis
The summary measure of benefit used in the economic analysis patients diagnosed.

Direct costs
The quantities and the costs were analysed separately. The costs of ELR, HUT, Holter, EPS, ILR, and echocardiography were calculated. The costs were derived using actual data from the London Health Sciences Centre (London, ON, Canada), the Ontario Health Insurance Plan Physicians’ Fee Schedule, and physician fee schedules for Nova Scotia, Quebec and British Columbia. The cost of ILR was obtained from the manufacturer. The operating cost of ILR was obtained using figures for pacemaker pulse generator replacement. Discounting was irrelevant as the costs were incurred at the same time as the diagnosis. The price year was 1997.
Statistical analysis of costs
No statistical analysis of the costs was reported.

Indirect Costs
The indirect costs were not taken into account.

Currency
Canadian dollars (Can$).

Sensitivity analysis
A form of sensitivity analysis was performed on the costs, in that the ranges determined from different centres were used to construct a range of plausible values for the Canadian context (reported in the 'Cost Results' section).

Estimated benefits used in the economic analysis
See the diagnostic yield results for each model reported in the 'Effectiveness Results' section.

Cost results
The costs for the different models (100 patients) were calculated, the range reflecting the range that was found in the different cost sources examined. The costs were:

for model 1, Can$39,447 - Can$81,022;
for model 2, Can$64,794 - Can$131,701;
for model 3, Can$61,608 - Can$127,335;
for model 4, Can$89,131 - Can$116,803;
for model 5, Can$56,506 - Can$112,207; and
for model 6, Can$45,556 - Can$103,174.

No side-effects, for example the stress and discomfort of undergoing the tests, were taken into account.

Synthesis of costs and benefits
The authors combined the diagnostic yield and cost of each model to produce a cost per diagnosis. The cost per diagnosed patient was:

for model 1, Can$467 - Can$959;
for model 2, Can$660 - Can$1,341;
for model 3, Can$627 - Can$1,297;
for model 4, Can$908 - Can$1,189;
for model 5, Can$575 - Can$1,143; and
for model 6, Can$460 - Can$1,043.
Model 6 had the lowest cost per diagnosis and was also the model with the highest diagnosis rate (described in the 'Results of the Review' section). The higher diagnostic rate resulted partly from including ILR and partly from changing the order of the tests.

**Authors' conclusions**
The test order of model 6 gave the best results. It was the dominant strategy as it produced the highest diagnostic yield (98.9%) and was the least expensive per diagnosed patient (Can$460 - Can$1,043). The order of model 6 was decided by ordering the tests in ascending order of cost per diagnosis.

**CRD COMMENTARY - Selection of comparators**
The authors compared what they described as having been the conventional order of diagnostic tests (model 1) with 5 other models, all of which included the comparatively new ILR. This selection of the comparators was valid. All models broadly followed a strategy of starting with the least invasive and least expensive test.

**Validity of estimate of measure of effectiveness**
The effectiveness measure, the percentage of patients diagnosed, was useful in measuring the diagnostic accuracy, although not an effect on health. The method used to derive this measure from the published studies using weighted averages was sound. However, the authors did not consider the impact on the effectiveness estimate of differences between the primary studies. Also, since only point estimates were used, sensitivity analyses of the effectiveness data were not permitted in the modelling.

**Validity of estimate of measure of benefit**
The measure of benefit was obtained directly from the effectiveness results (diagnosis). The health benefits gained from diagnosis were not assessed in the present study.

**Validity of estimate of costs**
The estimate of the costs was valid in as much as it confined itself to the perspective of the third-party payer, but did not include the costs borne by the patient (for example, the time given by the patient and the stress caused by the tests). Information on the costs and the quantities was taken from published sources. A statistical analysis of the prices was not undertaken, although a form of sensitivity analysis was conducted. The authors also noted the high cost per diagnosis of echocardiography and EPS. It would be interesting to know which price variations in the latter two diagnostic tests would have affected the authors' conclusions. The large range of cost estimates gives rise to some uncertainty about the results which, again, could have been analysed in more extensive sensitivity analyses.

**Other issues**
The authors made appropriate comparisons of their results with the findings of other studies. However, they did not address the issue of generalisability to other settings. The authors did not present their results selectively and their conclusions reflected the scope of the analysis. They drew attention to the fact that clinical judgement should take precedence over modelling concerning the best order of diagnostic tests. The authors also drew attention to their uncertainty about the reliability of the results relating to the accuracy of some of the tests; the published results on diagnostic accuracy were higher than their clinical experience. They also pointed out that the accuracy of the tests chosen may be influenced by the order in which they are performed.

**Implications of the study**
The authors recommend that, unless there is a clear clinical reason to do otherwise, the strategy described in model 6 should be followed when deciding on the test order for syncope. This strategy followed the principle of ordering tests according to the cost per diagnosis. It yielded the highest diagnostic rate of all the models considered.
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