Cost-effectiveness of enhanced external counterpulsation (EECP) for the treatment of stable angina in the United Kingdom


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.

CRD summary
This study evaluated the cost-utility of enhanced external counterpulsation (EECP) plus usual care compared with usual care alone, for people with chronic stable angina. EECP was cost-effective, in the base case, but the results were highly sensitive to the expected duration of EECP quality-of-life benefit and the authors concluded that they needed to be carefully assessed. More research is needed to obtain more conclusive results.

Type of economic evaluation
Cost-utility analysis

Study objective
To evaluate the cost-effectiveness of enhanced external counterpulsation (EECP) in people with chronic stable angina.

Interventions
EECP was a noninvasive technique used to increase the blood flow to the heart. EECP plus the usual care was compared with usual care alone. The EECP therapy included 35 hours of treatment (35 sessions), with repeat procedures (average of 10 additional sessions) if required.

Location/setting
UK/out-patient care.

Methods
Analytical approach:
A Markov model, with a life-time horizon, was used to evaluate the potential long-term costs and benefits associated with the improvements in health-related quality of life with EECP therapy. The authors reported an NHS perspective.

Effectiveness data:
A systematic review was performed to identify randomised controlled trials (RCTs) for the effectiveness data (McKenna, et al. 2009, see 'Other Publications of Related Interest' below for bibliographic details). One RCT was found (Arora, et al. 2002, see 'Other Publications of Related Interest' below for bibliographic details). This trial compared EECP with another treatment and the systematic review assessed its quality as good. Four of the outcomes of the trial were considered to be intermediate and the fifth outcome, health-related quality of life at one year, was used in the model. Pooled expert opinion was used to project the observed benefit of EECP beyond the trial duration of one year to produce long-term estimates. Treatment was assumed to have no effect on mortality, since no differences were reported in the trial. The risk of cardiovascular events and their associated mortality was informed by risk equations applied in another published trial (Briggs, et al. 2007, see 'Other Publications of Related Interest' below for bibliographic details). The age-dependent other-cause mortality data were based on standard UK rates.

Monetary benefit and utility valuations:
The improvement in quality of life up to 12 months was from the RCT found in the review. Quality of life was measured using the Short Form (SF)-36 Health Survey and these data were transformed into European Quality of life (EQ-5D) scores, using a mathematic algorithm. The utilities for years two, three, and four plus were elicited from five clinical experts.
Measure of benefit:
The measure of benefit was quality-adjusted life-years (QALYs) and an annual 3.5% discount rate was applied.

Cost data:
The direct costs included the per patient capital cost of the EECP machine, consumable equipment (cuffs, hoses, and plethysmograph), consumables (scan, trousers, gel, and electrodes), staffing, and overheads. Costs were reported in 2008 UK pounds sterling (£) and an annual 3.5% discount rate was applied.

Analysis of uncertainty:
A Monte Carlo simulation was performed to assess the parameter uncertainty. Worst-case and best-case scenarios were analysed, as well as other scenarios.

Results
In the base case, the estimated QALYs were 7.492 for EECP and 7.237 for usual care. The cost for EECP was £4,750 and the costs of usual care were not included. The incremental cost-effectiveness ratio (ICER) for EECP was £18,643 per additional QALY gained.

The worst-case scenario produced an ICER of £63,072 and the best-case scenario produced an ICER of £5,831. Sensitivity analysis found that the probability of EECP being cost-effective, at a threshold of £20,000 per QALY, was 44.4% and at £30,000 per QALY it was 69.8%. The results were highly sensitive to how long the quality of life benefits were assumed to last, and to the cost of EECP, but they were robust to the probability of requiring additional sessions.

Authors’ conclusions
The cost-effectiveness of EECP was highly sensitive to the duration of quality of life benefits and more research on this duration was needed. The generalisation of the results beyond the population in the RCT should be done with caution.

CRD commentary
Interventions:
The interventions were described and seem to have been relevant to patients with chronic stable angina, where surgery was not an option or was refused by a symptomatic patient, after full pharmacological therapy had been established. The EECP was evaluated assuming that it would improve the quality of life only; this was due to limited evidence of comparative effectiveness for other outcomes.

Effectiveness/benefits:
The authors carried out a systematic review of the literature, which was reported elsewhere (McKenna, et al. 2009). The single RCT found was considered to be of good quality by the authors and it reported an improvement in quality of life at 12 months, in patients who received EECP in addition to usual care. No data were available on the expected long-term effects of EECP on health-related quality of life and so these were elicited from expert opinion. The results were shown to be highly sensitive to the range of expert responses collected by the authors. This process was appropriate due to the lack of published data, but very few clinicians were surveyed and the results must be considered to be uncertain.

Costs:
The only relevant cost included was that of the EECP, which included the capital cost of the machine, equipment replacement, consumables, human resources, and overheads. Only the incremental costs of the EECP were presented, which was appropriate. No costs relevant to the reported perspective seem to have been omitted. According to the authors, the EECP costs were expected to decrease if more patients were referred for therapy. Overall, the reporting of the cost components of the model was adequate.

Analysis and results:
The model and analysis were described and seem to have been appropriately conducted. Even when the EECP was cost-effective, in the base case, the authors noted that the results were highly sensitive to variations in the expert opinion on the long-term EECP benefit. In the worst-case scenario, where this benefit was assumed to be limited to the first year after therapy began, EECP was estimated to be not cost-effective as the ICER was over the thresholds recommended by the National Institute of Health and Clinical Excellence (NICE). The results were also sensitive to the EECP costs. The
limited evidence, on which this analysis was based, is a major limitation.

**Concluding remarks:**

Given the evidence available, the results should be considered to be inconclusive; no consensus on the long-term EECP benefit between experts was found and the results were highly sensitive to variations in these opinions.

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