Microvolt T-wave alternans and the selective use of implantable cardioverter defibrillators for primary prevention: a cost-effectiveness study
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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
The aim was to explore the effect of microvolt T-wave alternans (MTWA) testing on the cost-effectiveness of implantable cardioverter defibrillators (ICDs) for the primary prevention of arrhythmic events or death, in patients with severe left-ventricular dysfunction. The authors concluded that selecting patients using MTWA did not make ICDs cost-effective, compared with medical therapy. The methods and the reporting of the study were satisfactory and the results appear to be reliable.

Type of economic evaluation
Cost-effectiveness analysis, cost-utility analysis

Study objective
The aim was to explore the effect of microvolt T-wave alternans (MTWA) testing on the cost-effectiveness of implantable cardioverter defibrillators (ICDs) for the primary prevention of arrhythmic events or death, in patients with severe left-ventricular dysfunction.

Interventions
Three primary prevention strategies were compared. These were medical therapy for all patients, ICDs for all patients, and ICDs for patients selected on the basis of a positive or indeterminate MTWA result.

Location/setting
Canada/secondary care.

Methods
Analytical approach:
The study used a state-transition Markov model, which was constructed to determine the clinical and economic impact of the three strategies. It used published evidence, mainly from a meta-analysis of randomised controlled trials (Ezekowitz, et al. 2007, see ‘Other Publications of Related Interest’ below for bibliographic details), and expert opinion. A 10-year time horizon was adopted and the authors stated that the perspective was that of the Canadian health care system.

Effectiveness data:
The evidence was primarily from a meta-analysis of randomised controlled trials (Ezekowitz, et al. 2007), as well as other published studies and expert opinion. The main clinical parameters were the efficacy of ICDs, the predictive ability of MTWA, and patient mortality.

Monetary benefit and utility valuations:
The utility estimates were from a published study (Buxton, et al. 2006, see ‘Other Publications of Related Interest’ below for bibliographic details), which used the European Quality of life (EQ-5D) questionnaire to derive them.

Measure of benefit:
The measure of benefit was quality-adjusted life-years (QALYs) gained.

Cost data:
The costs included the fees of professionals and the costs of ICD implantation. These costs were from a number of sources including a technology assessment that was conducted at McGill University, and a range of published studies. All costs were presented in 2007 Canadian dollars (CAD) and were adjusted using the health care component of the consumer price index.

Analysis of uncertainty:
A series of one-way and two-way sensitivity analyses was performed to identify the primary variables that influenced the incremental cost-effectiveness ratios. Probabilistic sensitivity analysis was also performed.

Results
Medical therapy for all patients was associated with a mean lifetime cost of CAD 45,800 and led to a gain of 4.18 QALYs.

ICDs for selected patients, based on MTWA, cost CAD 73,800 and gained 4.43 QALYs resulting in an incremental cost-effectiveness ratio of CAD 108,900 per QALY, compared with medical therapy. ICDs for all patients cost CAD 84,500 and gained 4.49 QALYs resulting in an incremental cost-effectiveness ratio of CAD 177,400 per QALY, compared with the MTWA selective strategy.

The parameters that had the greatest effect on the incremental cost-effectiveness ratios were the time horizon, the cost of ICD implantation, the frequency of ICD replacement, and the efficacy of the ICDs.

Authors’ conclusions
The authors stated that neither the strategy of ICD therapy for all patients, nor their selective use based on MTWA results, was cost-effective, compared with medical therapy.

CRD commentary
Interventions:
The alternative strategies were well described and appear to have included the usual practice without MTWA. These strategies are also likely to be relevant in other settings.

Effectiveness/benefits:
The authors reported the clinical data and referenced their sources. The data were potentially of high quality, but the details of the trials and studies were not reported, so it is not possible to ascertain whether the best available evidence was used. Some details for the utility data were provided, but the population, from which the estimates were derived, was not reported.

Costs:
The authors stated that the perspective was that of the Canadian health care system and they included the direct costs relevant to this system. The cost data were not broken down into individual components, which prevents the replication of results for other settings. The sources of the costs were referenced. The authors reported the price year and the currency, and appropriately used the health care component of the consumer price index for adjustments.

Analysis and results:
The analytic approach was satisfactorily reported and the model structure was reported in full, with a diagram. The results were clearly and fully reported. The sensitivity analysis was comprehensive ranging from one- and two-way sensitivity analyses to probabilistic sensitivity analysis, which captured the full impact of parameter uncertainty. The reporting was generally good, with the base-case estimates of effectiveness, utilities, and cost data being reported. The authors also discussed the strengths and limitations of their study.

Concluding remarks:
The methods and the reporting of the study were satisfactory and the results appear to be reliable.

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