The cost-effectiveness of automatic implantable cardiac defibrillators: results from MADIT


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
Automatic implantable cardiac defibrillators.

Type of intervention
Secondary prevention; treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Selected asymptomatic patients with coronary disease and non-sustained ventricular tachycardia, a prior myocardial infarction, an ejection fraction =

Setting
The practice setting was primary care. The economic analysis was carried out in the USA.

Dates to which data relate
Effectiveness and resource data were obtained between 1990 and 1996. 1995 prices were used.

Source of effectiveness data
The estimates for the cost-effectiveness of automatic implantable cardiac defibrillators (AICD) were derived from a single study; the Multicenter Automatic Defibrillator Implantation Trial (MADIT).

Link between effectiveness and cost data
Prospective costing was undertaken on the effectiveness study sample.

Study sample
196 patients from 38 centres (36 in the USA and 2 in Europe) were included in the original study. 181 US patient records were used in the cost-effectiveness analysis. No power calculations were stated. No other details were provided.

Study design
The study was a randomised controlled trial. Patients were allocated to receive either implantable cardiac defibrillators (ICDs) or conventional medical therapy. The average duration of follow-up was 27 months (range: 1 - 61). No loss to follow-up was stated.
Analysis of effectiveness
The basis for the analysis of the clinical study (intention to treat or treatment completers only) was not stated. Primary health outcomes used in the original study were survival times between the treatment groups. It was not made clear in this (secondary) paper whether or not the two study groups were comparable in terms of age, sex, etc. The reader is referred to the original trial (N Engl J Med, 1996 at reference 5 of this paper) for further information.

Effectiveness results
The average survival time (over a four-year period) for the ICD group was 3.66 years compared with 2.80 years for the conventionally treated subjects.

Measure of benefits used in the economic analysis
The benefit measure was life years saved. The economic analysis was based on 181 patients in the United States.

Direct costs
Direct cost measurements included hospitalisations, emergency visits, physician visits, outpatient tests/procedures and other disease or treatment-related service. Quantities and costs were reported separately. 1995 prices were used. A 3% discount rate was applied. Costs were computed from the perspective of a health service.

Statistical analysis of costs
Bootstrap resampling: Discounted differential costs were computed using average costs which were multiplied by the Kaplan-Meier estimates of survival over the period of analysis (using a 3% discount rate) for the intervention and the comparator.

Indirect Costs
Indirect costs were not assessed.

Currency
US dollars ($).

Sensitivity analysis
One-way sensitivity analysis was applied to both technology costs and methodological issues.

Estimated benefits used in the economic analysis
The average survival time (over a four-year period) for the ICD group was 3.66 years compared with 2.80 years for the conventionally treated subjects.

Cost results
Accumulated net costs were $97,560 (ICDs) and $75,980 (conventional or medications-alone).

Synthesis of costs and benefits
An incremental cost-effectiveness ratio of $27,000 per life-year saved was found for ICD use. Sensitivity analyses showed that the incremental cost-effectiveness ratio would be reduced to approximately $23,000 per life-year saved if transvenous defibrillators were used instead of the older devices, which required thoracic surgery.
Authors' conclusions
ICDs are cost-effective in selected patients with a high-risk of suffering from ventricular arrhythmias.

CRD COMMENTARY - Selection of comparators
The selection of ICDs versus conventional medication-only treatment was justified.

Validity of estimate of measure of benefit
Economic benefits were adequately expressed in terms of life-years saved, which were based on a recent randomised controlled trial.

Validity of estimate of costs
Prospective resource usage data were justified and analysed sufficiently (discount rates, price years, etc.).

Other issues
No power calculations were stated from the original paper, although reference to this paper indicates that this was conducted and the groups were shown to be well matched. Overall, this was a well written paper although the study sample characteristics were not reported in this paper which may render the application of these results to other patient groups difficult (the reader should consult the MADIT trial to address this issue). Also, it is difficult to quantify how well the project was co-ordinated through the 38 centres and by relying on patients to complete information around resource usage, etc. In this respect the authors acknowledged that reporting errors may have occurred.

Implications of the study
The authors advocate larger studies that would substantiate the claims of the results found in this study.

Source of funding
Supported by an independent research grant to the University of Rochester from CPI/Guidant Corporation, St Paul, Minnesota, USA.

Bibliographic details

PubMedID
9626173

Original Paper URL
http://circ.ahajournals.org/cgi/content/abstract/97/21/2129?maxtoshow=&amp;HITS=10&amp;RESULTFORMAT=&amp;searchid=957264282394_2944&amp;FIRSTINDEX=&amp;volume=97&amp;firstpage=2129&amp;search_url=http%3A%2F%2Fcirc.ahajournals.org%2Fcgi%2Fsearch&amp;journalcode=circulationaha

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Indexing Status
Subject indexing assigned by NLM

MeSH
Cost-Benefit Analysis; Defibrillators, Implantable /economics; Health Care Costs; Humans
AccessionNumber
21998000857

Date bibliographic record published
31/08/1999

Date abstract record published
31/08/1999