Implantable cardioverter defibrillators: arrhythmias. A rapid and systematic review

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Authors' objectives
To provide a rapid review of the clinical effectiveness and cost-effectiveness of implantable cardioverter defibrillators compared with conventional therapy, in patients at risk of sudden cardiac death from arrhythmias.

Searching
The following electronic databases were searched for the period 1980 to 1999: Cochrane Library (Issue 3, 1999), MEDLINE, EMBASE, BIDS, National Research Register, International Network of Agencies for Health Technology Assessment, NHS Economic Evaluation Database. Full details of the search strategy are reported. In addition bibliographies of related papers were assessed for relevant studies, internet searches were conducted, and experts were contacted to identify additional published and unpublished references.

Study selection
Study designs of evaluations included in the review
Systematic reviews, meta-analyses or randomised controlled trials (RCTs).

Specific interventions included in the review
Implantable cardioverter defibrillators (ICDs) compared with conventional therapy (such as anti-arrhythmic drugs, catheter ablation or surgery).

Participants included in the review
People at high risk of sudden cardiac death (SCD) usually due to ventricular tachyarrhythmia.

Outcomes assessed in the review
Reduction in mortality, prevention of tachyarrhythmias and improvement in quality of life.

How were decisions on the relevance of primary studies made?
Studies were screened for relevance and inclusion by one reviewer.

Assessment of study quality
Primary studies were scored using the Jadad scale (see Other Publications of Related Interest no.1) and secondary studies were scored using the CRD Review Score scale (see Other Publications of Related Interest no.2). Quality assessment was undertaken by one reviewer and checked by a second reviewer, any disagreements were resolved through discussion.

Data extraction
Data extraction was undertaken by one reviewer and checked by a second reviewer, disagreements were resolved by consensus.

Methods of synthesis
How were the studies combined?
Data are presented as a narrative review with full tabulation of results of all included studies. Formal meta-analysis was not undertaken due to lack of time.

How were differences between studies investigated?
Heterogeneity was not formally investigated.
Results of the review
One systematic review and seven RCTs (n=3706) were included in the review.

Systematic review (n=3 RCTs, 12 observational studies and 19 descriptive studies). The review concluded that there was general recognition that ICD is most appropriate for patients in one of two high-risk groups for SCD: cardiac arrest survivors and patients at high risk of malignant tachyarrhythmias on the basis of spontaneous or inducible arrhythmia, without an arrest, who are not eligible or have failed other medical or surgical treatment and who usually have underlying ischaemic heart disease and/or low LVEF.

Six studies, the majority of which were of good quality, found a favourable survival advantage for patients treated with ICD. Further results are not presented in a format that allows interpretation without extensive re-analysis of results.

Cost information
Eight cost effectiveness studies were identified. Unit costs of ICDs (based on 1999/2000 prices), ranged from £12,500 to £22,000. Total discounted costs for 3 years ranged from £20,000 to £29,000. Estimates of cost-effectiveness ranged from £20,250 to £87,000 per life-year saved. Cost per quality-adjusted life-year is estimated at £21,300 to £108,800.

Authors' conclusions
ICD therapy is effective in treating ventricular arrhythmias and in reducing total mortality in patients with life-threatening ventricular tachyarrhythmias compared with anti-arrhythmic drug therapy.

ICD therapy is effective as first-line management of patients at high risk for SCD due to ventricular tachyarrhythmias.

The particular subgroups of patients that may benefit from ICD therapy are those at high risk of SCD from ventricular tachyarrhythmias not due to a reversible cause, these include patients surviving cardiac arrest, patients having symptomatic sustained ventricular tachyarrhythmias, patients with symptomatic sustained ventricular tachyarrhythmias and left ventricular ejection fraction no greater than 40%.

CRD commentary
A reasonable review of the area limited by the poor synthesis of results. A thorough literature search was conducted which included attempts to identify unpublished studies. Methodological details of all review stages are provided, however, the authors state that one author reviewed titles and abstracts for relevance, it would have been better had this been done by two authors to minimise the chance of error in this process. Study validity was formally assessed using a validated checklist and comprehensive study details are provided. However, the results are presented as a summary of each individual study with no attempt to summarise across studies or pool results. This makes the results very difficult to interpret and so it is difficult to tell whether the authors' conclusions follow from the results.

Implications of the review for practice and research
Practice: The authors state that if implemented for indications supported by evidence from RCTs, ICDs may cost the NHS in excess of 24 million per annum.

Research: The authors state that future research should use British Pacing and Electrophysiological Group registries to assess the use of different types of ICD and current service provision.

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