Cost and length of hospital stay: comparisons between nonthoracotomy and epicardial techniques in patients receiving implantable cardioverter defibrillators

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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.

Health technology
Nonthoracotomy and epicardial techniques in patients receiving implantable cardioverter defibrillators. Patients implanted intrathoracically received one of the following models: Ventritex Cadence, Telectronics Guardian 4211 or Medtronic PCD. Those implanted using the nonthoracotomy approach received one of the following: Ventritex Cadence, Telectronics Guardian 4211 or CPI 1600.

Type of intervention
Secondary prevention; treatment

Economic study type
Cost-effectiveness analysis.

Study population
Patients receiving ICDs. 25 patients were implanted intrathoracically: 22 were males. The average age was 66. 64% of the patients had coronary diseases and 28% had cardiomyopathy. The mean left ventricular ejection fraction (LVEF) was 32%. Presenting arrhythmias were ventricular tachycardia (VT) in 20 patients, ventricular fibrillation (VF) in 3, or both in 2. 25 further patients were implanted using the nonthoracotomy technique: 22 were males. The mean age was 71. 72% of the patients had coronary diseases and 20% had cardiomyopathy. The mean LVEF was 37%. Presenting arrhythmias were VT in 20 patients, VF in 4, or both in 1.

Setting
The economic study was carried out in Florida, USA.

Dates to which data relate
Effectiveness and resources were estimated using data for 1992-93. No specific year was recorded for price data.

Source of effectiveness data
Effectiveness data was derived from a single study.

Link between effectiveness and cost data
Costing was undertaken on the same patient sample as that used in the effectiveness study. Both costing and effectiveness data seem to have been collected and analysed retrospectively.

Study sample
There were 25 patients in each group, making 50 patients in all. There was no mention of power calculations, and no
reference to sample selection, except to say that they were consecutive implantations.

**Study design**
Two retrospective case series. Single centre study. The duration of follow-up was the postoperative period spent in hospital. There was no loss to follow-up.

**Analysis of effectiveness**
It was not stated whether analysis of the clinical study was based on 'intention to treat' or 'treatment completers only'. The main health outcomes were proxied by total length of hospital stay, number of postoperative days in an intensive care unit, and postoperative length of stay. Patients in each group were comparable with the exception of age (p<0.05). As well as age, left ventricular ejection fractions appeared to differ but this difference was not statistically significant (p=0.06).

**Effectiveness results**
The total length of hospital stay was 16 days (+/- 6 days) for group I (epicardial approach) versus 12 days (+/- 5 days) for group II (nonthoracotomy approach) (p<0.05), representing a reduction of 20% for group II. The number of postoperative days in an intensive care unit was 3.2 days (+/- 2.8 days) for group I versus 0.5 days (+/- 0.6 days) for group II (p<0.001), representing a reduction of 84% for group II. Postoperative length of stay was 8.2 days (+/- 3.1 days) for group I versus 5.7 days (+/- 4.4 days) for group II (p<0.001), representing a reduction of 30% for group II.

**Clinical conclusions**
Nonthoracotomy ICD implantation in an experienced centre was associated with significantly shorter hospital stays and a virtual elimination of the need for postoperative intensive care. The presence of a statistically older population in the nonthoracotomy patients does not negate these beneficial effects. Further reductions in length of stay are possible if preoperative work-ups are shortened.

**Measure of benefits used in the economic analysis**
The main health outcomes were proxied by total length of hospital stay, number of postoperative days in an intensive care unit, and postoperative length of stay.

**Direct costs**
The only costs provided were mean total hospital charges for each group of patients based on total length of hospital stay. Costs were not discounted because the time period was only a matter of days and so long-term costs and benefits were not analysed. It is unclear how, or from which source, the hospital charges were derived. No breakdown of charges was provided. The quantity of resources was measured using data collected between 1992 and 1993 but it was not clear which year the economic data was based on.

**Statistical analysis of costs**
Confidence intervals and p-values were provided for quantities, and confidence intervals were presented for economic data but the particular statistical tests performed on the data were not recorded.

**Currency**
US dollars ($).

**Sensitivity analysis**
No sensitivity analysis was carried out.
Estimated benefits used in the economic analysis
A reduction in total length of hospital stay of 20% for group II (nonthoracotomy approach). A reduction in the number of postoperative days in an intensive care unit of 84% for group II. A reduction in postoperative length of stay of 30% for group II.

Cost results
Mean total hospital charges for the entire length of stay were $72,918 (+/- $26,770) in group I versus $55,031 (+/- $42,870) in group II, representing a mean reduction of 21% in global costs for group II patients.

Synthesis of costs and benefits
A synthesis was not undertaken by the authors since those in group II experienced greater benefits in terms of shorter hospital stay, and also the mean total hospital charges were smaller for this group of patients.

Authors' conclusions
Nonthoracotomy ICD implantation in an experienced centre was associated with significantly shorter hospital stays, a virtual elimination of the need for postoperative intensive care, and globally lower total hospital costs. The presence of a statistically older population in this group does not negate these beneficial effects. Further reductions in length of stay and costs are possible if pre-operative work-ups are shortened.

CRD Commentary
This was a limited, retrospective analysis which answered only the basic questions surrounding the two ICD techniques in the study. The sample size appears to be small and the authors did not explain whether it was adequate in terms of power calculations and in terms of justifying the study conclusions. Charges, rather than costs, were estimated and there was no explanation for the lack of analysis of costs or of how the charges were broken down. The study is likely to have limited generalisability, particularly to the UK, as the setting is a US community hospital.

Implications of the study
The study is useful as a starting point for further research as it suggests that nonthoracotomy technique is both more effective and cheaper in terms of hospital length of stay. However, further research would be required to extend the economic analysis to include wider costs and benefits both to the Health Service and society in order for the two techniques to be more accurately compared. This would also be useful in terms of comparing ICD implantation with other demands on health care resources.

Bibliographic details

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MeSH
Aged; Defibrillators, Implantable /economics; Electrodes, Implanted /economics; Equipment Design; Female; Florida; Hospital Charges /statistics & numerical data; Hospitals, Community /economics /utilization; Humans; Length of Stay /economics /statistics & numerical data; Male; Pericardium; Retrospective Studies; Tachycardia, Ventricular