Permanent pacemaker implantation after cardiac transplantation: extra cost of a conservative policy
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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
Delayed implantation of permanent pacemaker after cardiac transplantation.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Orthotopic cardiac transplantation patients.

Setting
The setting was a hospital. The study was carried out in Newcastle Upon Tyne, UK.

Dates to which data relate
The effectiveness and resource use data were derived from patients attending the institution from May 1985 to August 1995. The price date was 1995.

Source of effectiveness data
The clinical effectiveness data were taken from a single study.

Link between effectiveness and cost data
The costing was undertaken retrospectively on the same patient sample as that used in the effectiveness analysis.

Study sample
The study sample consisted of orthotopic cardiac transplantation patients who received permanent pacemaker implantation in one of two periods. In period 1 (May 1985-Nov 1990), pacemaker implantation took place between day 8 and day 20 post-transplant (n=16). In period 2 (Dec 1990-Aug 1995), pacemaker implantation took place on or after day 20 post-transplant (n=14). No power calculations were conducted.

Study design
The study was a retrospective case series from a single centre. The duration of follow-up for each patient was not reported.
Analysis of effectiveness
Primary outcome measures were evaluated for each patient who received permanent pacemaker implantation in each study period. These included: number of inpatient bed days; indication for pacing; type of pulse generator; complications arising from implantation and number of days temporary epicardial pacing required for recipients in period 2 who survived for 14 days or more.

Effectiveness results
The number and percentage of cardiac transplant patients who received permanent pacing implantations in period 1 was 16 (10.5%), and in period 2, 14 (7.8%). The mean time to implantation was significantly longer in period 2, 23.9 days (SD 5.8) versus 13.8 days (SD 3.9) in period 1 (P< 0.001.) Three pacemaker leads became displaced, two in period 1 and one in period 2. All were successfully repositioned or replaced. There were no other complications. Seven patients in period 2 were paced via temporary epicardial wires for more than 16 days post-transplantation, and thus potentially would have undergone permanent pacemaker implantation if the policy had not been changed from period 1. There were significantly more atrially-based pacemakers in period 2 compared with period 1 (2/16 versus 13/14, P<0.004). There were significantly more rate responsive pacemakers in period 2 than period 1 (8/16 versus 13/14, P = 0.02).

Clinical conclusions
A blanket policy for the timing of permanent pacemaker implantation after cardiac transplantation saved seven implantations. The change in the type of permanent pacemakers implanted between the two periods was physiologically sound.

Measure of benefits used in the economic analysis
The measures of benefit were the number of permanent pacemaker implantations prevented.

Direct costs
Quantities were reported separately from prices. Estimation of costs was based on actual data. The price date used was 1995. All other costs excluded were implicitly assumed as common. The costs measured were those associated with extended period of hospital stay, with the intervention relative to comparator, and the mean cost of the systems implanted, including: generators; leads; theatre time and mean cost attributable to lead replacement or repositioning.

The estimated saving in permanent pacemaker implantations in period 2 was calculated by multiplying the number of patients spared pacemaker implantation by the mean cost of a pacemaker system in period 2. The estimated cost of the increased bed occupancy owing to the delay in permanent pacing was calculated by multiplying the number of patients with pacemaker implantation in period 2 by the difference in mean bed day occupancy between the two periods, and then by the mean cost of inpatient stay per patient per day in period 2.

Currency
UK pounds sterling (£).

Estimated benefits used in the economic analysis
Seven permanent pacemaker implantations were avoided in period 2.

Cost results
The estimated saving in permanent pacemaker implantations in period 2 was 16,275. The estimated cost of the increased bed occupancy owing to the delay in permanent pacing was 60,095. The cost of the change in permanent pacemaker implantation policy was 43,820. The change in mode of permanent pacing between the two periods resulted in a mean increase in pacemaker costs of about 600 per unit in period 2 (P = 0.02).
Synthesis of costs and benefits
The cost per pacemaker implantation avoided was estimated to be 6,250.

Authors' conclusions
A small reduction in pacemaker implantations was achieved at a substantial extra cost, mainly due to the increase in hospital bed days. The increased expenditure should be balanced with the theoretical morbidity benefits to those spared permanent pacemaker implantation.

CRD COMMENTARY - Selection of comparators
The choice of comparator was based on practice before the policy change studied under the intervention strategy.

Validity of estimate of benefit:

The selection of the study patients was performed retrospectively, and transplant patients who did not undergo permanent pacemaker implants were not considered in the analysis of the effectiveness study. The effectiveness results were based on a very small number of patients treated under each policy, and no demographic data or clinical characteristics of the patients were presented. There could be significant bias in the results presented, and any conclusions regarding the number of pacemaker implantations avoided should be treated with considerable caution. A more adequate measure of benefit would also account for the morbidity associated with permanent pacemaker implantation.

Validity of estimate of costs

The retrospective before and after nature of the cost study could have hidden important biases in the cost estimation which might determine the result qualitatively. It seems that no important costs were omitted, but this was not confirmed by a detailed discussion of the costs associated with a change in policy such as the one described in the study. Many of the costs and cost calculations were presented as estimates of 'about' a certain figure, rather than providing precise figures.

Other issues
A proper definition of benefits is needed before the present study can be considered useful in terms of the cost-effectiveness of the strategies involved. The issue of generalisability was not adequately addressed. No proper comparisons with other studies were reported.

Implications of the study
Further, large studies are needed before any clear evidence regarding the cost-effectiveness of delayed implantation of permanent pacemakers after cardiac transplantation can be obtained. Adequate measurement and valuation of health outcomes need to be considered in such studies, alongside prospective controlled studies.

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None stated.

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