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Title **The Effectiveness and Cost Effectiveness of Dual-Chamber Pacemakers Compared with Single-Chamber Pacemakers for Bradycardia Due to Atrioventricular Block or Sick Sinus Syndrome: Systematic Review and Economic Evaluation**

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Aim

To estimate the effectiveness and cost effectiveness of dual-chamber pacemakers versus single-chamber atrial or single-chamber ventricular pacemakers in treating bradycardia due to sick sinus syndrome (SSS) or atrioventricular block (AVB).

Conclusions and results

The searches retrieved 1 systematic review of effectiveness and cost effectiveness, 4 parallel-group, randomized controlled trials (RCTs), and 28 crossover trials. Dual-chamber pacing was associated with lower rates of atrial fibrillation, particularly in SSS, than ventricular pacing, and prevents pacemaker syndrome. Higher rates of atrial fibrillation were seen with dual-chamber pacing than with atrial pacing. Complications were more frequent in dual-chamber pacemaker insertion. The 5-year cost of a dual-chamber system, including cost of complications and clinical events, was estimated to be around 7400 British pounds (GBP). The overall cost difference between single and dual systems is not large over this period: about GBP 700 more for dual-chamber devices. The cost effectiveness of dual-chamber compared with ventricular pacing was estimated to be around GBP 8500 per quality-adjusted life-year (QALY) in AVB and GBP 9500 in SSS over 5 years, and around GBP 5500 per QALY in both populations over 10 years. Under more conservative assumptions, the cost effectiveness of dual-chamber pacing is around GBP 30 000 per QALY. Probabilistic sensitivity analysis showed that under the base-case assumptions, dual-chamber pacing is likely to be considered cost effective at willingness-to-pay levels that are generally considered acceptable by policy makers. In contrast, atrial pacing (applicable in SSS but not AVB) may be cost effective compared with dual-chamber pacing.

Recommendations

Dual-chamber pacing results in small, but potentially important, benefits in populations with SSS and/or AVB compared with ventricular pacemakers. Pacemaker syndrome is crucial in determining cost effectiveness, but difficult to quantify due to difficulties in standardizing diagnosis and measuring severity. Dual-chamber pacing is common in the UK, and recipients tend to be younger. Current evidence is insufficient to inform policy on specific groups that could benefit most from pacing with dual-chamber devices.

Methods

A systematic review was carried out of RCTs. Standard frameworks were used to appraise the quality of selected studies. Meta-analyses, using random effects models, were carried out where appropriate. Limited exploration of heterogeneity was possible. Two frameworks were used in critical appraisal of economic evaluations. A decision-analytic model was developed using a Markov approach to estimate the cost effectiveness of dual-chamber versus ventricular or atrial pacing over 5 and 10 years as cost per QALY. Uncertainty was explored using one-way and probabilistic sensitivity analyses.

Further research/reviews required

Further important research is under way. Outstanding research priorities include the economic evaluation of UKPACE studies on the classification, diagnosis, and utility associated with pacemaker syndrome and evidence on the effectiveness of pacemakers in children.

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