Cost-effectiveness of rhythm versus rate control in atrial fibrillation

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
This study considered the treatment of atrial fibrillation (AF) using rhythm versus rate control. Rhythm control was defined as electrical cardioversion, anti-arrhythmic drugs and nonpharmacologic therapies (e.g. multisite atrial pacing, maze procedures or radiofrequency ablation procedures) to maintain sinus rhythm. Rate control used atroventricular nodal blocking agents, including ablation of the atroventricular junction and pacemaker implantation if needed, for ventricular rate control.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients with AF, who were either aged at least 65 years or were younger than 65 but had other risk factors for stroke or death.

Setting
The setting was secondary care. The economic study was carried out in the USA and Canada.

Dates to which data relate
The dates to which the clinical effectiveness and resource use data referred were not reported. The price year was 2002.

Source of effectiveness data
The effectiveness data were derived from a single study (i.e. the Atrial Fibrillation Follow-up Investigation of Rhythm Management study, the AFFIRM study; Wyse et al. 2002, see 'Other Publications of Related Interest' below for bibliographic details).

Link between effectiveness and cost data
The resource use data were collected prospectively from the same patient sample that provided the clinical effectiveness evidence.

Study sample
Sample size calculations were not reported to have been performed in the planning phase of the study in order to assure a certain power. A total of 4,060 patients with a first or a recurrent episode of AF that was likely to cause
morbidity or death, requiring long-term treatment for AF and with no contraindication of anticoagulation treatment, were included in the study. Of these, 2,027 were randomly assigned to the rate-control group and 2,033 to the rhythm-control group. The methods used to select the sample were not reported in the paper. The authors reported that the patients recruited in the study were similar to those with AF in the general population in terms of their age, gender and cardiovascular co-morbid conditions. Further information about the study design, the inclusion and exclusion criteria, and the results of the study were available elsewhere (see 'Other Publications of Related Interest' below for bibliographic details).

Study design
The study was a randomised controlled trial that was carried out in multiple centres (including 213 clinical sites). The patients were block randomised by treatment centre. The patients were followed up for a mean period of 3.5 years, up to a maximum of 5.65 years. Some patients were lost to follow-up, although the rate of loss to follow-up was not reported in the paper. As the authors highlighted, crossover rates between treatments were high: 14.9% from rate control to rhythm control, and 37.5% from rhythm control to rate control.

Analysis of effectiveness
The primary health outcome used was the mean survival time. This was extrapolated from the clinical data using the Kaplan-Meier product limit estimator. It appears that the data have been analysed on an intention to treat basis. No details of the comparability of the groups at baseline were reported in the paper.

Effectiveness results
The mean survival of patients treated with rate control was 4.67 years, compared with 4.60 years for those treated with rhythm control.

Clinical conclusions
There was no statistically significant difference in survival between patients treated with rate control and rhythm control.

Measure of benefits used in the economic analysis
The measure of health benefit used was the mean survival time. This was directly derived from the effectiveness analysis.

Direct costs
The perspective of the study was that of a third-party health care payer. The resource use and unit cost data were detailed in the paper. The costs were grouped into five categories. More specifically, the costs of hospital stays, cardiac procedures, cardioversions, short-stay and emergency department visits, and medication. The sources of the unit costs were:

the Healthcare Cost and Utilization Project (HCUP) statistics for the 1995 HCUP-3 Nationwide Inpatient Sample for Diseases of the Circulatory System for hospital stay;

the 2002 Physician Fee Schedule Payment Amount File for the associated physician charges;

the price lists of three manufacturers for the costs of pacemakers and implantable cardioverter defibrillators;

the Current Procedural Terminology codes for catheter ablation procedures;

the average Medicare costs for the cost of short hospital stay and emergency department visits;

the average payment made to a hospital included in the clinical study for cardioversion costs; and
the average wholesale prices for the medication costs.

A cost-to-charge ratio of 0.575 was applied to HCUP prices in order to represent costs. Expert opinion was used to determine the standardised doses of medication used in practice. The price year was 2002 and future costs were discounted at a rate of 3% per annum. With the exception of the costs for pacemakers and implantable cardioverter defibrillators (which were not adjusted), the costs were converted to year 2002 using the medical care component of the Consumer Price Index. The costs estimated were the average costs per patient.

Statistical analysis of costs
The cost data were treated deterministically.

Indirect Costs
No indirect costs were included in this study.

Currency
US dollars ($).

Sensitivity analysis
Sensitivity analyses, using bootstrap techniques, were conducted to assess uncertainty surrounding variability in the data and to enhance the generalisability of the study findings.

Estimated benefits used in the economic analysis
See the 'Effectiveness Results' section.

Cost results
The average cost was $20,546 per patient with rate control, compared with $25,623 per patient with rhythm control.

Synthesis of costs and benefits
When the clinical effectiveness data were combined with the cost information, treatment with rate control dominated treatment with rhythm control. This was the case in 95% of the bootstrap replications of the sensitivity analysis.

Authors' conclusions
Rate control was more cost-effective than rhythm control for treating patients with atrial fibrillation (AF).

CRD COMMENTARY - Selection of comparators
This study considered the treatment of AF with rate control and rhythm control because, as the authors stated, these are the main two approaches for the rhythm management of AF. You should consider how these options compare to the clinical practice in your setting prior to applying the results of this study.

Validity of estimate of measure of effectiveness
The clinical effectiveness data used in the study were taken from a randomised controlled trial, which was appropriate for the study question. Although the trial had a cluster design, the rationale for this was not reported and the paper did not indicate whether this element of the study design was considered in the analysis of the data. The method of randomisation was not reported and there does not appear to have been any blinding. The authors commented that the study sample presented characteristics similar to the study population, although no evidence of this was shown in the
paper. In addition, the characteristics of the two treatment groups were not compared, so it was not possible to identify whether there were any potential confounding factors. The statistical analysis of the trial data accounted for those who were lost to follow-up or withdrew from the study. This provides a more realistic estimate of the effectiveness of the treatments that would be experienced if they were applied in routine clinical practice.

**Validity of estimate of measure of benefit**
The measure of benefit (survival) was calculated using data from the clinical trial. No explicit justification for this choice was given. The authors acknowledged that their study did not consider whether there was a difference in quality of life between the two treatment groups, but suggested that this was unlikely to be the case.

**Validity of estimate of costs**
The study was undertaken from the perspective of a third-party health care payer. As such, all the appropriate costs appear to have been included. A clear price year was reported, although the costs of pacemakers and implantable cardioverter defibrillators were not reflated to this year and no justification for this was provided. The future costs were appropriately discounted to take account of the preference for current benefit. The paper provided a clear breakdown of resource use and unit costs, and a comprehensive sensitivity analysis was undertaken. The authors reported that they opted to take the cost data from publicly available cost structures, rather than from the participating centres, to enhance the generalisability of their findings. The sensitivity analysis considered the variation in costs likely to be encountered in the US setting. These factors add to the generalisability of the study results within this setting.

**Other issues**
The authors presented their findings in a comprehensive manner and their conclusions reflected the scope of the analysis. They compared their results with those from other studies comparing the two treatment options, and discussed possible reasons for the differences in findings. In terms of the generalisability of the results, the authors pointed out that the results of the economic analysis are limited to patients presenting similar characteristics and following comparable treatment protocols to those of the AFFIRM trial. However, as they remarked, the results cannot be generalised to younger patients not presenting risk factors for stroke or death.

**Implications of the study**
The authors did not make any recommendations for further research or changes in practice.

**Source of funding**
AFFIRM was supported by the National Heart, Lung, and Blood Institute. The CORE study was supported in part by the Canadian Institutes of Health Research Chronic Disease New Emerging Team Program, Canadian Diabetes Association, Kidney Foundation of Canada, Heart and Stroke Foundation of Canada, and the Canadian Institutes of Health Research Institutes of Nutrition, Metabolism and Diabetes, Circulatory and Respiratory Health, and Gender and Health.

**Bibliographic details**

**PubMedID**
15520421

**Other publications of related interest**
The Planning and Steering Committees of the AFFIRM study for the NHLBI AFFIRM investigators. Atrial fibrillation


**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Anti-Arrhythmia Agents /economics /therapeutic use; Anticoagulants /economics /therapeutic use; Atrial Fibrillation /drug therapy /mortality /therapy; Cardiac Surgical Procedures /economics; Catheter Ablation /economics; Computer Simulation; Cost-Benefit Analysis; Electric Countershock /economics; Emergency Service, Hospital /economics; Hospital Costs; Humans; Length of Stay /economics; Pacemaker, Artificial /economics; Retrospective Studies; Statistics, Nonparametric

**AccessionNumber**
22004008438

**Date bibliographic record published**
28/02/2006

**Date abstract record published**
28/02/2006