Cost-effectiveness of radiofrequency ablation for supraventricular tachycardia

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
Radiofrequency ablation (RA) for the treatment of supraventricular tachycardia in highly symptomatic patients.

Type of intervention
Treatment.

Economic study type
Cost-utility analysis.

Study population
The study population comprised patients with severe symptomatic supraventricular tachycardia due to atrioventricular nodal reentrant tachycardia or a concealed bypass tract. Patients suffering from Wolff-Parkinson-White syndrome were excluded since economic studies of RA in these patients had already been performed.

Setting
The setting was the community. The economic study was carried out in Stanford, CA, USA.

Dates to which data relate
Effectiveness data were derived from a review of studies published between 1966 and 2000. Resource data refer to 1997 and 1998. The price year was 1999.

Source of effectiveness data
Effectiveness data were derived from published studies.

Modelling
A Markov model was used to identify the course of a hypothetical cohort of patients who received one of the three treatment strategies. The characteristics of the patient cohort in the model (age, sex, drug efficacy, number of physician visits, etc) were derived from an unselected group of patients referred for RA at the Kaiser Permanente Medical Care Program of Northern Carolina which cares for 2.9 million subscribers.

Outcomes assessed in the review
The outcomes assessed in the review, which were used as inputs in the model, were:

demographic data (starting age of population, proportion with atrioventricular nodal reentrant tachycardia, with bypass, with supraventricular tachycardia not amenable to RA, events per year);
utility values (for patients receiving the three treatments);

several clinical probabilities (drug efficacy, rate of success, complications, and death with RA, atrioventricular block, arrhythmia, etc).

**Study designs and other criteria for inclusion in the review**
The authors did not specify the study designs to be included in the review or other inclusion criteria.

**Sources searched to identify primary studies**
Not reported.

**Criteria used to ensure the validity of primary studies**
The validity of primary studies was assessed by an evidence rating system slightly modified from that developed by the US Preventive Services Task Force to evaluate the quality of the evidence for certain model inputs used in the review.

**Methods used to judge relevance and validity, and for extracting data**
Not reported.

**Number of primary studies included**
Fifty-eight primary studies were included in the review.

**Methods of combining primary studies**
The primary studies were combined by reporting the range of values in each article and then selecting the best estimate within the range.

**Investigation of differences between primary studies**
Not carried out.

**Results of the review**
The starting age of the population was 40 years.

The proportions of individuals were 65% with atrioventricular nodal reentrant tachycardia, 30% with bypass 30%, and 5% with supraventricular tachycardia not amenable to RA.

The number of events per year was 11.5.

The utility value was 0.963 for patients receiving RA, 0.833 for long-term drug therapy, and 0.828 for episodic drug therapy.

As regards clinical variables, the drug efficacy was equal to 0.60, the rate of success was 0.97 and the probability of major complications was 0.004.

The probability of death with RA was 0.001, the probability of atrioventricular block was 0.01 and the probability of arrhythmia 0.05.

**Measure of benefits used in the economic analysis**
Quality-adjusted life years (QALYs) were used as the measure of benefit. The health utilities were derived from the NHS Economic Evaluation Database (NHS EED) produced by the Centre for Reviews and Dissemination. Copyright © 2017 University of York.
values obtained from a published study, based on telephone interviews with 161 patients who had undergone RA after drug therapy and who had experienced symptoms of medium or high severity. The basic method used to evaluate health states was the time-trade-off technique. For patients receiving episodic drug therapy, the utility values were decreased by 0.25 quality-adjusted life days for each event in excess of those experienced by patients receiving long-term drug therapy. QALYs were discounted at 3% per year.

**Direct costs**
All costs were discounted by 3% and adjusted to 1999 US dollars by using a gross domestic product deflator. The costs included in the model were the costs associated with routine office visits, electrophysiologic studies (hospital and professional fees), electrocardiographic monitoring, RA, pacemaker implantation and replacement, emergency department visits, annual drug prescription. Quantities and costs were not reported separately and their estimation was based on official published data and on a cohort of 60 patients seen at a major academic hospital. The total costs of each treatment were calculated through the decision tree. The quantity/cost boundary adopted was not stated by the authors. Resource data were gathered between 1997 and 1998.

**Statistical analysis of costs**
No statistical analysis of costs was carried out.

**Indirect Costs**
Indirect costs were not reported.

**Currency**
US dollars ($).

**Sensitivity analysis**
One-way and probabilistic sensitivity analyses were carried out to investigate the variability in the data used: reduced severity of disease (for patients with slight and moderate symptoms), several probability values, drug efficacy, utility values, and costs of drug. Best and worst scenarios for RA were also assumed.

**Estimated benefits used in the economic analysis**
The total number of QALYs was 21.66 for RA, 18.56 for long-term drug therapy, and 18.46 for episodic drug therapy. RA and long-term drug therapy produced respectively 3.75 and 0.38 incremental QALYs compared to episodic drug therapy. The RA was thus the most beneficial strategy.

**Cost results**
The total lifetime costs were $61,880 for RA, $89,820 for long-term drug therapy and $143,530 for episodic drug therapy. RA and long-term drug therapy were associated with $81,640 and $53,700 incremental cost savings respectively, compared to episodic drug therapy. The RA was therefore the less costly strategy.

**Synthesis of costs and benefits**
In the base case, RA was the dominant strategy, given that it resulted in lower costs and higher QALYs compared to both the alternatives. The one-way sensitivity analyses showed that RA remained cost-effective even with small gains in QALYs and very low costs of drugs. Changes in many other variables did not affect the results. In the probabilistic sensitivity analysis RA dominated long-term drug therapy in 93.7% of the simulations. The base case findings were therefore robust to changes in the variables.
Authors' conclusions
The analysis showed that in severely symptomatic patients (those who have approximately one episode of supraventricular tachycardia per month without treatment), radiofrequency ablation improved quality-adjusted survival and reduced lifetime medical expenditures.

CRD COMMENTARY - Selection of comparators
The comparators used represent the current practice for patients suffering from supraventricular tachycardia.

Validity of estimate of measure of effectiveness
Effectiveness data were derived from a review of numerous published articles. However, the method and conduct of the review were not explicitly reported. In addition, it would have been useful to have made explicit the process for determining the best estimate values chosen within the range of probability values derived from the literature.

Validity of estimate of measure of benefit
The estimation of benefit (QALYs) was modelled. The decision tree used to derive the QALY estimates seems appropriate to the objective of the study.

Validity of estimate of costs
Indirect costs were not included in the analysis, but they might have been relevant given the social perspective adopted, as stated by the authors. Furthermore, costs and quantities were not reported separately.

Other issues
Several sensitivity analyses were performed to increase the robustness and the external validity of the results, but the issue of generalisability to other settings was not addressed explicitly. Although the authors stated that a societal perspective was adopted, the conduct of the analysis suggests that a health services’ perspective was more likely to have been used. A possible limitation of the study, as pointed out by the authors, was that the utility values were obtained from severely symptomatic patients and, therefore, the results could not be valid for patients with minimal or moderate symptoms. Finally, as the authors underlined, RA was cost saving in the long term for severely symptomatic patients, but the time required to recoup the initial cost of RA might be more than 10 years.

Implications of the study
The authors recommended the adoption of RA in highly symptomatic patients. Further research should focus on eliciting utility values for patients whose symptoms are minimal or moderate.

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