Cost-Effectiveness of Radiofrequency Catheter Ablation for Atrial Fibrillation

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OBJECTIVES	We sought to compare the cost-effectiveness of left atrial catheter ablation (LACA), amiodarone, and rate control therapy in the management of atrial fibrillation (AF).
BACKGROUND	Left atrial catheter ablation has been performed to eliminate AF, but its cost-effectiveness is unknown.
METHODS	We developed a decision-analytic model to evaluate the cost-effectiveness of LACA in 55- and 65-year-old cohorts with AF at moderate and low stroke risk. Costs, health utilities, and transition probabilities were derived from published literature and Medicare data. We performed primary threshold analyses to determine the minimum level of LACA efficacy and stroke risk reduction needed to make LACA cost-effective at $50,000 and $100,000 per quality-adjusted life-year (QALY) thresholds.
RESULTS	In 65-year-old subjects with AF at moderate stroke risk, relative reduction in stroke risk with an 80% LACA efficacy rate for sinus rhythm restoration would need to be ≥42% and ≥11% to yield incremental cost-effectiveness ratios (ICERs) <$50,000 and $100,000 per QALY, respectively. Higher and lower LACA efficacy rates would require correspondingly lower and higher stroke risk reduction for equivalent ICER thresholds. In the 55-year-old moderate stroke risk cohort, lower LACA efficacy rates or stroke risk reduction would be needed for the same ICER thresholds. In patients at low stroke risk, LACA was unlikely to be cost-effective.
CONCLUSIONS	The use of LACA may be cost-effective in patients with AF at moderate risk for stroke, but it is not cost-effective in low-risk patients. Our threshold analyses may provide a framework for the design of future clinical trials by providing effect size estimates for LACA efficacy needed. (J Am Coll Cardiol 2006;47:2513–20) © 2006 by the American College of Cardiology Foundation

Atrial fibrillation (AF) is the most common sustained cardiac arrhythmia and is associated with significant morbidity and mortality (1,2). Recent randomized trials have demonstrated that, among patients with AF who were at risk for thromboembolic events, rhythm control with antiarrhythmic drugs was not associated with an improved survival when compared with rate control (3,4). However, the ability of antiarrhythmic therapy to maintain sinus rhythm beyond one year was limited in these studies (5), and subsequent post-hoc analyses have shown that patients who remained in sinus rhythm, regardless of the treatment strategy, had fewer strokes (6) and better survival (7) than patients who had recurrent AF, suggesting that the beneficial effects of sinus rhythm may have been offset by the adverse effects of antiarrhythmic therapy (7).

Left atrial catheter ablation (LACA) that encircles the pulmonary veins 1 to 2 cm from their ostia with additional linear lesions has been reported to be effective in maintaining sinus rhythm in patients with AF (8–10). Compared with the use of antiarrhythmic therapy, LACA has been demonstrated to improve quality of life and survival in a nonrandomized, consecutive series of 1,171 patients (10).

There are significant upfront costs and a risk of infrequent but severe complications with LACA. However, the potential benefits in stroke reduction of maintaining sinus rhythm without the adverse effects of antiarrhythmic drugs may justify the high initial costs when compared with medical therapy in patients with AF.

To date, randomized trials comparing ablation and medical therapy in patients with AF have not looked at "hard" end points such as stroke and death. Despite this, more patients are undergoing LACA treatment for AF. Given the cost of LACA, clinical trials are needed that examine not only the efficacy of LACA in preventing stroke and death but also its cost-effectiveness.

Thresholds for cost-effectiveness have traditionally been defined as $50,000 to $100,000 per quality-adjusted life-year (QALY) (11). Using a decision-analytic model, we conducted an analysis of the cost-effectiveness of LACA therapy for AF. Our primary focus was to examine the degree of stroke reduction, across levels of baseline stroke risk, at which LACA would be cost-effective.

METHODS

Model design and main outcomes. We constructed a Markov decision analysis model to assess the cost-effectiveness of rhythm control with LACA versus two more standards approaches: rhythm control with amiodarone and medical rate control therapy. We examined hypothetical cohorts of patients with AF who were at low and moderate

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Abbreviations and Acronyms

AF = atrial fibrillation
ICER = incremental cost-effectiveness ratio
LACA = left atrial catheter ablation
QALY = quality-adjusted life-years

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risk for stroke (Fig. 1). Short- and long-term outcomes; adverse events, including stroke, hemorrhage, drug toxicity, and procedural complications; and the attendant costs and utilities for each treatment strategy and health state were tracked (Appendix). The cycle length was three months, and all patients were followed until death. All analyses took the societal perspective.

For the primary threshold analysis, the efficacy and stroke risk reduction needed for LACA to be cost-effective at $50,000 and $100,000 per QALY were determined. In addition, sensitivity analysis was performed to assess the impact of other variables on cost-effectiveness. TreeAge Pro (Williamstown, Massachusetts) was used for model design and analyses.

Treatment strategies. RHYTHM CONTROL BY LACA. The use of LACA to eliminate AF has been performed using a variety of techniques. The efficacy of LACA, after accounting for reablations in the first year for AF recurrence and treatable atrial flutters, has been reported to range from 65% to 95% (8–10,12,13). Because LACA efficacy (relative to medical therapy) in restoring sinus rhythm remains unknown without direct large trial comparisons, we examined a wide range of efficacy rates for our threshold analyses. In the base case, we assumed an efficacy rate of 80% (with a 30% redo rate during the first year) and an annual relapse

rate back to AF of 2% (Appendix) (8,10,13).

RATE CONTROL. On the basis of a previous study (14), a combination of digoxin and atenolol was used for rate control therapy in this model. Because clinical trials have shown that patients with AF allocated to rate control therapy do convert to sinus rhythm (3,4), we estimated initial rates of conversion to sinus rhythm of 38%, and modeled an annual relapse rate of 5% to AF thereafter (Appendix).

RHYTHM CONTROL WITH AMIODARONE THERAPY. Rhythm control with amiodarone also was modeled for our analysis (Appendix). Amiodarone was chosen because its efficacy and safety profile are well established, and because it has been shown to be more effective than other antiarrhythmic agents (15–18).

Target population. Treatment strategies were assessed in a hypothetical 65-year-old cohort at either low or moderate risk of stroke. Patients at moderate risk of stroke were defined as having one risk factor (hypertension, diabetes mellitus, coronary artery disease, or congestive heart failure), whereas patients at low risk of stroke had no risk factors. An age of 65 years was chosen because the prevalence of AF is dependent on age and begins to increase significantly after the age of 65 years (1). Because the mean age of patients who undergo an ablation procedure is 50 to 55 years with one risk factor in large series (8,10), a hypothetical cohort of 55-year-old patients at moderate risk for stroke also was included. Patients who had ≥2 risk factors for stroke were considered to be at high risk and were excluded from the analysis because, thus far, they are atypical of patients who undergo a catheter ablation procedure for AF. Overall, three cohorts were analyzed (Table 1).
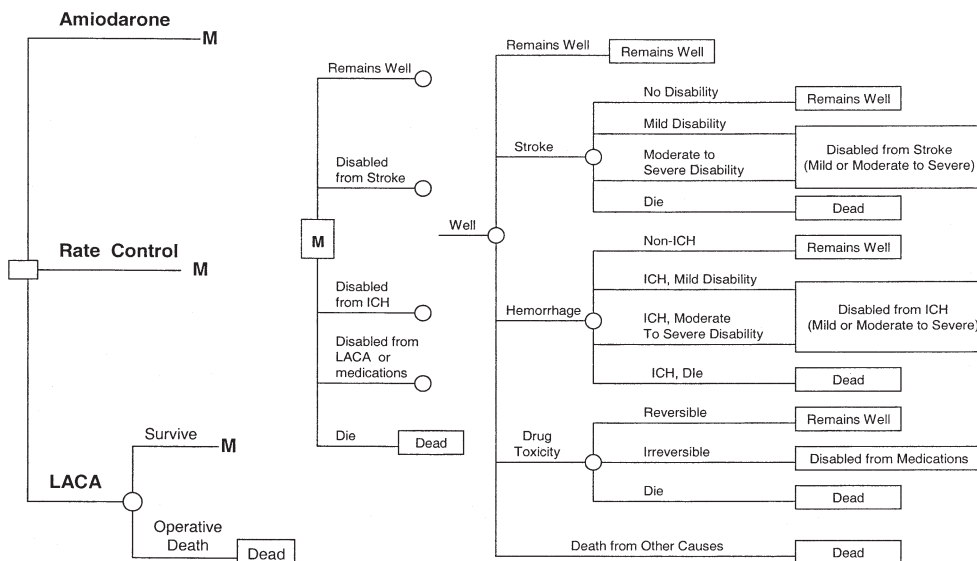
Figure 1. Simplified diagram of the Markov decision-analytic model. The **square at the left** represents the three treatment strategy choices. The **M** represents the Markov process, which leads to one of many health states. The **circles** represent chance events that may occur in each cycle (e.g., remain well, stroke, hemorrhage, drug toxicity, reversion to atrial fibrillation—not shown) and results in continued good health or one of several disabling states. The branch from **Well** illustrates these chance events. Health states in the figure are simplified, and each represents multiple states in the actual model (e.g., "disabled" includes separate health states in atrial fibrillation or sinus rhythm with mild or moderate-to-severe disability due to stroke, hemorrhage, left atrial catheter ablation [LACA] complications, or drug toxicity). ICH = intracranial hemorrhage.

Table 1. Atrial Fibrillation Study Cohorts and Treatment Strategies

Stroke Risk	Treatment Strategy
Moderate	LACA + warfarin
	Amiodarone + warfarin
	Rate control + warfarin
Moderate (age = 55 yrs)	LACA + warfarin
	Amiodarone + warfarin
	Rate control + warfarin
Low	LACA + warfarin
	LACA + aspirin
	Amiodarone + warfarin
	Amiodarone + aspirin
	Rate control + warfarin
	Rate control + aspirin

Three cohorts were examined with different treatment strategies coupled with warfarin or aspirin. All models are for a hypothetical 65-year-old cohort, except where indicated.
LACA = left atrial catheter ablation.

In all treatment arms, patients received antithrombotic or anticoagulant therapy. Patients at moderate risk of stroke received warfarin, whereas patients at low risk of stroke received either warfarin or aspirin. Patients with sinus rhythm restored continued warfarin therapy for six more months before transitioning to the use of aspirin. Patients with absolute indications or contraindications for antithrombotic therapy were excluded from the analysis. In addition, patients who had intractable symptoms or a need for urgent or emergent cardioversion were not included.

Probabilities and rates. The derivation of base-case values and range of the estimates for model variables are summarized in the Appendix. The following variables in the model deserve special emphasis.

STROKE. On the basis of previous studies, including a recent meta-analysis, patients in AF at moderate and low risk for stroke have annual baseline stroke risks (i.e., without antithrombotic therapy) of 3.0% and 1.4%, respectively (2,19,20). Aspirin has been found to reduce annual stroke risk by 22% (2,21–23), and warfarin confers additional risk reductions of 45% and 35% compared with aspirin therapy in patients at moderate and low risk, respectively (24). Therefore, our model incorporated annual stroke risks of 2.3% and 1.1% for aspirin therapy and 1.3% and 0.7% for warfarin therapy for patients in AF at moderate and low risk for stroke, respectively. Finally, because risk increases with age, stroke risk was adjusted linearly with a relative risk of 1.4 for each decade of age (21,25,26).

The annual risk of stroke in patients with AF restored to sinus rhythm is unknown. The Framingham study cohort reports an age-adjusted stroke incidence rate of 0.5%/year in patients without AF (27). Two cohort studies have both reported stroke rates in predominantly low-risk AF patients with sinus rhythm restored of 0.2% per year (28,29). However, because these studies were small, nonrandomized cohort studies with potential selection bias, we conducted our primary threshold analyses on this variable to better

assess its impact on cost-effectiveness (Appendix).

MORTALITY. Mortality was age-adjusted with life tables from the National Center for Health Statistics (30), and noncerebrovascular mortality was further modified by a relative risk of 1.3 and 2.3 in patients without and with moderate-to-severe disability (from stroke or intra-cranial bleed), respectively (2,20,21) (Appendix). Furthermore, the model incorporated relative risk reductions of 17% and 33% in nonstroke vascular mortality by aspirin and warfarin, respectively (2).

COST AND UTILITIES. All health care costs are presented in 2004 U.S. dollars; costs and life expectancy were discounted at 3% per year. Cost estimates were based on Medicare reimbursement rates (professional and facility costs), hospital accounting information, inflation-adjusted values from the published literature, and the Red Book for wholesale drug costs (Appendix) (11,31). The annual cost of warfarin therapy included every four-week serum monitoring and a problem-focused office visit (CPT code 99213), whereas digoxin therapy included biannual serum monitoring (32). Although atrioesophageal fistula is a rare event with ablation therapy, it was estimated to cost $50,000 and have a 50% mortality rate.

The quality of life for warfarin and aspirin therapies and individual health states were obtained from published literature (Appendix) (2,20,33–35). Short-term disutilities were applied for clinical events (stroke, hemorrhage, drug toxicity, and complications for ablation) by applying a disutility value of 0.5 for the duration of the event. A half-cycle correction for both costs and utilities was used to avoid overestimation of expected survival in the model (11).

SENSITIVITY ANALYSIS. We assigned estimates for one-year LACA efficacy of 80% and annual stroke risk in patients with restored sinus rhythm using estimates from the literature (Appendix); these variables were examined in special detail using threshold analyses. We also conducted one-way sensitivity analyses for all other variables in the model. Multivariate sensitivity analyses were then conducted using second order Monte Carlo simulation, whereby the distribution of ranges of every model variable is repeatedly sampled to estimate the distribution of cost-effectiveness estimates (11). For this simulation, 10,000 trials for each AF cohort were performed. A normal distribution encompassing four standard deviations for the estimate range was used for most variables. For skewed data (e.g., costs of hospitalizations and rates of complications), a log-normal distribution was assumed.

RESULTS

Base-case analysis. Using the assigned estimates for LACA efficacy and annual stroke risk in sinus rhythm (Appendix), the cost-effectiveness values of each treatment strategy stratified according to the risk of stroke are shown in Table 2. When the stroke risk was low, antithrombotic therapy with aspirin dominated therapy with warfarin regardless of the treatment strategy (data not shown).

Table 2. Incremental Cost-Effectiveness Ratios (ICER) in Base-Case Estimates, Stratified by Ischemic Stroke Risk

Stroke Risk	Strategy	Cost	Life-Years	QALYs	ICER ($/QALY)
Moderate (age = 65 yrs)	Rate control + warfarin	$39,391	11.47	10.81	Reference
	Amiodarone + warfarin	$43,358	11.45	10.75	Dominated
	LACA + warfarin	$52,369	11.55	11.06	$51,800/QALY
Moderate (age = 55 yrs)	Rate control + warfarin	$50,509	14.80	13.95	Reference
	Amiodarone + warfarin	$55,795	14.75	13.81	Dominated
	LACA + warfarin	$59,380	14.88	14.26	$28,700/QALY
Low	Rate control + ASA	$24,540	11.65	11.21	Reference
	Amiodarone + ASA	$38,425	11.60	11.02	Dominated
	LACA + ASA	$43,036	11.70	11.40	$98,900/QALY

Calculations for cost-effectiveness were performed by taking the incremental cost (difference between costs of compared strategies) divided by the incremental effectiveness (difference between quality-adjusted life-years [QALYs] of compared strategies). No calculations are needed for strategies that are dominated, as they are less effective and more costly than the reference strategy. All ICER results are measured in 2004 U.S. dollars and are rounded off to the nearest $100. Discrepancies in the ICER calculations are due to round-off error.
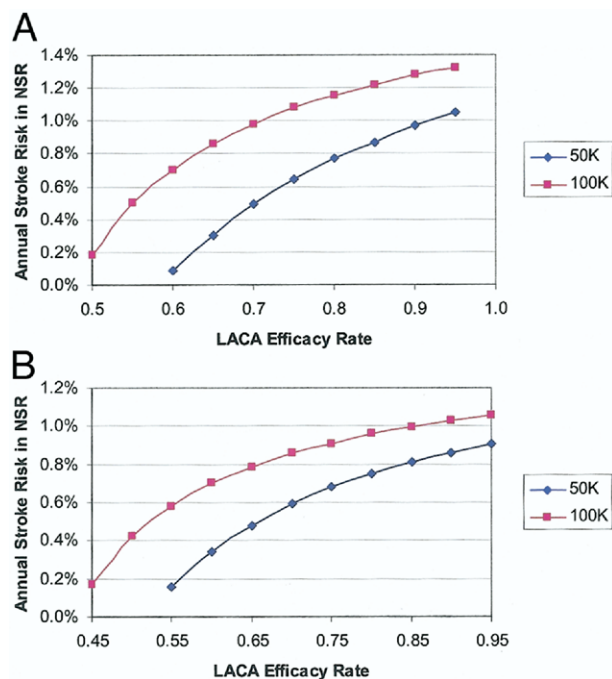   ASA = aspirin; LACA = left atrial catheter ablation.

Among 65 year-old patients at moderate risk for stroke, LACA (11.06 QALYs) was more effective than rate control (10.81 QALYs) and rhythm control with amiodarone (10.75 QALYs). However, LACA was more costly ($52,369) than amiodarone therapy ($43,358) and rate control ($39,391). Because amiodarone was both less effective and more costly, it was dominated by rate control therapy. Compared with rate control, LACA was associated with an incremental cost-effectiveness ratio (ICER) of $51,800 per QALY (Table 2). Likewise, among 55-year-old patients at moderate risk for stroke, a rate control strategy dominated amiodarone therapy, and LACA had an ICER of $28,700 per QALY compared with rate control. For patients at low risk for stroke, LACA had an ICER of $98,900 per QALY.

Main threshold analyses. Because rate control therapy dominated amiodarone therapy in all cohorts, and because LACA had an ICER ~$100,000 per QALY compared with medical therapy for AF patients at low risk of stroke, we focused our threshold analyses to comparisons between LACA and rate control therapy for the moderate-risk cohorts.

In the 65-year-old moderate-risk cohort, $50,000 and $100,000 per QALY thresholds with varying LACA efficacy and annual stroke risks in sinus rhythm are depicted in Figure 2A. At the base-case estimate of 80% for one-year LACA efficacy, an annual stroke risk in sinus rhythm of ≤0.76% and ≤1.15% would yield ICERs less than $50,000 and $100,000 per QALY. Thus, the relative risk of stroke with long-term sinus rhythm would need to decrease by 42% and 11%, respectively, compared with patients in AF on warfarin (1.3% per year), to yield ICERs below these thresholds. As LACA efficacy decreases, the stroke risk reduction with long-term sinus rhythm would need to increase for the same corresponding ICER threshold. LACA efficacy rates less than 75% and 60% would require a >50% stroke risk reduction with long-term sinus rhythm to yield ICER thresholds of $50,000 and $100,000 per QALY, a scenario that may be implausible. Similarly, Figure 2B depicts threshold analyses for the 55-year-old moderate stroke risk cohort. Not surprisingly in this cohort,

lower LACA efficacy rates are needed to satisfy the $50,000 and $100,000 per QALY thresholds, as younger patients live longer (Table 2) and are therefore exposed to higher lifetime risk for stroke and hemorrhage from anticoagulant therapy.

Because our model used conservative estimates (biased against LACA therapy) for the cardioversion rate with rate control therapy (38%), health state utility for patients in AF (1.0), and annual cost for rate control therapy ($400), we repeated the threshold analyses with less conservative estimates in the 65-year-old moderate risk cohort for a $50,000 per QALY threshold (Fig. 3). In each instance, lower

Figure 2. Main threshold analyses. Varying left atrial catheter ablation (LACA) efficacy rates and annual stroke risks with normal sinus rhythm (NSR) restoration are determined for incremental cost-effectiveness thresholds of $50,000 (**diamonds**) and $100,000 (**squares**) per quality-adjusted life-year for 65-year-old (**A**) and 55-year-old (**B**) subjects at moderate risk for stroke. For each LACA efficacy rate, LACA would be cost-effective at a specific threshold with stroke risks at or below the threshold lines.
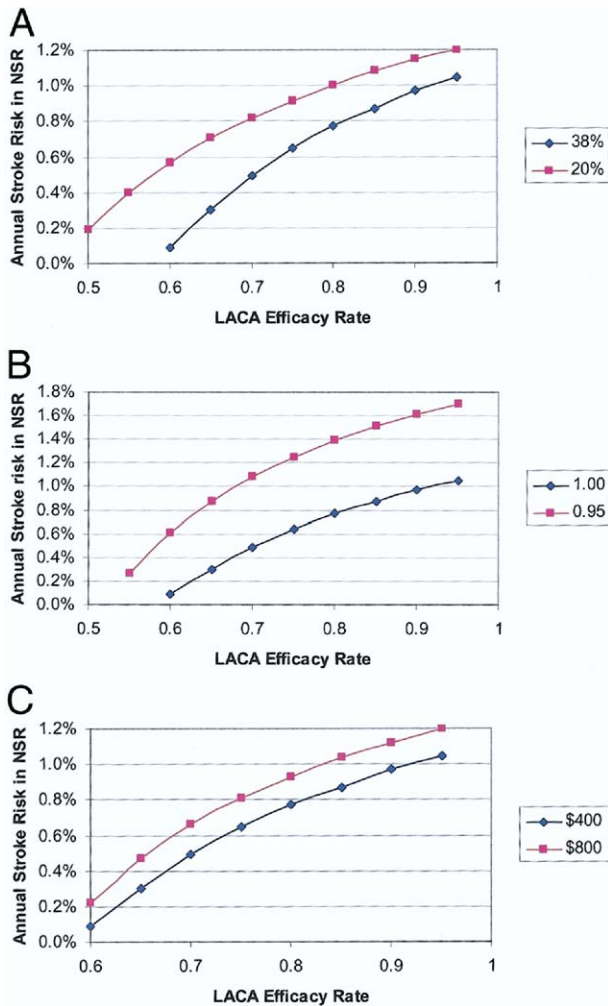
Figure 3. Threshold analyses using less conservative model estimates. Threshold analyses were repeated with less conservative estimates for normal sinus rhythm (NSR) restoration with rate control therapy **(A)**, health state utility for atrial fibrillation **(B)**, and annual cost of rate control therapy **(C)**. Analyses shown are for the 65-year-old moderate stroke-risk cohort for a $50,000 per quality-adjusted life-year cost-effectiveness threshold. **Diamonds** = base-case; **squares** = less conservative estimate; LACA = left atrial catheter ablation.

LACA efficacy rates or stroke risk reduction would be needed compared to the base-case estimate.

One-way sensitivity analysis. The results of one-way sensitivity analyses over a wide range of estimates for patients at moderate risk for stroke are shown in Figure 4. The most influential variables in the one-way sensitivity analyses were the risk of stroke in AF with warfarin, the discount rate, LACA cost, the utility and hemorrhage risk with warfarin therapy, the rate of recurrence of AF after LACA, and the conversion rate to sinus rhythm with rate control therapy. In no instance did the incremental cost-effectiveness range exceed $95,000 per QALY with these variables in either age cohort in one-way sensitivity analyses.

Multivariate sensitivity analysis. Monte Carlo simulations using base-case estimates within each cohort demonstrated that, with the 55-year-old moderate stroke risk cohort, the ICER comparing LACA with rate control

therapy had a 4% probability of being >$100,000 per QALY gained, and an 82% probability of being <$50,000 per QALY gained (Table 3). As expected, among the 65-year-old moderate stroke risk cohorts, the thresholds for cost-effectiveness were less certain, with 22% of simulations >$100,000 per QALY gained and only 40% of simulations <$50,000 per QALY gained.

DISCUSSION

This study provides a framework to assess the potential cost-effectiveness of ablation therapy in patients with AF. For moderate stroke-risk cohorts, LACA may be cost-effective if sinus rhythm restoration translates into lower rates of stroke and anticoagulant-related hemorrhage. At our base-case one-year LACA efficacy estimate of 80%, relative stroke risk reductions with sinus rhythm restoration of 42% and 11% would yield ICERs less than the thresholds of $50,000 and $100,000 per QALY, respectively. Not surprisingly, the relative stroke risk reductions with sinus rhythm restoration are inversely related to LACA efficacy. In patients at low risk of stroke, LACA therapy does not appear to be cost-effective unless the reduction in stroke risk is implausibly large. Our base-case estimates yielded an ICER ~$100,000 per QALY, with resultant multivariable sensitivity analyses showing that only 40% of all simulations would be <$100,000 per QALY (results not shown). However, only a minority of patients with AF are considered to be at low risk for stroke ("lone AF") (36) because the majority of patients will have at least one stroke risk factor. Importantly, by identifying minimum levels of LACA efficacy required for various cost-effectiveness thresholds, our analyses can help guide future clinical trials to determine estimates of effect sizes and study sample sizes needed to demonstrate both efficacy and cost-effectiveness.

No previous studies have assessed the cost-effectiveness of catheter ablation of AF. Rhythm control with antiarrhythmic drug therapy was compared with a rate control strategy in previous studies (2,15,33). In these studies, rhythm control was found to be more cost-effective than rate control. However, patients in the rate control strategy were assumed to remain in AF throughout their Markov cycles and, contrary to the observations from recent clinical trials (3,4), spontaneous cardioversions were not considered to occur in the model. We included these events in our model and found that rhythm control with amiodarone was dominated by rate control, consistent with the findings of a recent cost-effectiveness analysis of the Atrial Fibrillation Follow-Up Investigation of Rhythm Management (AFFIRM) trial (37).

The issue of cost-effectiveness for novel procedures such as LACA over long-term drug therapy is important to consider before clinical adoption of and reimbursement for the procedure. In this study, we took a conservative approach to assess the cost-effectiveness of LACA. First, the conversion rate to sinus rhythm with rate control therapy
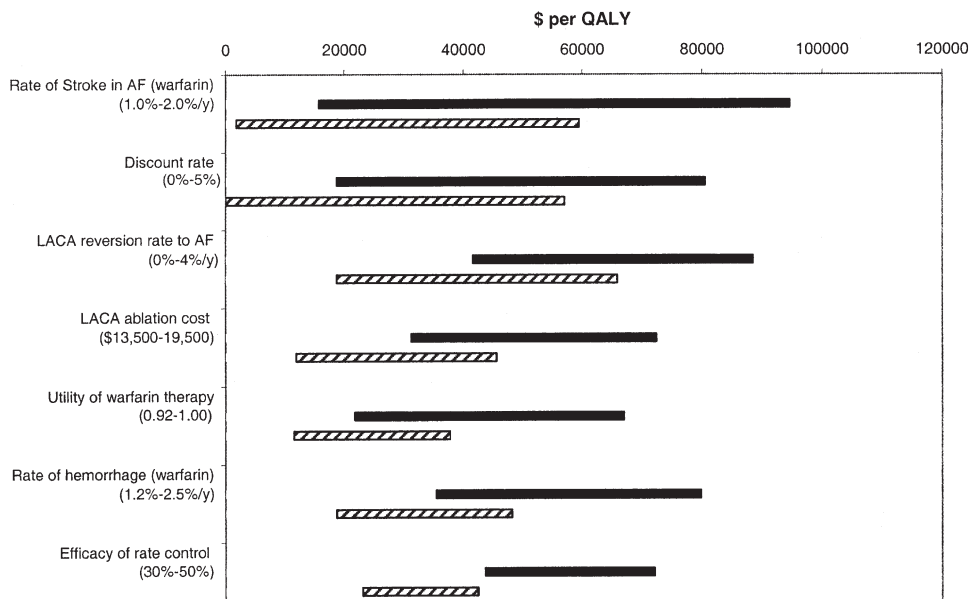
Figure 4. Tornado diagram of variables with significant influence on incremental cost-effectiveness for the moderate stroke-risk cohorts. Variables identified in one-way sensitivity analysis with the largest impact on incremental cost-effectiveness are depicted. The analysis compares left atrial catheter ablation (LACA) with rate control therapy for 65-year-old **(solid bars)** and 55-year-old **(ruled bars)** moderate stroke-risk cohorts. AF = atrial fibrillation; QALY = quality-adjusted life-year.

was biased in its favor, because we used published rates that included a significant percentage of patients that crossed over to antiarrhythmic therapy in the rate control group. Second, several studies prospectively comparing AF ablation with rate control therapy have demonstrated significant clinical improvements in quality of life in those treated with ablation (10,38,39). Because no validated health state utility measurements were performed in those studies, our model assumed similar health utility estimates for patients in sinus rhythm and in AF. Third, calcium channel blocker agents often are used in rate control therapy of patients with AF, but our model assessed the less expensive combination of atenolol and digoxin for a conservative estimate of cost in the rate control group. Fourth, most patients referred for LACA therapy have failed previous antiarrhythmic therapy. As such, we may have underestimated the true efficacy of LACA in our comparisons with the rate control and amiodarone strategies. In our sensitivity analyses with less conservative assumptions, it is not surprising that we found that lower LACA efficacy rates and lower reduction in stroke risk were needed to yield ICERs <$50,000 per QALY.

In our model, LACA consisted of encircling lesions around the pulmonary veins. However, AF also may be effectively eliminated using a variety of other approaches (40–42). Sensitivity analysis over a wide range of efficacy rates suggests that the threshold efficacy rates to render catheter ablation therapy for AF cost-effective at $100,000 per QALY are at or lower than the widely reported success rates with these alternative ablation techniques. However, without clinical trials looking at "hard" end points, the cost-effectiveness of ablation therapy for AF remains unknown. Nonetheless, the analyses in this study probably are applicable to the majority of left atrial radiofrequency catheter ablation procedures used to eliminate AF.

Traditionally, an ICER of $50,000 per QALY has been used to determine whether therapies are considered cost-effective, based on previous studies for hemodialysis (43). Recently, some have argued that ICERs of $100,000 and $150,000 per QALY are acceptable (11,44). Moreover, we recognize that a therapy's true cost-effectiveness should incorporate not only determination of ICERs but also the actual cost of the therapy and the disease burden in the general population. Finally, we caution that these results

Table 3. Multivariable Sensitivity Analyses

	Willingness to Pay					
	$50K/QALY	$100K/QALY	$80K/QALY	$60K/QALY	$40K/QALY	$20K/QALY
Age 65 yrs	40%	78%	68%	52%	25%	1%
Age 55 yrs	82%	96%	93%	87%	72%	38%

Sensitivity analyses with Monte Carlo simulation were conducted by repeated sampling across the ranges of parameter estimates for all model variables. For each of the atrial fibrillation cohorts at moderate risk of stroke, 10,000 trials were performed comparing LACA with rate control therapy. The percentage of the simulations with incremental cost-effectiveness estimates below various thresholds is given.
    K = thousand; QALY = quality-adjusted life-year.

should be interpreted in the context of a lifetime model. Should future clinical trials find LACA to be efficacious in reducing morbid events and even death, our model assumes that the benefits seen with sinus rhythm restoration are sustained beyond the typical trial duration. This is an assumption that all decision-analytic models make when using lifetime horizons. Not surprisingly, when we examined a 5- and 10-year time horizon for the base-case estimates for our moderate stroke-risk cohorts, we found that LACA appears less cost-effective, given that LACA has significant upfront costs (Appendix).

Study limitations. Our study had other limitations. Amiodarone was used as the choice of antiarrhythmic agent for the third therapy arm. A drug with a better adverse effect profile may have been more cost-effective. However, amiodarone is more effective than the majority of antiarrhythmic agents, and a lower efficacy of another drug would probably negate the beneficial effects of a better side effect profile. Finally, our model was developed only in 55- and 65-year-old cohorts and, therefore, the findings may not apply to younger or older patients. However, it is likely that LACA will be more cost-effective in younger patients, who have a longer life expectancy, as long as LACA is not associated with long-term deleterious effects or a high late-recurrence rate. On the other hand, LACA would be expected to be less cost-effective in patients older than 65 years because the inherent risk of stroke may be higher regardless of whether the patient is in AF or sinus rhythm.

Conclusions. In patients with AF, LACA is unlikely to be cost-effective in patients at low risk for stroke. In moderate-risk patients, LACA may be cost-effective if sufficiently high LACA efficacy rates in restoring sinus rhythm translate into lower morbidity. Our analyses may help in designing future clinical trials that compare ablation with medical therapy by providing estimates for LACA efficacy and stroke risk reduction needed in order to demonstrate both clinical efficacy and cost-effectiveness.

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APPENDIX

For the full technical appendix, please see the online version of this article.