



## Clinical Research

# Integrated Management Approach to Atrial Fibrillation Care: A Cost Utility Analysis

Manoj K. Saraswat, MD, MHS,<sup>a</sup> Lindsey Carter, MD,<sup>a</sup> Patrick Berrigan, MA,<sup>b</sup> John L. Sapp, MD,<sup>a</sup> Christopher Gray, MD,<sup>a</sup> Ann Fearon, RN,<sup>a</sup> Martin Gardner, MD,<sup>a</sup> and Ratika Parkash, MD, MSc<sup>a</sup>

<sup>a</sup> Department of Medicine, QEII Health Sciences Center, Halifax, Nova Scotia, Canada

<sup>b</sup> Research Methods Unit, Department of Community Health and Epidemiology, Dalhousie University, Halifax, Nova Scotia, Canada

See editorial by Gallagher et al., pages 1094–1096 of this issue.

### ABSTRACT

**Background:** Atrial fibrillation (AF) is a substantial burden on health care. Combined specialist and nurse-based AF clinics are associated with improved outcomes. However, Canadian data on the cost-effectiveness of this integrated management approach to AF care are lacking.

**Methods:** We evaluated health care costs and outcomes of 413 patients with newly-diagnosed AF in 3 emergency departments in Nova Scotia between January 1, 2011 and January 31, 2014. Using a before-after study design, patients were divided into usual care (228 patients) and intervention (185 patients) groups. The intervention was

### RÉSUMÉ

**Introduction :** La fibrillation auriculaire (FA) est un fardeau important pour les soins de santé. Les cliniques de FA constituées d'infirmières et de spécialistes sont associées à de meilleurs résultats cliniques. Toutefois, les données canadiennes sur le rapport coût-efficacité de cette approche intégrée de prise en charge de la FA sont insuffisantes.

**Méthodes :** Nous avons évalué les coûts des soins de santé et les résultats cliniques de 413 patients ayant récemment reçu un diagnostic de FA dans 3 services d'urgence en Nouvelle-Écosse entre le 1<sup>er</sup> janvier 2011 et le 31 janvier 2014. À partir d'un plan d'étude avant-après, nous avons réparti les patients en 2 groupes : soins habituels

Atrial fibrillation (AF) is the most prevalent cardiac arrhythmia and the leading cause of stroke. It is estimated that there are 350,000 Canadians living with AF.<sup>1</sup> AF is a substantial burden on health care resources, accounting for 0.5% of emergency department (ED) visits and > 200,000 hospitalizations each year in Canada.<sup>2,3</sup> There is a clear need for innovation in AF care to reduce utilization of acute care resources, such as specialized outpatient AF clinics.<sup>4</sup> Combined specialist and nurse-based AF clinics taking an integrated management approach to care are associated with a reduced risk of cardiovascular (CV) hospitalization, AF-related ED visit, or death.<sup>5,6</sup> To date, there are sparse data on the cost-effectiveness of the integrated approach to AF care; Hendriks et al. reported that a nurse-led chronic care program for AF patients was more cost-effective than usual care.<sup>7</sup> However, this study took place in a European setting, and the generalizability of the study to Canada is unclear. The purpose

of our study was to evaluate the cost-effectiveness of an integrated management approach to managing AF (AF clinic) vs usual specialty care (usual care) of AF in a Canadian setting. To conduct this evaluation, we assessed the cost and quality of life effects resulting from the patient outcomes reported in a recent Canadian study.

### Methods

The study on which this economic evaluation was based was conducted at 3 EDs in Nova Scotia with specialty care delivered centrally at the QEII Health Sciences Center in Halifax, Nova Scotia, Canada, between January 2009 and January 2014.<sup>5</sup> This study was approved by the institutional ethics board. Briefly, this was a before-after study in which newly diagnosed AF patients consecutively referred from the ED who received an intervention of nurse-led, physician-supervised AF clinic follow-up were compared with those who received usual care. The intervention comprised early patient education over the phone within 48-72 hours of diagnosis, group teaching on AF, team review of the case incorporating additional information gathered over the phone, clinic assessment by the electrophysiologist, and a detailed letter to the family physician with current and future management plan with detailed recommendations. The follow-up for

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Corresponding author: Dr Ratika Parkash, QEII Health Sciences Centre, HI Site, 1796 Summer St, Room 2501D, Halifax, Nova Scotia B3H 3A7, Canada. Tel.: +1-902-473-4474; fax: +1-902-473-3158.

E-mail: [ratika.parkash@nshealth.ca](mailto:ratika.parkash@nshealth.ca)

See page 1147 for disclosure information.

a nurse-run, physician-supervised AF clinic. Costs and quality-adjusted life years (QALYs) were compared between usual care and intervention. Costs were those incurred because of the clinical outcome, bleeding events, medications, and cardiovascular-related procedures. Probabilistic analysis was conducted to assess uncertainty.

**Results:** The AF clinic was associated with an average cost reduction of CAD\$210.83 and an average improvement in QALY of 0.0007 per patient. The AF clinic was dominant over usual care despite higher operational and medication costs over 1 year. It provided greater cost-saving in approximately 66% of probabilistic analysis simulations and generated more QALYs in approximately 92% of simulations. An incremental cost-effectiveness ratio < \$50,000 was found in 68% of simulations.

**Conclusions:** The present study provides guidance regarding the cost-effectiveness of an integrated management approach compared with usual specialty care of AF in a Canadian setting. We recommend further study be undertaken that prospectively plans for economic evaluation before definitive assessments of cost-effectiveness can be made.

patients within the clinic varied according to the recommendations outlined at the initial assessment. No standardized follow-up was mandated with the AF clinic nurse. The patients in the “before” group comprised consecutive patients who presented to the ED. Patients were followed for 1 year from the time of study entry. Data collection was performed retrospectively on patients in the “before” group, but prospectively in those in the “after” group. Follow-up was performed by a trained data abstractor.

Taking the cost perspective of the health care payer, we set out to assess the cost-effectiveness of an AF clinic vs usual care for treating patients with AF in terms of the cost required to gain an additional quality-adjusted life year (QALY). To assess cost-effectiveness, incremental cost effectiveness ratios (ICERs) were calculated by dividing the difference in cost between the AF clinic and usual care by the difference in effectiveness measured in QALYs:

$$\begin{aligned} \text{ICER} &= \frac{\text{AF clinic cost} - \text{usual care cost}}{\text{AF clinic effectiveness} - \text{usual care effectiveness}} \\ &= \frac{\Delta \text{ costs}}{\Delta \text{ effectiveness}} \end{aligned}$$

Decision-makers can assess cost-effectiveness by comparing ICER value with the amount their jurisdiction would be willing to pay to gain or willing to accept to forgo the outcome included in the ICER. Willingness-to-pay refers to the amount an individual, jurisdiction, or society would be willing to pay to gain a given outcome. Willingness-to-accept refers to the amount an individual, jurisdiction, or society would be willing to accept to forgo a given outcome.

To determine the average cost associated with AF care, cost estimates were applied to the health outcomes including CV-related hospitalizations, AF-related ED visits, bleeding events, medications, and the staff costs of the AF clinic and

(228 patients) et intervention (185 patients). L'intervention consistait en une clinique de FA dirigée par une infirmière et supervisée par un médecin. Nous avons comparé les coûts et les années de vie pondérées par la qualité (QALY, de l'anglais *quality-adjusted life year*) entre les soins habituels et l'intervention. Les coûts représentaient les coûts engendrés en raison des résultats cliniques, des événements hémorragiques, des médicaments et des interventions liées aux maladies cardiovasculaires. Nous avons réalisé une analyse probabiliste pour évaluer les incertitudes.

**Résultats :** Nous avons associé la clinique de FA à une réduction moyenne des coûts de 210,83 \$ CA et à une amélioration moyenne des QALY de 0,0007 par patient. La clinique de FA prédominait dans les soins habituels en dépit des coûts plus élevés d'exploitation et de médicaments sur 1 année. Elle a permis d'offrir une plus grande réduction des coûts dans approximativement 66 % des simulations d'analyse probabiliste et généré plus de QALY dans approximativement 92 % des simulations. Nous avons observé un rapport coût-efficacité différentiel de < 50 000 \$ CA dans 68 % des simulations.

**Conclusions :** La présente étude donne des orientations sur le rapport coût-efficacité d'une approche intégrée de prise en charge par rapport aux soins spécialisés habituels de la FA dans un contexte canadien. Nous recommandons d'entreprendre d'autres études qui permettent d'établir de manière prospective des plans d'évaluation économique avant de faire les évaluations finales du rapport coût-efficacité.

usual care (see [Supplemental Appendix S1](#) and [Supplemental Tables S1](#) and [S2](#)). CV-related hospitalizations were defined as an admission or discharge diagnosis of AF, heart failure, acute coronary syndrome, or cerebrovascular ischemic event. An acute coronary syndrome was defined as chest pain with a troponin elevation or significant electrocardiographic changes of ischemic injury. A cerebrovascular ischemic event was a neurology-confirmed diagnosis of a transient ischemic attack or stroke. An AF-related ED visit was defined as an ED admission or discharge diagnosis of AF, or the ED admission complaint included palpitations, syncope, presyncope, chest pain, malaise, or symptoms suggestive of a thromboembolic event. Other outcomes included: stroke, major bleeding, minor bleeding, and the degree of adherence to practice guidelines. Variables to assess guideline adherence included documentation of: alcohol use, hypertension, obstructive sleep apnea, thyroid function, echocardiogram, and prescription of oral anticoagulation (OAC) according to Congestive Heart Failure, Hypertension, Age, Diabetes, Stroke/Transient Ischemic Attack (CHADS<sub>2</sub>) score. Major bleeding was defined as bleeding with hemodynamic instability or requiring transfusion of 2 or more units of packed red blood cells. All other bleeding was considered minor.

Costs reflected 2016 Canadian dollars and were converted using Statistics Canada Consumer Price Index where required.<sup>8</sup> QALYs were calculated by assigning utility penalties to the average patient's health-related quality of life using the days lost to hospitalization method.<sup>9</sup> Detailed descriptions of costs and QALY estimates used in the study are provided in [Supplemental Appendix S1](#).

ICERs for 2 scenarios were calculated: (1) a 1-year period representing the study length; and (2) a 10-year follow-up period. The 1-year period represents the reference case scenario. In the 1-year scenario, estimates of unit costs and quality of life penalties were applied to the hospitalizations,

ED visits, bleeding events, and anticoagulant medication outcomes reported by Carter et al.<sup>5</sup> There were no missing data in this regard. Also considered were costs associated with staff wages for the AF clinic and usual care. The combined unit cost and outcome data was used to estimate averages and SDs for each of the cost categories and quality of life. The average cost and QALY values were used to calculate ICER and to inform a probabilistic analysis (PA).

In the 10-year scenario, a group of patients was assumed to progress forward over time receiving either the AF clinic or usual care. Patients could remain alive or die. If patients were alive in a given year then the cost and QALY estimates from the 1-year scenario were applied. The total cost and QALY were summed over the 10-year period and these were used to calculate ICER.

## QALY

In the present study QALYs were calculated by assigning utility penalties to the average patients' health-related quality of life. Utility penalties were assigned using days lost to hospitalization method. This method has previously been used in similar patient populations in lieu of more typical methods for calculating QALY.<sup>10-13</sup> To estimate the utility of an average AF patient, a utility score of 0.63 was assumed on the basis of a previous economic evaluation of an AF clinic vs usual care.<sup>7</sup> To calculate days lost to CV-related hospitalization, the average length of stay reported in the Canadian Institute for Health Information Patient Cost Estimator for the inpatient stay reported by Carter et al.<sup>5</sup> was used.<sup>14</sup> The Canadian Institute for Health Information Patient Cost Estimator is a national database, which reports the average cost and length of stay of 815 unique inpatient stays in Canada.

## Mortality

To estimate mortality in the 10-year follow-up scenario, odds ratios from a previous study on mortality in AF patients<sup>15</sup> were combined with Statistics Canada Life Tables.<sup>16</sup> Mortality rates from Statistics Canada Life Tables reflect men and women aged 64-74 years. Mortality rates were assumed to be equivalent between groups. This assumption was tested in scenario analysis.

## Discounting

In the 10-year follow-up scenario all costs and outcomes beyond 1 year were discounted at a rate of 1.5%.<sup>17</sup>

## PA

PA was performed in the 1-year and 10-year scenarios.<sup>17,18</sup> To conduct PA in the 1-year scenario, first estimates for the average, SD, and 95% confidence interval (CI) for each parameter were calculated. Then values were randomly selected from each CI for each cost category on the basis of a distributional assumption parameterized using the study means and SDs, which were then used to calculate ICER. This process was repeated 10,000 times using Excel (2007; Microsoft Corporation, Redmond, WA).

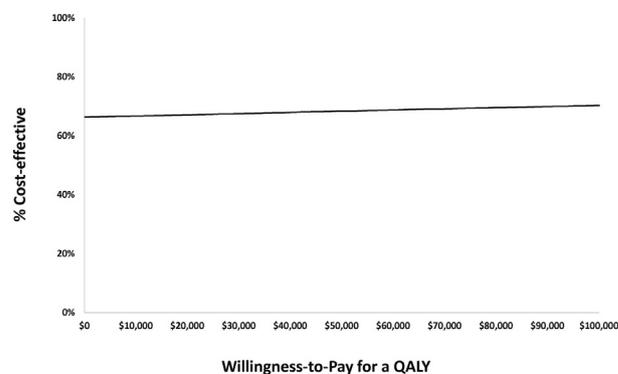
PA intervals for CV-related hospitalizations, AF-related ED visits, bleeding events, and medications represent 95% CI;

sampling was limited to 95% CI to avoid the inclusion of unrealistic values in ICER calculations. The cost of major bleeding events for the AF clinic was not varied in PA, because it was assumed to be 0. The PA intervals for the cost per patient of operating the AF clinic and usual care are  $\pm 10\%$ . Unit cost estimates were varied for key outcomes, OAC use, and ED visits. To vary unit cost estimates a value ranging from  $\pm 10\%$  of the unit cost estimate was applied to the corresponding number of occurrences that were generated for the respective parameter for each PA simulation and incorporated in ICER calculations.

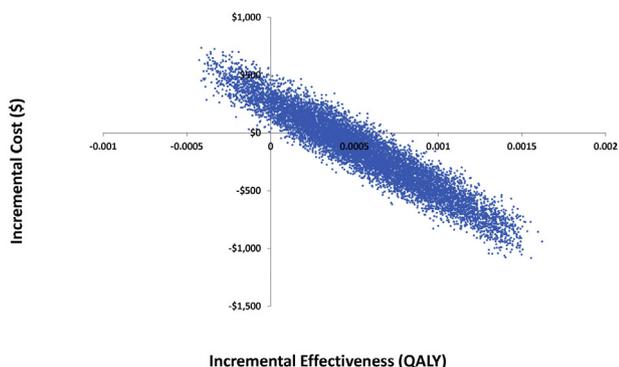
Because parameters that result in hospitalizations (CV-related hospitalizations and major bleeding events) influence cost and quality of life in the present study, these parameters are correlated. To account for this correlation we randomly sampled a value for average length of stay for CV-related hospitalizations and major bleeding events using a gamma distribution parameterized with study results. This value was then used to estimate cost and quality of life. For a list of parameter averages, PA intervals, and distributions see [Supplemental Table S1](#).

Using the 10,000 PA simulations, a cost-effectiveness acceptability curve (CEAC) was constructed ([Fig. 1](#)). A CEAC uses PA simulations to assess the probability that an intervention is cost-effective relative to another intervention conditional upon the variability observed in cost and outcome parameters. In the present study, the curve showed the percentage of PA simulations that fall below a given threshold of willingness-to-pay for a QALY.

[Figure 2](#) shows a cost-effectiveness plane (CEP). The CEP plots the difference in QALY on the horizontal axis vs the difference in cost on the vertical axis for each of the 10,000 PA simulations. By examining in which quadrants the bulk of PA simulations fall, the CEP can provide a visual representation of an intervention's likelihood of being cost-effective relative to another intervention conditional upon the variability of cost and outcome parameters. The lower quadrants correspond to PA simulations in which the AF clinic had lower costs and the quadrants on the right



**Figure 1.** Cost-effectiveness acceptability curve, 1 year scenario. Cost-effectiveness acceptability curve shows the percentage of simulations that are cost-effective using a range of willingness-to-pay thresholds (CAD\$). The willingness-to-pay to gain a quality-adjusted life year is assumed to be equal to the willingness-to-accept to forgo a quality-adjusted life year.



**Figure 2.** Cost-effectiveness plane, with incremental quality-adjusted life years (QALYs) on the x-axis and incremental costs (CAD\$) on the y-axis. Each observation represents a single trial of 10,000 trials. In the lower right quadrant, observations have lower costs and increased effectiveness.

correspond to PA simulations in which the AF clinic generated more QALYs.

For PA in the 10-year scenario, mortality, cost, and quality of life estimates were varied. Mortality was varied between the high and low values in the 95% CIs for male and female participants reported by Benjamin et al.,<sup>15</sup> subject to a uniform distribution. Although no difference in mortality was observed by Carter et al.,<sup>5</sup> previous literature has shown reduced mortality in the AF group vs usual care.<sup>6</sup> This was addressed by adding a multiplier that would reduce mortality by between 0% and 10% subject to a uniform distribution in the AF clinic group relative to the usual care group. The annual cost and quality of life applied to patients were varied by randomly sampling a set of annual cost and quality of life values from those derived in the 1-year PA. This allowed the 10-year PA to account for uncertainty regarding annual cost and quality of life values while also taking into account correlation in parameters. Ten thousand simulations were run and the results were used to construct a CEAC. For additional details see [Supplemental Appendix S1](#).

**Results**

The AF clinic group consisted of 185 patients (38.3% [n = 71] women) with a mean age of 63.6 ± 15 years and mean CHADS<sub>2</sub> score of 1.1 ± 1.2. The usual care group consisted of 228 patients (45.2% [n = 103] women) with a mean age of 64 ± 14.9 years and mean CHADS<sub>2</sub> score of 1.2 ± 1.2. Baseline characteristics are presented in [Table 1](#); further data on medications is provided in the [Supplemental Table S3](#). The health outcomes considered in this analysis are presented in [Table 2](#).

In the 1-year scenario, the AF clinic dominated usual care, having lower costs and superior effectiveness. The AF clinic was associated with an average cost reduction of CAD\$210.83 and an average improvement in QALY of 0.0007 per patient ([Table 3](#)). On the basis of PA results, 66.3% of simulations resulted in the AF clinic dominating the usual care; 68.4% of simulations resulted in ICER below \$50 000; 91.8% of simulations resulted in the AF clinic generating more QALYs;

**Table 1.** Baseline characteristics

Characteristic	AF clinic (n = 197)	Specialist (n = 236)	P
Age, years	63.9 ± 14.6	64 ± 15	0.9
Female sex	79 (45.1)	106 (44.9)	1
Hypertension	86 (43.7)	71 (30.1)	0.004
Diabetes	25 (12.7)	23 (9.7)	0.4
Congestive heart failure	21 (10.7)	23 (9.7)	0.8
Stroke	12 (6.1)	17 (7.2)	0.7
Coronary artery disease with myocardial infarction	11 (5.6)	32 (13.6)	0.006
Valvular heart disease	7 (3.6)	15 (6.4)	0.3
Congenital heart disease	0 (0)	3 (1.3)	0.3
Cardiac surgery	4 (2)	18 (7.7)	0.008
Pacemaker	2 (1)	7 (3)	0.2
Peripheral vascular disease	7 (3.6)	6 (2.5)	0.6
Cerebrovascular disease	3 (1.5)	9 (3.8)	0.2
Chronic pulmonary disease	26 (13.2)	23 (9.7)	0.3
Sleep apnea	18 (9.1)	12 (5.1)	0.1
LVEF	57.5 ± 8.2	55.6 ± 9.8	0.04
Creatinine	105.5 ± 138	100 ± 120.9	0.7
TSH	2.6 ± 2.3	2.6 ± 1.8	0.9
T4	14.2 ± 2.9	15.3 ± 5.2	0.1
CHADS <sub>2</sub>	1.2 ± 1.3	1.2 ± 1.2	0.6
0	85 (43.1)	123 (52.1)	0.05
1	54 (27.4)	59 (25)	
≥ 2	58 (29.4)	54 (22.9)	
CHA <sub>2</sub> DS <sub>2</sub> -VASC	2.2 ± 1.9	2.3 ± 1.8	0.6
0	45 (23.2)	57 (24.5)	0.3
1	37 (19.1)	52 (22.3)	
2	42 (21.6)	57 (24.5)	
≥ 3	70 (36.1)	67 (28.8)	

Data are presented as n (%) or mean ± SD.

CHADS<sub>2</sub>, Congestive Heart Failure, Hypertension, Age, Diabetes, Stroke/Transient Ischemic Attack; CHA<sub>2</sub>DS<sub>2</sub>-VASC, Congestive Heart Failure, Hypertension, Age (≥ 75 years), Diabetes, Stroke/Transient Ischemic Attack, Vascular Disease, Age (65-74 years), Sex (Female); LVEF, left ventricular ejection fraction; T4, thyroxine; TSH, thyroid-stimulating hormone.

and 66.3% of PA simulations resulted in the AF clinic being cost-saving ([Figs. 1 and 2](#)).

In the 10-year scenario, the AF clinic was associated with an average cost reduction of \$1969.61 and an average improvement in QALY of 0.0065 per patient ([Table 3](#)). A scenario analysis was conducted to assess the sensitivity of results to the assumption of equal mortality between groups. Scenario analysis showed that the AF clinic would remain dominant over usual care for all scenarios in which mortality was assumed to be less in the AF clinic. If mortality was

**Table 2.** Health outcomes\*

Outcome	AF clinic	Usual care
CV-related hospitalizations	13 (7.0)	24 (10.5)
AF related ED visits	25 (13.5)	54 (23.7)
Major bleed	0 (0)	3 (1.3)
Minor bleed	4 (2.2)	4 (1.8)
Use of oral anticoagulation	107 (57.7)	90 (39.3)

Data are presented as n (%).

AF, atrial fibrillation; CV, cardiovascular; ED, emergency department.

\*Table values reflect the number of incidences reported by Carter et al.<sup>5</sup> with the exception of CV-related hospitalizations. CV-related hospitalizations reflect the total number of CV-related hospitalizations not the number of patients who experienced at least 1 CV-related hospitalization as was reported in Carter et al.<sup>5</sup>

**Table 3. Cost-effectiveness results**

Intervention	Cost, CAD\$	Δ Cost	QALY	Δ QALY	ICER
One year					
AF clinic	\$1,883.03	−\$210.83	0.6294	0.0007	Dominant
Usual care	\$2,093.86		0.6287		
10 years at a 1.5% discount rate					
AF clinic	\$17,591.59	−\$1,969.61	5.88	0.0065	Dominant
Usual care	\$19,561.20		5.87		

AF, atrial fibrillation; ICER, incremental cost-effectiveness ratio; QALY, quality-adjusted life year.

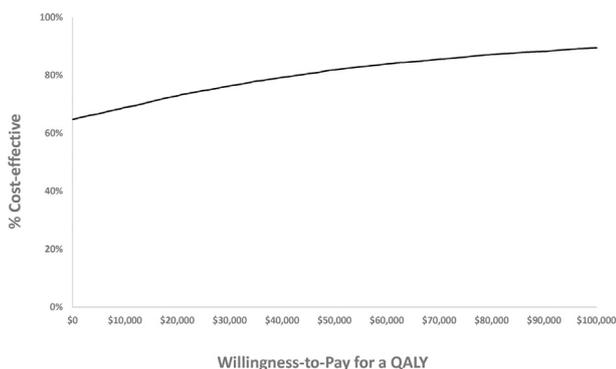
elevated by more than approximately 1.1% in the AF clinic group relative to usual care, the AF clinic would cease to be dominant.

In the 10-year PA, 64.8% of simulations resulted in the AF clinic dominating usual care; 81.9% of simulations resulted in ICER below \$50 000; 99.3% of simulations resulted in the AF clinic generating more QALYs; and 64.8% of PA simulations resulted in the AF clinic being cost-saving (Fig. 3).

## Discussion

Our analysis showed that the AF clinic was associated with lower cost and improved QALYs over usual care in the management of patients with new onset AF who presented to the ED. Our findings suggest that for patients with AF in Canada, adopting an integrated management approach to care could potentially save the health care system up to \$74 million dollars annually. The AF clinic was associated with an average cost reduction of \$210.83 and an average improvement in QALY of 0.0007 per patient. In PA for the reference case scenario, the AF clinic was more cost-saving in 66% and generated more QALYs in 92% of simulations. An ICER below \$50,000 was shown in approximately 68% of simulations.

Previous studies have shown that the estimated cost to the health care system for care of AF is \$4840 per patient per year, and might be higher depending on the burden of symptoms.<sup>19</sup> The distribution of costs are among in-hospital care, emergency room visits, and family physician visits. Previous studies from the United States,



**Figure 3.** Cost-effectiveness acceptability curve 10-year scenario, showing the percentage of simulations that are cost-effective using a range of willingness-to-pay thresholds. QALY, quality-adjusted life year.

United Kingdom, and France have estimated annual costs to be 6.650 million, 803 million and 2.605 million in US dollars, respectively.<sup>20-22</sup> McDonald et al. reported an 88% increase in ED visits with a primary diagnosis of AF over a 12-year period (1993-2004).<sup>23</sup> Of these, 64% were admitted to hospital; this proportion remained constant over the 12-year period. With these statistics and the known aging population in Canada, the management of AF requires careful consideration over the next few decades.

The findings of this analysis are in line with previous research suggesting that the AF clinic, or alternative models of care, might represent a cost-effective allocation of resources in treating patients with AF. A cost-utility analysis was performed in a nurse-led, physician-supervised AF clinic for treating European patients with AF. It showed that the AF clinic was associated with lower cost and improved outcomes relative to usual care and was thus more cost-effective, although it showed a probability of being cost-effective for the AF clinic of 99% compared with usual care at a willingness-to-pay threshold of 40,000 euro. Pathak et al. reported that a structured physician-directed risk factor management program is cost-saving and showed improved outcomes.<sup>24</sup> The cost savings were because of fewer specialist visits, emergency room visits, hospitalizations, cardioversions, and ablation procedures.

## Limitations

There are limitations to the present study. There is inherent bias in the design because it is not a randomized study. First, with respect to hospitalizations, it was assumed that the severity and complexity of inpatient stays was equivalent between groups. It is possible that patients in one of the groups who required inpatient stays might have had less severe symptoms than those in the other. In addition, outcomes were not adjudicated in a blinded fashion, which could be a source of bias. Second, to assign costs for inpatient stays, assumptions were required regarding the effect of comorbidities, length of stay, and the procedures that occurred during an inpatient stay. Subsequently, the costs assigned to inpatient stays are likely subject to error. Third, follow-up visits with specialists or general practitioners were not accounted for, as were procedures such as cardioversion or ablation. Because patients in the AF clinic group had access to a nurse specializing in AF, it is suspected that visits to specialist and general practitioners would have been less frequent for patients in the AF clinic than the usual care, but there might have been an increase in the number of procedures. Additionally, non-OAC medications were not accounted for in the present study. The days lost to hospitalization method represents a limitation of the present study. Although days lost to hospitalization is likely to correlate with patients' quality of life, it does not reflect patients' preferences for health states, as would be accounted for if a more common approach to calculating QALY were used. Future study would benefit from the application of direct methods (standard gamble or time trade-off) or indirect methods (health utility surveys) of estimating utility for the calculation of QALYs.

## Conclusion

In our study we analyzed the cost-effectiveness of an integrated management AF clinic and showed that the AF clinic resulted in greater cost savings and more QALYs compared with usual care. Because value judgements regarding the suitability of an intervention for adoption vary between jurisdictions, there is no universal acceptance criterion for adopting interventions on the basis of economic considerations.<sup>19</sup> Decision-makers should weigh the likelihood of an intervention having better outcomes in tandem with the intervention's affordability. Although the present study can provide a degree of guidance to decision-makers considering the adoption of an integrated approach to AF management, additional clinical trials that include prespecified designs for economic evaluation will be required before definitive assessments of value for money can be made. Relative to the present study, such studies would benefit from the collection of more cost variables such as family doctor visits, collection of quality of life data using conventional methods such as health utility surveys, randomization, and multijurisdictional study sites.

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### **Supplementary Material**

To access the supplementary material accompanying this article, visit the online version of the *Canadian Journal of Cardiology* at [www.onlinecjc.ca](http://www.onlinecjc.ca) and at <https://doi.org/10.1016/j.cjca.2019.04.016>.