PERCEIVED EFFICACY IN PATIENT-PHYSICIAN INTERACTIONS AMONG OLDER ADULTS WITH ATRIAL FIBRILLATION

A Master's Thesis Presented

By

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Master of Science in Clinical Investigation

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ABSTRACT

Background: Management of atrial fibrillation (AF) is complex and requires active patient engagement in shared decision making to achieve better clinical outcomes, greater medication adherence, and increased treatment satisfaction. Efficacy in patient-physician interactions is a critical component of patient engagement, but factors associated with efficacy in older AF patients have not been well-characterized.

Methods: We performed a cross-sectional analysis of baseline data from the ongoing Systematic Assessment of Geriatric Elements in Atrial Fibrillation (SAGE-AF) study, a cohort study of older adults (age ≥ 65) with non-valvular AF and CHA_2DS_2-VASc score ≥ 2. Participants were classified according to their Perceived Efficacy in Patient-Physician Interactions (PEPPI-5) score (lower: 0-44; higher: 45-50). Logistic regression analysis was used to identify sociodemographic, clinical (AF type, AF treatment, medical comorbidities), and geriatric (cognitive impairment, sensory impairment, frailty, independent functioning) factors associated with lower reported efficacy.

Results: Participants (n = 1209; 49% female) had a mean age of 75. A majority (66%) reported higher efficacy in their interactions with physicians. Lower efficacy was associated with persistent AF (adjusted odds ratio [aOR] = 1.52; 95% confidence interval [CI] = 1.13-2.04) and with symptoms of depression (aOR = 1.67; CI = 1.20-2.33) or anxiety (aOR = 1.40; CI = 1.01-1.94). Decreased odds of lower efficacy were observed in participants with chronic kidney disease (aOR

= 0.68; CI = 0.50-0.92) and those classified as pre-frail compared to those classified as not frail (aOR = 0.71; CI = 0.53-0.95).

Conclusion: Older patients with persistent AF or symptoms of depression or anxiety have decreased efficacy in patient-physician interactions. These individuals merit greater attention from physicians when engaged in shared decision making.

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CHAPTER I: INTRODUCTION

Atrial fibrillation (AF) is the most prevalent sustained cardiac arrhythmia in the United States, with upward of 6 million American adults estimated to currently have this condition and models forecasting an increase to over 12 million cases by 2030.[1,2] Atrial fibrillation is especially common in older adults, with prevalence estimated to be up to 14% in individuals aged 80 years or older as compared to less than 1% overall.[3]

Medical management of AF is complex, often requiring combinations of medications—potentially taken indefinitely—to reduce symptoms, slow disease progression, and prevent sequelae including ischemic stroke.[1] While these medications are generally effective, many also have known adverse effects that pose barriers to adherence and can significantly impact patients' lifestyle and treatment satisfaction.[4] For example, use of warfarin, the most prescribed medication for prevention of thromboembolic stroke in AF patients, requires ongoing, periodic laboratory testing to ensure treatment efficacy and often necessitates changes to existing medication regimens and dietary patterns.[5] Given the concerns associated with different AF management approaches and the impact of these tradeoffs on treatment adherence, current clinical guidelines recommend the use of shared decision making when selecting treatment regimens for patients with AF.[1,6]

Shared decision making (SDM) is defined as a collaborative approach to medical decision making that incorporates clinical evidence as well as patient values and preferences.[1,6,7] Shared decision making is associated with improved clinical outcomes, medication adherence, and treatment satisfaction, particularly when applied to long-term decisions in the context of chronic disease.[8] While many different SDM interventions exist, an essential piece of all SDM implementations is the active participation of patients in developing an understanding of available options and utilizing that knowledge to form informed preferences.[7] To successfully participate in SDM, patients must therefore be able to engage effectively with providers to both acquire knowledge and express their personal values and preferences.

Self-efficacy is defined as “the perceived ability to produce a desired action.”[9] Efficacy in patient-physician interactions is particularly important for participation in SDM processes, as patients with higher efficacy are able to communicate more effectively with their physicians.[10] This type of efficacy may be influenced by both patient factors and physician factors due to the intrinsically bidirectional nature of patient-physician interactions.[10] For this reason, efficacy in patient-physician interactions can also be considered to be a measure of patient trust in their physicians and of patient satisfaction,[10] both of which are of significant importance in delivering optimal clinical care.

Efficacy in patient-physician interactions has previously been studied in individuals with chronic conditions such as cardiovascular disease and diabetes mellitus.[11–13] However, to the best of our knowledge, this association has not been previously examined in individuals with AF. Greater understanding of the factors associated with efficacy may therefore inform changes to AF management practices to yield improved patient outcomes.

Using data from a large observational study of older adults with non-valvular AF, we examined efficacy in patient-physician interactions with a specific focus on patient factors associated with lower efficacy.

CHAPTER II: METHODS

Study Population

This investigation utilized data from the Systematic Assessment of Geriatric Elements in AF (SAGE-AF) study, an ongoing prospective study of adults with non-valvular AF aged 65 years and older.[14–16] In brief, study participants were recruited between 2015 and 2018 from several clinics in Massachusetts and Georgia, including both primary care and specialty care clinics. Individuals meeting the age criteria who had a diagnosis of AF—as determined by electrocardiography, Holter monitor, or prior documentation in medical records—and a CHA_2DS_2-VASc score ≥ 2 were eligible for participation in SAGE-AF. Exclusion criteria included: having a documented contraindication to oral anticoagulation therapy, using oral anticoagulation therapy for conditions other than AF, having scheduled procedures with high risk of bleeding, being unable to provide written informed consent, being unable to speak English, being pregnant, and being a prisoner.

Approval for the study was granted by the Institutional Review Boards at the University of Massachusetts Medical School, Boston University, and Mercer University, and all participants provided written informed consent. Data were collected by trained research personnel who conducted interviews (face-to-face or telephone) with individual participants and abstracted medical records at the time of study enrollment. Participants also underwent targeted in-person physical assessments at baseline to evaluate cognitive status and physical limitations.

Assessment of Efficacy in Patient-Physician Interactions

We assessed efficacy using the Perceived Efficacy in Patient-Physician Interactions (PEPPI-5) scale, a previously validated 5-item questionnaire that evaluates a patient's self-reported confidence in interacting with health care providers.[10,17] The questionnaire assesses an individual's ability to identify knowledge gaps, communicate with providers to address those gaps, and direct development of plans to address self-identified chief concerns. All questions are scored on a Likert scale (0-10), with a score of 0 representing no confidence and a score of 10 representing extreme confidence. Study participants were asked to complete this questionnaire as part of the baseline interview.

Variables

Study participants were assessed at baseline to measure sociodemographic and clinical factors as well as geriatric conditions. Sociodemographic variables included age, sex, marital status, race/ethnicity, and highest level of education attained. Clinical variables obtained from medical records included AF type, history of ablation, use of antiarrhythmic or rate control therapy, use of anticoagulation therapy, Charlson comorbidity index, and medical comorbidities, including chronic cardiovascular and metabolic conditions, among others. Participants were classified as having depression symptoms based on a Patient Health Questionnaire-9 score ≥ 5 and as having anxiety symptoms based on a General Anxiety Disorder-7 score ≥ 5.[18,19]

Geriatric variables included cognitive impairment, hearing and vision impairment, frailty, and independent functioning. Cognitive impairment was assessed using the Montreal Cognitive Assessment with impairment defined as a score ≤ 23.[20] Frailty was measured using the Cardiovascular Health Survey (CHS) frailty scale, and participants were classified as frail, pre-frail, or not frail in accordance with CHS scoring guidelines.[21] Independent functioning was measured using a modified version of the Instrumental Activities of Daily Living (IADLs) scale assessing all domains except laundry; responses to each domain were scored as independent (1 point) or not independent (0 points), with a cumulative score of 7 representing the highest level of functioning.[22] The remaining geriatric variables were obtained by self-report.

Statistical Analysis

All participants who completed the PEPPI-5 questionnaire at baseline were included in the analysis. As no standard cut point for PEPPI-5 scores has been established in existing literature, we dichotomized the scores into categories of higher efficacy (45-50) and lower efficacy (0-44) based on the distribution of scores in the study sample. To evaluate the appropriateness of this cut point, we additionally performed a sensitivity analysis comparing subjects with the maximum score (50) and those with lower scores.

Differences in the sociodemographic, clinical, and geriatric variables were compared between individuals with higher and lower efficacy using chi-square tests for categorical variables and t-tests for continuous variables. Bivariate logistic regression models comparing the odds of having lower versus higher efficacy were generated, and the variables that met the significance threshold of $p < 0.20$ were included in the adjusted multivariable logistic regression model. All analyses were conducted using SAS 9.4.

CHAPTER III: RESULTS

Study Population Characteristics

A total of 1209 study participants were included in the present analysis. Their mean age was 75 years (standard deviation: 7 years), approximately one-half were women, three-fifths had an education level less than college graduate, and 85% were receiving oral anticoagulation therapy.

PEPPI-5 scores ranged from 0-50 with a median score of 47 (IQR: 42-50) (Figure 3.1). Approximately two-thirds of participants reported a score ≥ 45, and 38% of all study participants reported a score of 50.

Participants with lower efficacy were significantly more likely to have persistent versus paroxysmal AF (Table 3.1). These individuals scored higher on the Charlson comorbidity index, were more likely to have a history of congestive heart failure and symptoms of depression or anxiety, and were significantly more likely to report hearing impairment, vision impairment, and lower levels of independent functioning.

Factors Associated with Lower Efficacy

In the adjusted multivariable logistic regression model, participants with persistent AF had 50% greater odds of reporting lower efficacy than those with paroxysmal AF (Table 3.2). Other factors associated with lower efficacy included symptoms of depression (70% greater odds) and anxiety (40% greater odds) as well as vision impairment (30% greater odds). Individuals with chronic kidney disease had 30% lower odds of reporting lower efficacy, as did those identified as pre-frail versus not frail. Participants identified as frail versus not frail also had 30% lower odds of reporting lower efficacy, though this difference did not reach statistical significance.

Sensitivity Analysis

When participants with a PEPPI-5 score of 50 were compared to those with lower scores, similar differences in baseline characteristics were noted (Table S1). As with the prior analysis, participants reporting lower efficacy were significantly more likely to report symptoms of depression and anxiety as well as hearing and vision impairment. While these individuals were still more likely to have persistent AF, congestive heart failure, and higher Charlson comorbidity index scores, these differences no longer reached statistical significance. No difference in independent functioning was observed, though participants with lower efficacy had statistically higher rates of valvular heart disease.

In the adjusted multivariable logistic regression model, the directionality of all estimates was preserved (Table S2). However, the differences in odds of having persistent AF, chronic kidney disease, anxiety symptoms, and frailty no longer achieved statistical significance. Additionally, participants reporting lower efficacy had 30% greater odds of having valvular heart disease in this model.

Figure 3.1. Distribution of PEPPI-5 Scores

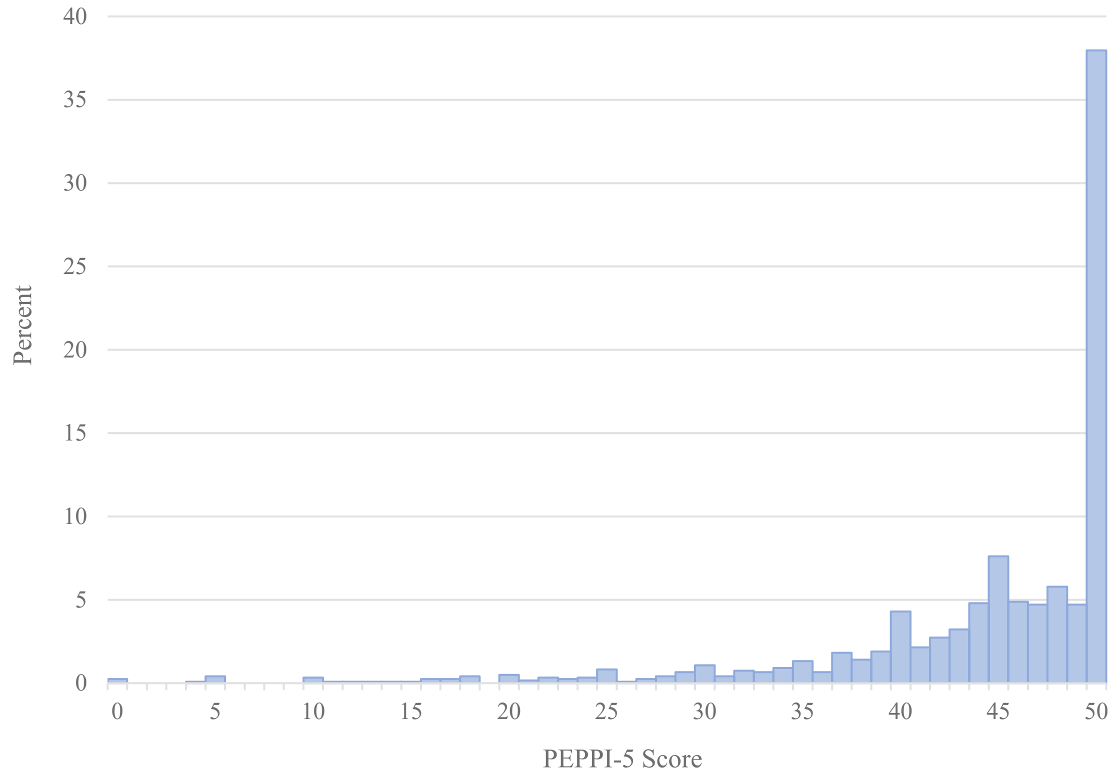

Table 3.1. Characteristics of Study Participants			
	PEPPI-5 0-44 (n=415)	**PEPPI-5 45-50 (n=794)**	**P-value**
Demographics			
Age categories (%)			
65-74 years	50.1	50.8	0.88
75-84 years	36.1	36.5	
≥ 85 years	13.7	12.7	
Women (%)	50.1	48.2	0.53
Married (%)	56.2	57.1	0.90
Race/ethnicity (%)			
Non-Hispanic White	84.8	85.8	0.66
Education (%)			
Some college or less	58.5	56.4	0.47
Clinical			
AF Type (%)			
Paroxysmal	54.9	62.0	**0.04**
Persistent	29.4	22.0	
Permanent	6.0	6.1	
Prior ablation (%)	22.4	20.0	0.33
Antiarrhythmic therapy (%)	32.5	36.3	0.20
Rate control therapy (%)	77.1	80.7	0.14
Anticoagulation therapy (%)	86.3	85.1	0.28
Medical comorbidities (%)			
Hypertension	89.2	90.6	0.44
Congestive heart failure	40.5	34.5	**0.04**
Diabetes mellitus	29.4	27.1	0.39
Valvular heart disease	27.0	23.3	0.16
Cardiomyopathy	23.4	20.3	0.21
Myocardial infarction	19.8	18.9	0.72
Angina	15.9	15.7	0.94
Ischemic stroke	10.4	9.5	0.61
Osteoarthritis	54.5	49.0	0.07
Cancer	30.4	31.0	0.82
Chronic kidney disease	26.0	29.7	0.18
Chronic lung disease	27.2	24.4	0.29
Hypothyroidism	21.5	22.5	0.19
Depression symptoms (%)	37.1	23.1	**<0.01**
Anxiety symptoms (%)	30.4	19.4	**<0.01**

Charlson comorbidity index (mean, SD)	6.2 (2.6)	5.9 (2.5)	**0.03**
Geriatric			
Cognitive impairment (%)	42.7	41.3	0.65
Hearing impairment (%)	40.7	34.1	**0.02**
Vision impairment (%)	31.3	23.4	**<0.01**
Frailty (%)			
Not Frail	33.7	33.9	0.18
Pre-Frail	50.4	53.9	
Frail	15.9	12.2	
IADLs (mean, SD)	6.7 (0.8)	6.8 (0.6)	**0.03**

Chronic lung disease: asthma, chronic bronchitis, emphysema
IADLs: Instrumental Activities of Daily Living (score between 0-7)

Table 3.2. Select Factors Associated with Lower* PEPPI-5 Scores

	Unadjusted OR (95% CI)	Adjusted OR** (95% CI)
Clinical		
AF Type		
Paroxysmal	Referent	Referent
Persistent	**1.50 (1.14, 1.99)**	**1.52 (1.13, 2.04)**
Permanent	1.12 (0.68, 1.87)	1.17 (0.69, 2.00)
Antiarrhythmic therapy	0.85 (0.66, 1.09)	0.89 (0.68, 1.16)
Medical comorbidities		
Congestive heart failure	**1.29 (1.01, 1.65)**	1.18 (0.88, 1.59)
Valvular heart disease	1.22 (0.93, 1.60)	1.14 (0.85, 1.53)
Osteoarthritis	1.25 (0.98, 1.58)	1.14 (0.89, 1.46)
Chronic kidney disease	0.83 (0.64, 1.09)	**0.68 (0.50, 0.92)**
Depression symptoms	**1.96 (1.51, 2.53)**	**1.67 (1.20, 2.33)**
Anxiety symptoms	**1.81 (1.38, 2.38)**	**1.40 (1.01, 1.94)**
Charlson comorbidity index	**1.05 (1.00, 1.10)**	1.05 (0.99, 1.12)
Geriatric		
Hearing impairment	**1.33 (1.04, 1.69)**	1.20 (0.93, 1.54)
Vision impairment	**1.49 (1.14, 1.94)**	**1.33 (1.01, 1.75)**
Frailty		
Not Frail	Referent	Referent
Pre-Frail	0.94 (0.72, 1.22)	**0.71 (0.53, 0.95)**
Frail	1.31 (0.90, 1.90)	0.70 (0.45, 1.10)
IADLs	**0.83 (0.70, 0.97)**	0.92 (0.77, 1.10)

* Low PEPPI-5 score: < 45
** Adjusted model includes only variables associated with low PEPPI-5 score in the bivariate models

CHAPTER IV: DISCUSSION

This is the largest and most recent study to examine efficacy in patient-physician interactions among older adults with AF. Using data from the SAGE-AF cohort, we observed that the majority of participants reported high levels of efficacy, with a skewed distribution of scores consistent with prior studies in other patient populations.[23,24] Characteristics of patients with lower efficacy included having persistent AF, having comorbid congestive heart failure, having symptoms of depression or anxiety, scoring higher on the Charlson comorbidity index, having hearing or vision impairment, and having fewer IADLs.

Clinical Factors

We observed differences in reported efficacy in individuals with persistent AF (compared to paroxysmal AF) as well as those with comorbid congestive heart failure, depression, and anxiety; participants reporting lower efficacy also had higher Charlson comorbidity index scores.

The prior literature has shown that individuals with greater illness burden report lower levels of efficacy,[25] possibly due to the increased complexity of decision making associated with the management of multiple chronic conditions. However, the Charlson comorbidity index score, which can be utilized as a measure of illness burden, did not achieve statistical significance in the adjusted multivariable logistic regression model, suggesting that its contribution to efficacy may be smaller than that of other factors.

In the present study, we observed that participants with persistent AF had greater odds of reporting lower efficacy as compared to those with paroxysmal AF. Atrial fibrillation is a disease of considerable complexity, and differences in the clinical presentation and management of the different types of AF contribute to this complexity.[26] Patients with persistent or permanent AF may experience greater illness burden given the typically greater severity of symptoms and the need for medical intervention to manage those symptoms. These individuals also tend to have higher rates of comorbidities, which may further increase illness burden.[27] While this association was not observed among individuals with permanent AF, this may be explained by the relatively small number of participants with permanent AF in this sample.

Consistent with the results of prior studies, participants with symptoms of depression or anxiety had significantly greater odds of reporting lower efficacy scores than those without these conditions.[25] Studies that have examined the association between depression and efficacy suggest a complex, potentially bidirectional relationship between these factors[28]; a similarly complex relationship between anxiety and efficacy may also exist.[29] This finding is of particular clinical relevance because depression and anxiety are highly prevalent in patients with AF and have significant effects on morbidity, mortality, and healthcare utilization in this population.[30] Therefore, AF patients with comorbid depression or anxiety might constitute a particularly vulnerable population that is at greater risk of experiencing worse clinical outcomes as a result of decreased efficacy.

Interestingly, participants with chronic kidney disease (CKD) had significantly lower odds of reporting lower efficacy. Optimal management of CKD requires significant self-management to slow disease progression, and self-efficacy has been identified as a critical component for successful self-management.[31] For this reason, several efficacy scales have been developed and studied in this patient population, including a modified version of the PEPPI-5.[31,32] These scales have subsequently been used in studies to assess the effects of interventions to improve efficacy.[31] Given this interest in improving efficacy among individuals with CKD, it is possible that this particular population benefits from clinical management approaches that promote greater efficacy. Further examination of these approaches might therefore inform analogous management approaches for patients with AF.

Geriatric Conditions

Patients with lower efficacy were more likely to have hearing impairment, visual impairment, frailty, and a lower number of IADLs, though vision impairment was the only factor independently associated with lower efficacy after controlling for other factors in the adjusted multivariable logistic regression model. While cognitive impairment was not associated with lower efficacy, individuals with more severe cognitive impairment may have been underrepresented in this sample due to their inability to provide informed consent.

Hearing and vision impairment have been previously identified as potential factors associated with poorer communication between patients and physicians.[33,34] The prior literature has shown that nonverbal communication has a significant effect on patient-physician interactions,[34] and any such effects are likely to impact efficacy specifically as well. Vision impairment may have a particularly significant effect on efficacy due to the relatively greater impairment of ability to recognize and interpret body language.[35] As both AF and vision impairment are highly prevalent in older adults, identification of lower efficacy in individuals with vision impairment will be especially important to ensure optimal clinical outcomes.

We observed that individuals classified as pre-frail had significantly lower odds of reporting lower efficacy scores compared to individuals classified as not frail. We also observed a similar effect with individuals classified as frail, though this difference did not reach statistical significance, possibly due to the smaller number of participants classified as frail. These results are in contrast with the findings of prior studies in other patient populations, which suggest that pre-frailty and frailty are associated with higher odds of reporting lower efficacy.[36,37] This difference may be attributable to the use of disparate definitions of efficacy (e.g. general self-efficacy or efficacy in coping versus efficacy in patient-physician interactions) or different measurement instruments.[36,37] Higher efficacy in frail patients might also be a result of social desirability effects or greater dependence on physicians. Alternatively, these results may reflect greater attention from physicians for frail patients, which may in turn promote higher efficacy. Further investigation into the association between frailty and efficacy is needed to better characterize this effect.

Implications for Clinical Practice

The patient-physician relationship occupies a unique and critical role in achieving optimal clinical outcomes.[38] Contemporary research has shown that collaborative approaches to medical decision making yield significant improvements in satisfaction with care and overall health; however, such approaches are only feasible when patients are sufficiently engaged in the decision making process.[39] Thus, low efficacy in patient-physician interactions poses a significant barrier to patient engagement in collaborative approaches such as shared decision making, with consequent negative effects on health outcomes.

Additionally, prior studies examining interventions to increase efficacy suggest that such approaches can yield observable improvements in health outcomes in addition to increasing patient knowledge and treatment adherence.[40,41] Specific techniques for enhancing efficacy in patients are actively being developed and studied, reflecting further acknowledgement of the importance of enhancing efficacy as part of clinical management.[42,43]

It is therefore imperative for physicians to have the necessary tools for accurately assessing and reliably increasing efficacy in clinical practice. By identifying populations that are likely to exhibit low efficacy and providing targeted interventions to improve efficacy, physicians will be able to better address the needs of all patients and provide them with the quality care they deserve.

Study Strengths and Limitations

This study has several strengths. We utilized a diverse, carefully characterized cohort of more than 1200 older adults with AF, which permitted detailed examination of factors related to efficacy in patient-physician interactions. Additionally, this study utilized established, validated instruments for assessing patient-reported factors, which were further enhanced by chart abstraction and physical examinations. However, the results of this study should be considered in the context of certain limitations. As a cross-sectional study, this investigation was unable to determine the temporality of observed associations, as lower efficacy may itself be an antecedent to disease development. In addition, participants in this study predominantly self-identified as non-Hispanic whites and had paroxysmal AF, potentially limiting the generalizability of these findings to other populations. Finally, the differences in odds estimates based on PEPPI-5 cut point suggest the possibility of residual confounding. Further investigation is needed to address these limitations.

Conclusions

In this large sample of older adults with non-valvular AF, we observed that perceived efficacy in patient-physician interactions was generally high. Individuals with persistent AF, depression, or anxiety report lower efficacy scores and are thus less likely to engage in shared decision making. Development of targeted approaches to assess and increase efficacy will be necessary to ensure optimal clinical and patient-reported outcomes in these groups.

APPENDIX

Sensitivity Analysis Results

Table S1. Characteristics of Study Participants			
	PEPPI-5 0-49 (n=750)	**PEPPI-5 50 (n=459)**	**P-value**
Demographics			
Age categories (%)			
65-74 years	51.7	48.6	0.57
75-84 years	35.5	37.9	
≥ 85 years	12.8	13.5	
Women (%)	48.3	49.9	0.58
Married (%)	56.3	57.3	0.68
Race/ethnicity (%)			
Non-Hispanic White	85.7	85.0	0.71
Education (%)			
Some college or less	56.3	58.4	0.48
Clinical			
AF Type (%)			
Paroxysmal	57.1	63.6	0.13
Persistent	26.4	21.6	
Permanent	6.5	5.2	
Prior ablation (%)	19.5	23.1	0.13
Antiarrhythmic therapy (%)	34.0	36.6	0.36
Rate control therapy (%)	79.2	80.0	0.75
Anticoagulation therapy (%)	86.5	83.9	0.21
Medical comorbidities (%)			
Hypertension	89.5	91.1	0.37
Congestive heart failure	38.3	33.8	0.12
Diabetes mellitus	28.5	26.8	0.51
Valvular heart disease	26.8	20.9	**0.02**
Cardiomyopathy	21.5	21.1	0.89
Myocardial infarction	18.4	20.5	0.37
Angina	15.2	16.8	0.47
Ischemic stroke	10.3	8.9	0.45
Osteoarthritis	52.9	47.5	0.07
Cancer	29.6	32.7	0.26
Chronic kidney disease	27.3	30.3	0.27

Chronic lung disease	26.0	24.4	0.54
Hypothyroidism	22.3	22.0	0.92
Depression symptoms (%)	32.3	20.9	**< 0.01**
Anxiety symptoms (%)	25.6	19.2	**0.01**
Charlson comorbidity index (mean, SD)	6.1 (2.6)	5.9 (2.6)	0.28
Geriatric			
Cognitive impairment (%)	40.5	43.8	0.27
Hearing impairment (%)	38.7	32.7	**0.04**
Vision impairment (%)	29.2	21.1	**< 0.01**
Frailty (%)			
Not Frail	33.3	34.6	0.23
Pre-Frail	14.8	11.3	
Frail	51.9	54.0	
IADLs (mean, SD)	6.8 (0.8)	6.8 (0.6)	0.08
Chronic lung disease: asthma, chronic bronchitis, emphysema IADLs: Instrumental Activities of Daily Living (score between 0-7)			

Table S2. Select Factors Associated with Lower* PEPPI-5 Scores		
	Unadjusted OR (95% CI)	**Adjusted OR** (95% CI)**
Clinical		
AF Type		
Paroxysmal	Referent	Referent
Persistent	**1.36 (1.03, 1.81)**	1.34 (1.00, 1.80)
Permanent	1.39 (0.84, 2.32)	1.44 (0.84, 2.46)
Antiarrhythmic therapy	0.89 (0.70, 1.14)	0.95 (0.73, 1.22)
Medical comorbidities		
Congestive heart failure	1.22 (0.95, 1.55)	1.10 (0.82, 1.47)
Valvular heart disease	**1.38 (1.05, 1.83)**	**1.34 (1.00, 1.79)**
Osteoarthritis	1.24 (0.99, 1.57)	1.17 (0.92, 1.49)
Chronic kidney disease	0.87 (0.67, 1.12)	0.76 (0.57, 1.02)
Depression symptoms	**1.80 (1.37, 2.36)**	**1.66 (1.18, 2.33)**
Anxiety symptoms	**1.45 (1.09, 1.93)**	1.09 (0.78, 1.52)
Charlson comorbidity index	1.03 (0.98, 1.07)	1.01 (0.95, 1.07)
Geriatric		
Hearing impairment	**1.30 (1.02, 1.66)**	1.21 (0.94, 1.55)
Vision impairment	**1.54 (1.17, 2.02)**	**1.41 (1.07, 1.87)**
Frailty		
Not Frail	Referent	Referent
Pre-Frail	1.00 (0.77, 1.29)	0.82 (0.63, 1.09)
Frail	1.36 (0.92, 2.00)	0.90 (0.57, 1.41)
IADLs	0.85 (0.71, 1.02)	0.94 (0.78, 1.14)

* Low PEPPI-5 score: < 50
** Adjusted model includes only variables associated with PEPPI-5 score < 45 in the bivariate models

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