

Racial/ethnic and sex differences in safety outcomes and atrial fibrillation/atrial flutter–related acute healthcare utilization after catheter ablation of atrial fibrillation

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BACKGROUND Catheter ablation is recommended for the treatment of symptomatic atrial fibrillation (AF) refractory to medical therapy.

OBJECTIVE The study sought to examine racial/ethnic and sex differences in complications and AF/atrial flutter (AFL)–related acute healthcare utilization following catheter ablation for AF.

METHODS We performed a retrospective analysis using data from the Centers for Medicare and Medicaid Services Medicare Standard Analytical Files (October 1, 2014, to September 30, 2019) among patients ≥ 65 years of age with AF who underwent catheter ablation for rhythm control. The risk of any complication within 30 days and AF/AFL-related acute healthcare utilization within 1 year of ablation by race, ethnicity, and sex were assessed using multivariable Cox regression modeling.

RESULTS We identified 95,394 patients for analysis of postablation complications and 68,408 patients for analysis of AF/AFL-related acute healthcare utilization. Both cohorts were $\sim 95\%$ White and 52% male. Female patients had a slightly elevated risk of

complications compared with male patients (adjusted hazard ratio [aHR] 1.07, 95% confidence interval [CI] 1.03–1.12). Black (aHR 0.78, 95% CI 0.77–1.00) and Asian (aHR 0.67, 95% CI 0.50–0.89) patients had lower utilization compared with White patients. Specifically, Asian men (aHR 0.58, 95% CI 0.38–0.91) had lower utilization compared with White men.

CONCLUSION Differences in safety and healthcare utilization after catheter ablation for AF were observed by race/ethnicity and sex groups. Underrepresented racial and ethnic groups with AF had a lower risk of AF/AFL-related acute healthcare utilization postablation.

KEYWORDS Race; Ethnicity; Atrial fibrillation; Catheter ablation; Safety; Complications

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Introduction

Catheter ablation is a guideline-recommended therapy for treatment of recurrent symptomatic atrial fibrillation (AF) and atrial flutter (AFL).¹ Prior research has demonstrated racial/ethnic and sex differences in rhythm control strategies and stroke reduction therapies among patients with AF.^{2–18} Compared with men, women have been reported to have lower likelihood of receiving catheter ablation.^{6,10,12,14,19,20}

Whether there are differences in rates of postablation complications and AF/AFL-related acute healthcare utilization at the intersection of race/ethnicity and sex is unclear and not fully understood.

There are limited comprehensive assessments of differences in postablation outcomes by race/ethnicity and sex in nationwide U.S. clinical practice. Accordingly, the objective of this study was to describe race/ethnicity and sex differences in the risk of complications and AF/AFL-related acute healthcare utilization following catheter ablation in patients 65 years of age or older undergoing catheter ablation for AF, using contemporary data from a large and nationally representative real-world database.

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KEY FINDINGS

- In this contemporary cohort of U.S. patients 65 years of age and older who underwent atrial fibrillation/atrial flutter ablation, women had a 7% higher risk of complications compared with men, which primarily stemmed from a higher rate of complications among White women.
- Atrial fibrillation/atrial flutter–related acute health-care utilization in the postblinking 1-year period was 13% to 33% lower in Black, Asian, and Hispanic individuals compared with White individuals.
- The most common complications post–atrial fibrillation/atrial flutter ablation were congestive heart failure, urinary tract infections, thromboembolism, and pacemaker insertions.

Methods

Study design and data source

We conducted a retrospective analysis of individuals 65 years and older using the Centers for Medicare and Medicaid Services (CMS) Medicare Standard Analytical Files (SAF) database from October 1, 2014, to September 30, 2019. The CMS SAF database includes healthcare claims for both inpatient and outpatient settings. The limited dataset includes fee-for-service claims for Medicare Part A and Part B enrollees; however, claims for individuals enrolled in the Medicare Advantage plans are not included.

Study population

Our study population comprised of patients with a code indicative of catheter ablation occurring in an inpatient setting (International Classification of Diseases–Tenth Revision [ICD-10]: 02553ZZ, 02563ZZ, 02573ZZ, 02583ZZ, 025K3ZZ, 025L3ZZ, 025M3ZZ, 025S3ZZ, 025T3ZZ; Current Procedural Terminology [CPT]: 93656 alone or 93656 [±93657, ±93655]) with a primary diagnosis of AF (ICD-10: I48.0, I48.1x, I48.2x, and I48.91) or outpatient setting (CPT: 93656) with a primary or secondary diagnosis of AF. The first such occurrence during the study period was defined as the index ablation.

Patients were included if they were at least 65 years of age at the time of index ablation and were continuously enrolled in the database 12-month prior to the index date. Patients were excluded if, in the 12-month preindex period, they had surgical ablation, valvular procedure or atrioventricular node ablation, or left atrial appendage occlusion. Patients were also excluded if they had a history of congenital heart disease or coronary artery bypass grafting procedure, received care outside of the United States, or had missing data for race/ethnicity or sex. [Supplemental Appendix A](#) lists the codes used for the assessment of study inclusion and exclusion criteria.

Outcomes

Safety outcomes assessed within 30 days of the index catheter ablation procedure included a composite measure of any complication (index ablation between October 1, 2015, and August 31, 2019). Any complication within 30 days of catheter ablation was based on a composite of the following complications: cardiac perforation, acute myocardial infarction, ischemic stroke, hemorrhagic stroke, thromboembolism, transient ischemic attack, phrenic nerve damage, pericarditis, major vascular access complications, bleeding including hematoma, arteriovenous fistula, blood transfusion, atriopharyngeal fistula, severe pulmonary vein stenosis requiring intervention, vagal nerve injury, congestive heart failure, urinary tract infection, pneumonia, and pacemaker insertion. Considering that complications were assessed based on diagnosis codes (and procedure codes), for the assessment of such complications during index ablation admission, a “present on admission: yes/no” variable was created for each patient based on identification (presence or absence) of these diagnosis or procedure codes in the preindex ablation 3-month period. Assessment of complication during index ablation admission accounted for the present on admission flag. [Supplemental Appendix B](#) lists the codes used for the assessment of complications.

We also evaluated AF/AFL-related acute healthcare utilization within 1 year of catheter ablation (index ablation between October 1, 2015, and September 30, 2018). AF/AFL-related acute healthcare utilization was assessed following a standardized 90-day blanking period to avoid capturing early recurrences during the blanking period as recommended by the Heart Rhythm Society guidelines.²¹ For the purpose of this analysis, AF/AFL-related acute healthcare utilization was defined by having at least 1 of the following events occurring in the postblinking period 91 to 365 days after index ablation: inpatient readmission with primary diagnosis of AF (ICD-10: I48.0, I48.1x, I48.2x, and I48.91), cardioversion (ICD-10: 5A2204Z, 5A12012; CPT: 92960, 92961), repeat catheter ablation for AF (defined using the same codes as the index ablation), AFL-related inpatient admission, or AFL-related catheter ablation (CPT: 93653).

Study variables

Race/ethnicity and sex were considered the primary independent variables. Race/ethnicity was determined using available categories in the SAF data (ie, White, Black, Asian, Hispanic, North American Native, and other). Due to limited sample size, North American Native and other were combined into an other race/ethnicity category for the assessment of AF/AFL-related acute healthcare use in the 1-year period postablation; in the 30-day follow-up cohort (for the assessment of complications), due to small sample sizes among Asian and Hispanic patients, we further merged Asian and Hispanic with the other race/ethnicity by sex category. Additionally, we evaluated study outcomes by race/ethnicity and sex pairs, comprising White male, White female, Black male, Black female, Asian male, Asian female, Hispanic

Table 1 Variation in 30-day post-catheter ablation complications by race/ethnicity and sex

Outcome	30-d follow-up safety cohort (n = 95,394)		
	Any complication	P value	aHR (95% CI)
Race/ethnicity*		<.0001	
White (n = 91,292)	8857 (9.7)		Reference
Black (n = 1973)	304 (15.4)		1.05 (0.94–1.18)
Other (n = 2129) [†]	233 (10.9)		1.06 (0.93–1.20)
Sex*		<.0001	
Male (n = 50,215)	4150 (8.3)		Reference
Female (n = 45,179)	5244 (11.6)		1.07 (1.03–1.12)
Race/ethnicity and sex [‡]		<.0001	
White male (n = 48,171)	3903 (8.1)		Reference
White female (n = 43,121)	4954 (11.5%)		1.09 (1.04–1.14)
Black male (n = 933)	135 (14.5)		1.17 (0.98–1.39)
Black female (n = 1040)	169 (16.3)		1.06 (0.91–1.24)
Other male (n = 1111) [†]	112 (10.1)		1.18 (0.98–1.42)
Other female (n = 1018) [†]	121 (11.9)		1.05 (0.87–1.26)

Values are n (%), unless otherwise indicated. The hazard models were adjusted for the following study covariates: age, copayment amount, Elixhauser comorbidity score, CHA₂DS₂-VASc score, sleep apnea, intracardiac echocardiography use, frailty, provider region, and hospital bed size.

aHR, adjusted hazard ratio; CHA₂DS₂-VASc = congestive heart failure, hypertension, age ≥ 75 years, diabetes mellitus, prior stroke or transient ischemic attack or thromboembolism, vascular disease, age 65–74 years, sex category; CI, confidence interval.

*Multivariate model wherein race/ethnicity and sex were considered as separate independent variables of interest (controlling for study covariates).

[†]Other race/ethnicity in the efficacy cohort defined as North American Native or other race/ethnicity as indicated by Standard Analytical Files data.

[‡]Multivariate model in which race/ethnicity and sex were added as a paired independent variable of interest (controlling for study covariates).

male, Hispanic female, other race/ethnicity male, and other race/ethnicity female.

Study covariates included patient demographics (age), clinical characteristics (Elixhauser comorbidity score, CHA₂DS₂-VASc (congestive heart failure, hypertension, age ≥ 75 years, diabetes mellitus, prior stroke or transient ischemic attack or thromboembolism, vascular disease, age 65–74 years, sex category) score, sleep apnea, intracardiac echocardiography use, and frailty [Hospital Frailty Risk Score of 5 or greater]),²² copayment amount, and provider characteristics (region, hospital bed size). We also assessed AF type as a covariate (paroxysmal, persistent, chronic, unspecified); however, given the high occurrence of unspecified AF patients, which cannot be classified accurately, we performed analyses both with and without the addition of this variable as a covariate.

Statistical analyses

Baseline characteristics by race/ethnicity and sex were evaluated using chi-square tests of independence for categorical variables and analysis of variance tests for continuous variables. Survival analyses were used to examine differences in study outcomes by race/ethnicity and sex. Patients were censored if they died, were lost to follow-up (defined as gap of >1 day in enrollment), or reached the end of the follow-up time (30 days for complications, 365 days for AF/AFL-related acute healthcare utilization) without having an event. Risk of any complication and AF/AFL-related acute healthcare utilization was assessed using Cox proportional hazards models adjusting for study covariates. For each outcome, 2 sets of models were run, one with race/ethnicity and sex as main independent variables along with other independent variables and one with race/ethnicity and

sex pairs as the main independent variable along with other independent variables. For the main analysis, AF type was excluded as a covariate; however, we did perform supplemental analysis with AF type included and have reported results for both with and without AF type.

A 2-sided *P* value $<.05$ was the threshold for statistical significance, and all analyses were conducted using R for Windows, version 4.0.2 (R Foundation for Statistical Computing, Vienna, Austria). The use of CMS Medicare SAF was reviewed by the New England Institutional Review Board (IRB) and was determined to be exempt, including consent with IRB approval exemption, from broad IRB approval, as this research project did not involve active human subject participation.

Results

A total of 95,394 patients were identified for the 30-day follow-up safety cohort. The sample was primarily White (95.7%) and male (52.6%). Women were slightly older than men (73.1 ± 5.4 years vs 72.0 ± 4.9 years). Black patients had higher mean Elixhauser comorbidity scores (5.6 ± 2.9 vs 4.2 ± 2.5) and frailty scores (6.3 ± 6.5 vs 4.2 ± 5.1) as compared with White patients. Patients primarily had paroxysmal AF at the time of the index ablation, regardless of race/ethnicity or sex (Supplemental Table 1a).

In the 1-year follow-up healthcare utilization cohort, 68,408 patients were identified. Similar to the safety cohort, 95.7% of patients were White and 52.5% were male. The average age of women was slightly older than men (73 ± 5.4 years vs 71.9 ± 4.9 years). Black and Hispanic patients had the highest mean Elixhauser comorbidity scores (5.5 ± 2.9 and 5.0 ± 2.5 , respectively) and frailty scores (5.9 ± 6.3 and 5.0 ± 5.8 , respectively) (Supplemental Table 1b).

Table 2 Variation in postblinking 1-year AF/AFL recurrence by race/ethnicity and sex

Outcome	1-y follow-up efficacy cohort (n = 68,408)		
	AF- and AFL-related acute healthcare utilization	P value	aHR (95% CI)
Race/ethnicity*		.4279	
White (n = 65,470)	11,285 (17.2)		Reference
Black (n = 1408)	220 (15.6)		0.87 (0.77–1.00)
Asian (n = 414)	48 (11.6)		0.67 (0.50–0.89)
Hispanic (n = 266)	34 (12.8)		0.72 (0.51–1.01)
Other (n = 850) [†]	140 (16.5)		0.93 (0.78–1.09)
Sex*		.0038	
Male (n = 35,925)	6,119 (17.0)		Reference
Female (n = 32,483)	5,608 (17.3)		0.98 (0.95–1.02)
Race/ethnicity and sex [‡]		.0509	
White male (n = 34,465)	5,898 (17.1)		Reference
White female (n = 31,005)	5,387 (17.4)		0.99 (0.95–1.02)
Black male (n = 664)	105 (15.8)		0.90 (0.74–1.09)
Black female (n = 744)	115 (15.5)		0.84 (0.70–1.02)
Asian male (n = 194)	20 (10.3)		0.58 (0.38–0.91)
Asian female (n = 220)	28 (12.7)		0.73 (0.51–1.06)
Hispanic male (n = 114)	14 (12.3)		0.68 (0.40–1.15)
Hispanic female (n = 152)	20 (13.2)		0.74 (0.48–1.15)
Other male (n = 488) [†]	82 (16.8)		0.95 (0.77–1.18)
Other female (n = 362) [†]	58 (16.0)		0.88 (0.68–1.14)

Values are n (%), unless otherwise indicated. The hazard models adjusted for the following study covariates: age, copayment amount, Elixhauser comorbidity score, CHA₂DS₂-VASc score, sleep apnea, intracardiac echocardiography use, frailty, provider region, and hospital bed size.

AF = atrial fibrillation; AFL = atrial flutter; other abbreviations as in [Table 1](#).

*Multivariate model wherein race/ethnicity and sex were considered as separate independent variables of interest (controlling for study covariates).

[†]Other race/ethnicity in the efficacy cohort defined as North American Native or other race/ethnicity as indicated by Standard Analytical Files data.

[‡]Multivariate model where race/ethnicity and sex were added as a paired independent variable of interest (controlling for study covariates).

Complications

Overall, congestive heart failure, urinary tract infections, pacemaker insertion, and thromboembolism were the most common complications postablation ([Supplemental Tables 2a-c](#)). Black patients (vs White patients and other patients), female patients (vs male patients), and Black female patients (vs all race-sex pairs) had the highest composite rates of complications, respectively. Black patients (vs White patients and other patients) had higher rates of blood transfusion, congestive heart failure, and pneumonia. Women (vs men) had higher rates of cardiac perforation, thromboembolism, bleeding including hematoma, arteriovenous fistula, and pseudoaneurysm, blood transfusion, congestive heart failure, urinary tract infection, pneumonia, and pacemaker insertion. Black women (vs all combinations of race-sex pairs) had higher rates of pacemaker insertion, thromboembolism, bleeding including hematoma, arteriovenous fistula, and pseudoaneurysm postablation. Black women (along with White women) had higher rates of urinary tract infection, and pneumonia (along with other women) as compared with all combination of race-sex pairs. Black men had higher rate of congestive heart failure as compared with all combination of race-sex pairs.

After multivariable adjustment of study covariates (excluding AF type) for the model with race/ethnicity and sex as separate independent variables, we saw no statistically significant difference in the adjusted hazard ratios (aHRs) for any complication among Black (aHR 1.05, 95% confidence interval [CI] 0.94–1.18) and other race/ethnicity (aHR 1.06, 95% CI 0.93–1.20) patients as compared with White patients

([Table 1](#)). Risk of any complication was 7% higher in female patients (aHR 1.07, 95% CI 1.03–1.12) compared with male patients. For regression analysis, wherein race/ethnicity and sex pairs were included as the main independent variable, a higher risk of any complication was seen in White women (aHR 1.09, 95% CI 1.04–1.14) as compared with White men ([Table 1](#)). Similar results were observed when multivariate adjustment was run with the inclusion of AF type ([Supplemental Table 3](#)).

AF/AFL-related acute healthcare utilization

[Supplemental Tables 4a and 4b](#) demonstrate the proportion of patients with inpatient admission, repeat catheter ablation, and electrical cardioversion due to both AF and AFL and AFL alone (inpatient admission and repeat catheter ablation), respectively. When examining the rate of overall AF/AFL-related acute healthcare utilization, significant differences were observed by race/ethnicity and sex. From the model wherein race/ethnicity and sex were included as separate independent variables, overall AF/AFL-related acute healthcare utilization was observed to be the highest among White patients (17.2%) and women (17.3%). Results from multivariable regression analysis adjusting for study covariates (excluding AF type) found that Asian (aHR 0.67, 95% CI 0.50–0.89) patients had lower risk of AF/AFL-related acute healthcare utilization in the postblinking 1-year period as compared with White patients ([Table 2](#)).

When examined by type of acute healthcare utilization ([Supplemental Tables 5a, 5b, 6a, and 6b](#)), women were

observed to have a significantly higher risk of AF/AFL-related inpatient admission (HR 1.34, 95% CI 1.25–1.44) and a significantly lower risk of cardioversion (HR 0.89, 95% CI 0.84–0.94) as compared with men. Female patients were also observed to have lower risk of AFL-related inpatient admission (HR 0.78, 95% CI 0.73–0.84) and AFL-related catheter ablation (HR 0.66, 95% CI 0.54–0.79). There was no significant difference in repeat catheter ablation of AF/AFL between women and men (HR 1.05, 95% CI 0.99–1.13).

For the model including race/ethnicity and sex pairs as the main independent variable of interest, rates of AF/AFL-related acute healthcare utilization were observed to be the highest among White women (17.4%) and lowest among Asian men (10.3%), with results approaching significance for race/ethnicity and sex (chi-square P value = .0509) (Table 2). No significant differences were seen in AF/AFL-related healthcare use by race/ethnicity and sex pairs, except in Asian men (HR 0.58, 95% CI 0.38–0.91). When examined by type of acute healthcare use, significant differences were seen by race/ethnicity and sex (Supplemental Tables 5a, 5b, 6a, and 6b). Black patients were observed to have significantly lower risk of repeat catheter ablation (aHR 0.76, 95% CI 0.59–0.99) and cardioversion (aHR 0.64, 95% CI 0.52–0.80) as compared with White patients (Supplemental Table 5a). However, Black patients were at higher risk (aHR 1.71, 95% CI 1.03–2.82) of AFL-related catheter ablation as compared with White patients (Supplemental Table 5b). Results were generally consistent with the inclusion of AF type as a covariate (along with other study covariates) (Supplemental Tables 6a and 6b).

Discussion

In this study of U.S. patients 65 years of age and older who underwent catheter ablation for AF/AFL, we found no difference in complications by race/ethnicity; however, women had a 7% higher risk of complications compared with men, which primarily stemmed from a higher rate among White women. Overall AF/AFL-related acute healthcare utilization in the postblanking 1-year period was 13% to 33% lower among Black and Asian patients, with this difference being specifically marked for Asian men compared with White patients. To our knowledge, this is the first study to examine differences in postablation complications and outcomes at the intersection of race/ethnicity and sex.

As with prior studies, we observed slightly elevated risk of postablation complications among women compared with men.^{2,11,12,14} Specifically, our analysis suggests higher rates of congestive heart failure in women as well as pacemaker insertion and femoral access site complications, which were similarly documented by Zylla and colleagues.²³ Furthermore, we did observe a higher rate of cardiac perforation in women compared with men, which is similar to previous studies by Cheng and colleagues²⁴ and Michowitz and colleagues.²⁵ However, when further stratified by race/ethnicity, the risk of complications was observed to be higher among White women as compared with White men. For women from underrepre-

sented racial and ethnic groups (UREGs), the risk of complications postablation was not statistically different compared with White men. Though prior studies have suggested higher rate of complications among women as compared with men, our study highlights that this may not be a blanket phenomenon, and there is considerable variation in complications within the intersection of race/ethnicity and sex. Further research is needed to understand if there are other, unmeasured factors that may put White women at higher risk for complications. Furthermore, the clinical implications of these findings suggest improved patient selection for AF/AFL ablation is needed, particularly in women, who are generally older, have higher burden of comorbid medical illness, and longer durations of AF compared with men at the time of AF ablation.²⁰ These factors may be drivers of increased burden of complications in women, particularly in White women. Our study results reflect that considering women from different racial/ethnic groups as a homogeneous group may not be an appropriate approach, and it is critical to assess sex in relation with race and ethnicity in the assessment of ablation outcomes including postablation complications. Though such evaluation may be difficult to achieve in clinical or prospective trials (due to enrollment challenges, sample size, etc.), leveraging observational data sources, as done in this and prior studies, could prove critical in better examination of ablation outcomes heterogeneity in patients with AF.

Studies of AF/AFL-related acute healthcare utilization by sex have conflicting results. In an analysis from the Catheter Ablation vs. Antiarrhythmic Drug Therapy for Atrial Fibrillation (CABANA) trial, Russo and colleagues²⁶ found that catheter ablation (as compared with drug therapy) reduced the risk of AF/AFL-related acute healthcare utilization overall, but the effect was greater among men. Kaiser and colleagues¹¹ found that women were more likely to have AF/AFL-related readmission but have a lower risk of repeat ablation and cardioversion. Our results were similar to those reported by Kaiser and colleagues, with women observed to have a significantly higher risk AF/AFL-related inpatient admission but a significantly lower risk of cardioversion. Women were also observed to have lower risk of AFL-related inpatient admissions and repeat ablation. As such, no significant difference was observed in the overall composite of AF-related healthcare utilization among women as compared with men, suggesting that the overall effectiveness of ablation was comparable among the 2 groups. It should be noted that our findings of lower use of procedural rhythm control postablation with cardioversion in women do not indicate lower overall rates of AF. Additionally, though not listed in Results, we also observed additional ablation lines performed during AF ablation among our sample (CPT code 93655 and/or 93657 use during ablation procedures identified with CPT code 93656). Almost 43% of patients had an additional ablation line performed during AF ablation, which is suggestive of the arrhythmia burden imposed on the patients.

There are limited data with respect to racial and ethnic variation in AF/AFL-related acute healthcare utilization

following catheter ablation.^{4,27,28} Durrani and colleagues²⁷ found that Black patients were less likely to have AF recurrence compared with White patients. A recent study by Thomas and colleagues²⁸ based on analysis of the data from the CABANA trial showed that while catheter ablation reduced the risk of AF recurrence in all patients (as compared with drug therapy), the effect was stronger among racial and ethnic minority patients. In contrast, Bukari and colleagues⁴ found no difference between Black and White patients or male and female patients in likelihood of AF recurrence (ie, occurring at least 3 months after catheter ablation procedure). Our results showed that, overall, Asian patients (specifically Asian men) had a significantly lower risk of AF/AFL-related acute healthcare utilization compared with White patients (driven by lower rate of repeat ablation and cardioversion). Postablation AF/AFL-related acute healthcare utilization among UREGs may be influenced by range of factors including genetics/ancestry, time between diagnosis and ablation, environmental exposures, procedural characteristics, and AF severity, with some or all of these factors potentially contributing to the lower rates of AF/AFL-related acute healthcare utilization among UREGs. Alternatively, social determinants of health, including factors that decrease access to healthcare resources such as lack of healthcare coverage, distance from medical care, and transportation difficulties, may lead to lower utilization of healthcare resources aimed at treating postablation AF in UREG populations.

Given that the majority of the research on AF (including ablation outcomes) has focused on patients in the Western hemisphere, with scant information available on patients of non-European ancestry,²³ it is unclear whether pathophysiological differences in AF and the influence of ablation on such differences by race/ethnicity and sex influence the findings of this analysis. More research is needed to examine if postablation improvements among patients of Black and Asian race are not due to a data artifact but are truly demonstrative of the success of ablation in such patients. Until then, our results do offer insights that should allow providers to discuss the feasibility of ablation procedure among patients of different racial/ethnic and sex groups.

Limitations

Our study has several limitations, including those inherent to claims-based studies such as coding errors, missing data, and reporting bias. While we controlled for potential confounders in our analysis, there is still the possibility of residual confounding. We could not ascertain certain procedural parameters including ablation strategy, utilization of 3-dimensional mapping systems, type of ablation catheter used, and procedure duration. Given that AF recurrence cannot be fully ascertained through claims data, our study used healthcare utilization as a proxy for clinical AF recurrence that led to intervention; therefore, there may be potential for information bias. However, the proxy measures included have also been used in a previous study of postcatheter ablation outcomes.¹¹ One of the exclusion criteria for our study was

related to excluding patients with missing data on race and/or sex, leading to attrition in our sample. To rule out any potential attrition bias, we conducted descriptive statistics comparing patients with and without missing race, ethnicity, and sex data. Although we found statistically differences between the 2 groups in terms of comorbidities and demographics, these differences are most likely driven by the large differences in sample size between the cohort with missing race/sex (n = 2341) and the cohort without missing race/sex (n = 95,394) (Supplemental Table 7). Despite being a large, national database, SAF data include only patients 65 years of age and older, enrolled in Medicare Part A or B with suboptimal diversity with respect to race and ethnicity; thus, our findings may not be generalizable to all AF patients. Despite these limitations, this study is one of the few to analyze complications and AF/AFL-related acute healthcare utilization at the intersection of race/ethnicity and sex.

Conclusion

In this study of a contemporary sample of patients 65 years of age and older who underwent catheter ablation for AF, we found variation in complications and AF/AFL-related acute healthcare utilization by race/ethnicity and sex. Understanding the drivers leading to differential safety and healthcare utilization patterns by race/ethnicity and sex are important to achieve equitable treatment for all AF patients.

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Patient Consent: Patient consent was not required for this research project.

Ethics Statement: The use of CMS Medicare SAF was reviewed by the New England Institutional Review Board (IRB) and was determined to be exempt from broad IRB approval, as this research project did not involve active human subject participation.

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