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ATRIAL FIBRILLATION MANAGEMENT IN HISPANIC ADULTS

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Hahn School of Nursing and Health Science

DOCTOR OF PHILOSOPHY IN NURSING

ATRIAL FIBRILLATION MANAGEMENT IN HISPANIC ADULTS

by

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Abstract

Background: Research has found atrial fibrillation (AF) to be the primary or a contributing cause of death on 183,321 death certificates, and an underlying cause of death for 26,535 Americans in 2019. Findings indicate an increased AF diagnosis in White people compared to racial and ethnic minorities, contrasting widespread findings of increased prevalence of cardiovascular disease and ischemic strokes in minorities. Significant disparities—by race and socioeconomic status in disease distribution and access to testing and lifesaving treatments—have been documented, specifically associated with social determinants of health (SDOH); i.e., the conditions in which people are born, grow, live, work, and age. The Hispanic population is the second-largest ethnic group, comprising 18.7% of the total population, nonetheless few studies describe AF diagnosis, treatment, and outcomes in Hispanics (Linares et al., 2019).

Purpose/Aims: To explore the SDOH, select sociodemographics, and symptom burden in Hispanic/Latino adults compared to non-Hispanic/Latino adults with AF who obtain rhythm and rate control treatment.

Methods: A cross-sectional correlational design was used. Data was extracted from the electronic health record of 750 participants receiving treatment for AF between June 2020 and June 2022. Inclusion criteria: Age 21 years and older, gender (males, females, other), and ECG-confirmed AF. Measurements: Age, race, ethnicity, gender, health plan, body mass index, hypertension diagnosis, smoking, alcohol use, admitting/primary/ secondary diagnoses, type of AF diagnosis, employment status, access to healthcare, type of community, AF treatment (rhythm, rate control), reported symptoms.

Data Analysis: Descriptive (frequencies, measures of dispersion) and inferential

statistics, including bivariate (chi-square tests and t-tests) and multivariate (binomial logistic regression) analyses.

Findings: Select clinical findings were not significantly associated with ethnicity (e.g., smoking status, admitting/primary/secondary diagnoses, or diagnoses of hypertension were not associated with ethnicity). Alcohol use was greater in non-Hispanics, and being overweight, obese and morbidly obese was greater in Hispanics. Hispanic participants were younger than non-Hispanic participants. Ethnicity was not significantly associated with any of the AF pharmacological and non-pharmacological care treatments evaluated in this study (i.e., in-hospital antiarrhythmic drugs, in-hospital rate control drugs, prior catheter ablation, prior surgical ablation, and cardioversion).

Implications for Research: The American Association of Colleges of Nursing goals for nurses include addressing pervasive inequities in healthcare to meet the needs of all individuals. Studies have found great variability in AF symptomology, and current treatment guidelines recommend clinical treatment decisions based on a patient's symptoms. Findings from this study will inform and guide treatment strategies for Hispanics with AF. The study revealed disparities in healthcare. In this cohort, Hispanics traveled longer distances for care, sought care at an earlier age, and had catheter ablations more frequently than non-Hispanics; obesity was a prevalent comorbidity among Hispanics.

Dedication

I thank God for sending His Holy Spirit to give me strength, patience, and knowledge to fulfill His purpose through me. I dedicate this research work to my family: My husband Luis who is my rock, my mother, Mariana, and my brother Javier who have looked after me my whole life, his wife Diana and my two nieces Sayuri and Sheila, who are a daily reminder of how beautiful life can be when you are having fun. My extended family Tía Angelita, and her family, Tío Victor and his family and Tio Kleber may God rest his soul and his family for always opening their hearts and home to us and my friends for their unconditional love and support. This PhD research work is a gift to all Hispanic families to address health inequities so that we may have a brighter future. My mission is to use the nursing point of view to make a positive change and improve the health and wellbeing of the underserved.

Acknowledgements

I would like to express my most sincere and immense gratitude to my dissertation chairperson, Dr. Cynthia Connelly, for all her valuable time and research guidance through this journey and for always sharing her scientific knowledge and expertise to improve my novice scientific research skills. I would like to thank my dissertation committee, Dr. Caroline Etland and Dr. Allon Rafael for their recommendations in finalizing my research work. Many thanks to Dr. Georges and Dr. Mayo for helping me understand the importance of learning nursing theoretical foundations, concepts, and links when formulating research design. Special thanks to Dr. Ruth Bush and Dr. Eileen Fry-Bowers for helping me involve other disciplines to develop my nursing perspective, and to use the "nursing lens" to improve healthcare and influence scientific knowledge and health policy. My appreciation to the entire faculty and staff, such as Ms. Patricia Calero at the University of San Diego, Hahn School of Nursing and Health Science, and the Beyster Institute for Nursing Research who helped doctoral scholarship. Lastly, my gratitude to my PhD cohort, health professional colleagues, and to the El Camino staff and community for their kindness and support that made possible this professional achievement. It was an honor to have been selected for the Dean's Merit Scholarship and Dean's PhD Research Scholar Award. I am grateful for the opportunity to contribute to nursing research and advocate for health equity in Hispanic communities.

Thank You & God Bless you all,

--- Tania

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Chapter 1

Introduction

Background

For over two decades multiple studies have reported rising mortality rates from atrial fibrillation (AF). In 2019 AF was mentioned on 183,321 death certificates and was found to be an underlying cause of death in 26,535 Americans (Centers for Disease Control and Prevention [CDC], 2019). In the United States, the increased financial burden from AF stems from more than 454,000 hospitalizations in patients with AF as the primary diagnosis (Benjamin et al., 2019). AF causes about one in seven strokes and contributes to about 158,000 deaths each year (CDC, 2022).

The global prevalence of AF was 43.6 million in 2016. Although, over the past decades, stroke incidence rates have fallen by 42% in high-income countries (Heart Rhythm Society, 2019), stroke still ranks as the fifth-leading cause of death in the United States (CDC, 2022). Studies from the Framingham group found AF was diagnosed at the time of stroke or soon after a stroke in about 20% of patients (U.S. Preventive Services Task Force [USPSTF], 2022). The consequences of ischemic stroke range from mild to debilitating depending on the extent of brain involvement and the time from the onset of symptoms to treatment. One year post COVID-19 infection, Xie et al. (2022) found - in a sample with mostly White males - an increased risk for AF, with a hazard ratio of 1.71 (95% CI 1.62 to 1.79) and burden of 10.74 (95% CI 9.61 to 11.91) in those admitted to the ICU with acute COVID-19 infection.

The paradox in AF ethnic and racial findings indicate an increased AF diagnosis in Whites compared to racial and ethnic minorities (Tamirisa et al., 2021; Wyse et al.,

2002). Hindricks et al. (2021) found a lifetime AF risk of 37% for individuals of European ancestry at age 55 years. This contrasts with widespread findings of ischemic strokes, cardiovascular disease, and metabolic syndrome found in greater prevalence in minorities. One explanation for this discrepancy may be attributed to the high prevalence of select risk factors (e.g., social, clinical, etc.) for AF in racial and ethnic minorities, which are underrepresented in clinical trials. Notably, studies have shown AF differences based on race or ethnicity cannot be explained by genetic, or structural cardiac factors (Essien et al., 2021).

Social factors need to be studied to understand the ethnic and racial differences in AF diagnoses. The REasons for Geographic And Racial Differences in Stroke (REGARDS) Study (N = 14,000) found 5,077 Black enrolled participants had a lower relative risk 0.46 (95% CI 0.39 to 0.53) of developing AF when compared to White participants (n = 8611; O'Neal et al., 2017). Furthermore, the REAGARDS study found a decreased awareness of AF in Blacks compared to Whites by at least one-third (Essien et al., 2021). On the balance, the Multi-Ethnic Study of Atherosclerosis (MESA) Study (N = 6,000) found similar rates of AF across all races using the ambulatory rhythm monitor (Essien et al., 2021). Differential clinical recognition of AF may partly explain racial and ethnic differences in AF.

Structural racism, less access to general and specialty healthcare and underrepresentation in medical research is partly to blame for the racial and ethnic paradox in AF (Essien et al., 2021). Racial and ethnic minorities have increased clinical factors for AF (i.e., obesity, hypertension, diabetes, and obstructive sleep apnea), which doesn't explain the reduced risk for AF in minorities; it could be that social factors may

protect minorities against AF. Understanding the social determinants of health (SDOH) in people with AF is an important step towards equity in healthcare in the United States.

Studies have shown Black and Hispanic patients with AF suffer from higher rates of ischemic strokes, cardiovascular mortality from myocardial infarction, and congestive heart failure (CHF) than Whites (Essien et al., 2021). Few studies exist however explaining the prevalence of AF diagnosis and management in Hispanics. Studies frequently show racial and ethnic minorities with AF have poor management therapies and lack appropriate guideline directed medical therapy (Essien et al., 2021). The SDOH (i.e., low income, low education level, and poor health literacy) in these minority populations result in a decreased likelihood of engaging in preventive health (Essien et al., 2021). Consequently, racial, and ethnic minorities are at higher risk of receiving disparate treatment for rate and rhythm control, leading to poor AF-related quality of life and increased AF symptoms.

Pathophysiology

AF is a type of supraventricular tachycardia. AF occurs when the signals in the atria (upper chambers) of the heart are chaotic resulting in quivering of the atria. The atrioventricular (AV) node is bombarded with hundreds of disorganized atrial signals and attempts to transmit them to the ventricles (lower chambers of the heart) resulting in an irregular and often fast rhythm. Uncoordinated atrial activation leads to ineffective atrial contraction. The diagnosis is typically made by capturing the presence of AF on a 12-lead electrocardiogram (ECG), irregularly irregular R to R intervals (when atrioventricular conduction is not impaired), and absent P waves (consistent with irregular atrial activation); or by documenting continuous evidence of AF on an ECG rhythm strip for

greater or equal to 30 seconds (January et al., 2019).

AF is a progressive disease defined as acute AF (onset within 48 hours), paroxysmal (self-terminating AF lasting less than 7 days), recurrent AF (2 or more episodes) evolving into persistent (lasting longer than 7 days), longstanding persistent (continuous for more than 12 months when deciding to adopt a rhythm control strategy) and finally permanent (does not terminate, despite therapy with drugs or electrical cardioversion and no further attempts to restore sinus rhythm will be undertaken (de Vos et al., 2010; January et al., 2019). Various factors are associated with AF progression including valvular disease, alcohol consumption, age, left atrial dimension and the degree of atrial enlargement over time, stroke, COPD, hypertension, and CHF (de Vos et al., 2010).

The loss of coordinated atrial contraction with each beat in AF leads to variability in ventricular filling and sympathetic activation (January et al., 2014). To be sustained, AF requires an initiating trigger and an anatomic substrate. Symptoms of AF may include varying degrees of fatigue, weakness, chest pain, palpitations (feeling of fluttering or pounding of the chest), shortness of breath, activity intolerance, hypotension, syncope, or CHF; however, AF may often be asymptomatic (January et al., 2014). Serious complications from AF include CHF, thromboembolic events, and stroke. Tachycardia-induced ventricular dysfunction and cardiomyopathy from asynchronous myocardial contraction may also occur, typically when the ventricular rate is not adequately controlled (January et al., 2014; Martin & Lambiase 2017). Ventricular contractility is inconsistent in AF due to diastolic filling variability and changes in force intervals; resulting in decreased in cardiac output and increased filling pressures which can lead to

CHF (January et al., 2014).

Mathematical models of human myocytes explain the mechanism of AF. Atrial tachycardia remodeling (ATR) shortens atrial refractoriness by decreasing action potential duration, primarily by down regulation of calcium ion current channels (I*ca*) and increased inward rectifier potassium current channels (I*k*) and acetylcholine-dependent potassium current (I*kAch*); (Nattel et al., 2008; Ni et al., 2018). ATR impairs atrial contractility by causing calcium handling abnormalities resulting in atrial dilation that further promotes reentry. ATR consistently decreases transient outward potassium current (I*to*); producing an outward current component that opposes inward sodium current during action potential upstroke (Nattel et al., 2008; Ni et al., 2018). Thus, I*to* down regulation (decreasing the number of receptors on the surface of target cells, making the cells less sensitive to a hormone or another agent) may facilitate wave propagation by indirectly increasing action potential amplitude (Nattel et al., 2008). Result in reduced current densities of I*ca* and of I*to* in rapid atrial pacing found in human AF (Nattel et al., 2008; Ni et al., 2018). I*to* is related to cardiac memory and modulates the amplitude of current response to an extra stimulus, or a train of stimuli applied at a frequency that is within the rapidly changing phase of I*to* reactivation. The current does not turn off or deactivate completely and produces marked changes in atrial myocyte response time, altering the short-term firing rate of an ectopic focus (Ni et al., 2018).

The pathogenesis of AF is the interaction between initiating triggers, often in the form of rapidly firing ectopic foci located inside one or more pulmonary veins, and an abnormal atrial tissue substrate capable of maintaining the arrhythmia (Nattel et al., 2008; Ni et al., 2018). Inward calcium currents cause the membrane potential to plateau, which

contributes significantly to the action potential duration. At rapid atrial rates such as those during periods of fibrillation, the repeated inward calcium current significantly increases myocyte calcium load.

Rapid, disorganized electrophysiological and contractile activity of the atria during AF episodes is likely to result in affected atrial tissue being under perfused and somewhat ischemic. Van Bragt et al. (2014) found an increase in lactate production during acute AF, suggesting blood flow to the left atrium is not sufficient to meet its metabolic demands. AF favors ischemia and structural changes resulting in fibrosis (Van Bragt et al., 2014). AF causes an increase in coronary blood flow demand exceeding the perfusion reserve such that there is a supply-demand mismatch of the atrial myocardium (Van Bragt et al., 2014). In the chronic state, this mismatch might result in recurrent bouts of atrial ischemia. Insufficient oxygen supply to the left atrium results in electrical and structural remodeling (i.e., fibrosis; De Boer et al., 2003), an irreversible structural change that causes an exacerbation of ischemia due to longer oxygen diffusion pathways through the tissue. Fibrosis also leads to electrophysiologic changes favoring re-entry pathways (De Boer et al., 2003). Labovitz & Meriwether, (2016) report AF was associated with higher levels of prothrombotic factors, endothelial dysfunction, and markers of platelet activation. Studies found decreased left atrial appendage velocity less than 20 cm/s indicates a high risk of subsequent cerebral ischemia in these patients (Labovitz & Meriwether, 2016). AF related strokes occur when a blood clot forms in the left atrium, then emboli to a cerebral blood vessel lining limiting blood flow to the brain.

Minimizing symptoms, physical limitations and quality of life decline associated with AF are important aspects of AF treatment. Comorbid conditions may exacerbate AF

symptoms and therefore must be evaluated in conjunction with AF health related quality of life. Well known AF culprits include sleep apnea, excessive alcohol use, smoking, high blood pressure, sedentary lifestyle, and cardiometabolic disease. Women with a diagnosis of AF were at higher risk for ischemic stroke and thromboembolism and had worse outcomes and higher rate of recurrences after cardioversion (Wyse et al., 2002). The pathophysiologic mechanism in thromboembolism in women versus men is unclear. Decreasing negative consequences associated with SDOH risk factors in AF starts with understanding screening, prevention, and treatment of AF in ethnic minorities.

Strategies for Atrial Fibrillation Management

The treatment for AF includes medications to control the heart rate and rhythm, and anticoagulants to prevent blood clot formation and reduce the risk of stroke and other thromboembolic events. Procedures to treat AF include cardioversion, percutaneous catheter ablation, and surgical ablation via thoracotomy (e.g., Maze ablation). Left atrial appendage closure devices (Watchman or Amplatzer Amulet) are used to decrease the likelihood of forming clots in patients with AF who cannot tolerate long term anticoagulation. Higher thromboembolic risk guides the decision to treat patients with anticoagulation therapy to mitigate the risk of stroke and other thromboembolic events. Traditionally, a well-validated point-based system referred to as the CHA2DS-VASc score is used to risk stratify patients in this regard; although this is typically limited to patients with non-valvular AF, defined as AF in the absence of significant mitral stenosis (Olsen et al., 2011). The CHA2DS2-VASc score includes several variables for which 1 or 2 points are allotted: CHF = 1, Hypertension = 1, Age greater than or equal to 75 years = 2, Diabetes mellitus = 1, prior Stroke or transient ischemic attack or other

thromboembolic event = 2, Vascular disease (defined as myocardial infarction, peripheral arterial disease, or aortic plaque) = 1, age greater than or equal to 65 =1, and Sex category (female gender =1). Cumulative scores of 2 or greater portend a higher statistical risk of stroke therefore the expert consensus guidelines recommend oral anticoagulation for these patients. These clinical decisions, however, are affected by several additional factors including medication side effects, intolerances, and other safety issues, as well as cost considerations. Likewise, another scoring system is often utilized in conjunction to assess bleeding risk associated with anticoagulation use. The HASBLED score is also a well validated point-based system, and includes Hypertension, Abnormal Renal/Liver Function, Stroke, Bleeding History or Predisposition, Labile INR, Elderly, Drugs/Alcohol. Each variable is assigned 1 point and a score 3 or above is considered high risk for bleeding, posing a clinical challenge in medication management and stroke risk mitigation. In select cases with high CHA2DS-VASC scores and high HASBLED scores, patients may benefit from alternative (nonpharmacologic) stroke risk mitigation strategies such as left atrial appendage closure.

Oral anticoagulation treatment options include direct oral anticoagulants (DOACs), which directly target thrombin and factor Xa in the coagulation cascade; and Warfarin (a vitamin-K antagonist, VKA). DOACs are a relatively novel option in the 21st century compared to VKA therapy and have demonstrated noninferiority to the latter in several head-to-head clinical trials in stroke prevention (Roberti et al., 2021). DOAC therapy has quickly become the preferred choice due to favorable pharmacokinetics and pharmacodynamics. Currently, one caveat limiting widespread DOAC use is the FDAs nonvalvular AF label, restricting DOAC use in patients with significant mitral stenosis

(or other valvular etiologies for AF). Until generic formulations become available, cost is another prohibitive factor for DOACs, limiting their use in certain patient populations (Quirino et al., 2009).

The correlation between AF symptoms and documented cardiac arrhythmia is inconsistent (Quirino et al., 2009). While studies have found AF therapies can be associated with improvement in symptoms, quality of life, functional status, and emotional status (Atwood et al., 2007; Mohanty et al., 2014); certain medications, such as beta blockers and antiarrhythmic drugs, have not been shown to reduce the risk of stroke, and may further contribute to polypharmacy (Quirino et al., 2009). Basing AF treatment on symptoms alone may be insufficient in ethnic minorities. Differences in clinical outcomes by ethnicity, education, health literacy, and environmental characteristics have rarely been examined. Current AF management may be worsening health disparities by failing to account for differences in patient reported outcomes by ethnicity, race, and gender.

Quality of Life

Individuals with AF report varying degrees of worsening quality of life related to symptomology, and medications side effects, which may result in anxiety. A study by Dubard and Gizlice, (2008) found poor health is more likely to be reported by Spanish speaking Hispanics (39%) than English speaking Hispanics (17%; $p < .001$).

Self-reporting on health-related quality of life questionnaires uncovers the significance of health to the individual. The Atrial Fibrillation Effect on Quality of Life (AFEQT) instrument measures quality in patients diagnosed with AF. Despite self-assessment of health-related quality of life being an important precursor to behavior

change, rarely do lifestyle change studies examine its possible influence along with ethnic preferences and demographics in adults. Research is needed on Social Determinants of Health (SDOH) related to AF and the identification of risk factors in racial and ethnic minorities to design and deliver preventive interventions appropriate for ethnic minorities dealing with AF.

Social Determinants of Health

The SDOH are the conditions in which people are born, grow, live, work, and age (World Health Organization [WHO], 2008). For example, a person's neighborhood walkability and available resources can influence health behaviors. Medi-Cal, California's federal Medicaid program, has limited focus on contributing sociodemographic variables influencing disease prevalence, leading to widening mortality disparities between social classes and health inequities (Koch et al., 2010). Despite spending the most on medical care, the United States ranks lower in life expectancy and infant mortality compared to other affluent nations (Koch et al., 2010). Even with expanded health insurance coverage, key racial disparities in health outcomes persist among races and genders (Koch et al., 2010). Behavioral patterns and lifestyle choices associated with poor health and health-related deaths in the United States are shaped by income, education, and employment (Koch et al., 2010). Factors such as access to pharmacies, health literacy, education level, and income status play a significant role in explaining how SDOH affects health behaviors.

Living in a society with a legacy of racial discrimination affects psychobiologic pathways, even without overtly discriminatory incidents (Broyles et al., 2012). The relationship between income-health and education-health reflects reverse causation;

sickness can lead to income loss and lower educational achievement (Braveman et al., 2005). Socioeconomic factors can influence health-related behaviors that may affect disease outcomes much later in life (Braveman et al, 2005). Environmental conditions can also impact health. Less availability of fresh foods combined with increased fast-food outlets and limited recreational opportunities, lead to poor nutrition and sedentary lifestyles, often causing obesity and worsening cardiovascular disease. Children growing-up in socioeconomically disadvantaged neighborhoods often experience emotional and psychological stress due to chronically inadequate resources (Braveman et al., 2005).

Some studies explain the biological wear and tear from chronic exposures to social and environmental stressors as allostatic load, which affects biological regulatory systems in response to social and environmental stress (Broyles et al., 2012). For example, stress can induce pro-inflammatory responses, leading to the production of IL-6100 and C-reactive protein, which are associated with early onset atherosclerosis (Liu et al., 2017). Additionally, lower income and educational achievement contribute to higher blood pressure and unfavorable cholesterol profiles (Broyles et al., 2012).

Access to Healthcare

Access to healthcare is worse for Spanish-speaking Hispanics than for English-speaking Hispanics. One study found 55% of Spanish-speaking Hispanics lacked health insurance, and 58% did not have a personal doctor compared to English-speaking Hispanics, where 23% ($p < .001$) lacked health insurance, and 29% ($p < .001$) did not have a personal doctor (DuBard & Gizlice, 2008).

Residents of Black and Hispanic neighborhoods travel farther to the nearest pharmacy to get their prescription medications, increasing risk of poor medication

adherence. Between 2010 to 2015, there were 2,663 newly opened pharmacies, with only 301 (11.3%) located in Black or Hispanic neighborhoods that previously lacked a pharmacy (Guadamuz et al., 2021). Pharmacy closure rates were lower in neighborhoods with a predominantly White population (11.0%) and diverse population (11.7%), and highest in neighborhoods with a predominantly Black (14.1%) and Hispanic (15.9%) population ($p < .05$; Guadamuz et al., 2021). More recently, in a 2021 California study, by Guadamuz et al., pharmacy closures were highest in Latino neighborhoods compared to White neighborhoods in Los Angeles (14.2% vs. 8.3% respectively) and San Jose (37.5% vs. 2.5% respectively).

Symptom Burden

AFEQT measures quality of life in AF across four domains: symptom burden, daily activities, treatment concerns, and treatment satisfaction. AFEQT defines AF symptoms as palpitations, irregular heartbeat, a pause in heart activity, and lightheadedness or dizziness. Higher AF symptom severity is associated with a lower quality of life and a high burden of psychological distress.

Smartphone applications using biowearable technologies enable heart rhythm monitoring and surveillance, empowering individuals to correlate high quality ECG recordings with symptom burden. This has also resulted in quicker arrhythmia detection and earlier time to diagnosis for asymptomatic patients, including earlier detection of arrhythmia recurrence after a rhythm-control intervention. In select patients, this can facilitate self-management strategies, (based on individualized treatment protocols, under the supervision of their care providers).

One study using AFEQT scores to demonstrate symptom burden on quality of life

found that heavier users of smartphone technology to monitor their rhythm were driven by higher symptom burdens; while other equally symptomatic patients were categorized as infrequent users due to feeling overwhelmed, affecting their willingness to engage in monitoring (Masterson Creber et al., 2022).

Hispanics/Latinos

Hispanic refers to Spanish-speaking Latin American people or people of Spanish-speaking descent (Merriam-Webster, 2021a). Latino is the abbreviated word for people born in Latin America or descendant of Latin American people living in the United States, regardless of their ability to speak Spanish (Merriam-Webster, 2021b). AF in Hispanics is not well understood, perhaps related to poor screening, or poor enrollment in clinical trials or poor health literacy. A study by Simpson et al. (2010), found that a lack of high school education was associated with stroke in both Mexican Americans and non-Hispanic Whites. It may contribute to poor adherence, dietary restrictions, or be a marker of lower socioeconomic status (SES).

A study by Linares et al. (2019) using a sample of diverse Hispanics and Latinos found that the overall AF prevalence was low across Hispanic/Latino backgrounds independent of clinical or demographic factors. These findings are paradoxical given the poorer AF risk factor profile in Hispanics and Latinos, which would suggest a higher AF burden in this group. Notably, Linares also found AF prevalence varied significantly across Hispanic/Latino groups, with the highest burden among Caribbean Hispanics.

In another study, Dewland et al. (2013) found White people had an increased risk of AF compared to Asians, Hispanics, and Blacks. These findings are congruent with multiple studies showing that Black people, despite having a higher burden of traditional

AF risk factors, experience a substantially lower rate of AF when compared with White people. The heightened risk associated with the White population was most pronounced in the absence of established AF risk factors, compatible with the presence of alternative disease mechanisms. These findings argue against a protective effect unique to Black people and instead suggest unidentified mechanisms separate from traditional AF risk factors.

Barriers

A fee-for-service reimbursement system presents challenges for upstream stroke prevention in AF patients by not encouraging prospective care planning or prevention. Treatment should focus on patient preferences and goals, independent of the type of provider; yet state licensing variations in scope of practice for nonphysician clinicians, as well as limited reimbursement for nonphysicians, limit access to specialty care for AF.

Risk factors for poor medication adherence among AF patients include sociodemographic characteristics, lifestyle factors, patient insight (self-awareness of health), poor health literacy, poor sleep hygiene, and mental health issues. Existing studies have reported AF, as a predominately White problem based on studies with mostly White enrollment (Koch et al., 2010; Shulman et al., 2017). Ethnic minorities suffer from a higher risk of stroke and heart attack; however, they are less well screened for AF, and have been under-enrolled in AF research studies. Screening measures, including in-office ECG testing for the diagnosis of AF requires access to care providers. Although independent smartphone applications and biowearable devices are becoming increasingly available, outcome data are limited, and individuals with subclinical arrhythmias may experience added psychological burden. The Framingham study

identified depressive symptoms, including anxiety, as barriers to medication adherence (Hennein et al., 2018). Further research is needed to improve utility and applicability of biowearable ECG data, particularly in ethnic minority communities.

Purpose of the Study

The purpose of this study was to explore the SDOH, select sociodemographic, and symptom burden in Hispanic/Latino adults compared to non-Hispanic/Latino adults with AF who receive rhythm control and rate control treatments.

Research Questions

Question 1. Do Hispanic/Latino adults with AF have a higher likelihood of receiving rate or rhythm management when compared to non-Hispanic adults?

Question 2. Do Hispanic/Latino adults travel farther for treatment when compared to non-Hispanic adults?

Question 3. Do Hispanic/Latino adults with AF receiving rate or rhythm management belong to higher SES, as measure by employment status and education level?

Question 4. Are there gender differences in Hispanic/Latino adults who receive treatment for AF?

Specific Aims

Aim 1. Describe select sociodemographic (race, ethnicity, age, gender) and clinical characteristics (hypertension, body mass index, diagnosis, smoking status, alcohol use), symptoms, SDOH (insurance, employment status, residence zip code, travel distance to hospital), and AF management (drugs, interventions) in adult Hispanic/Latino participants with AF receiving care at an urban hospital in Northern California.

Aim 2. Examine associations among select sociodemographic (race, ethnicity, age, gender) and clinical characteristics (hypertension, body mass index, diagnosis, smoking status, alcohol use), symptoms, SDOH (insurance, employment status, residence zip code, travel distance to hospital), and AF management (drugs, interventions) in adult Hispanic/Latino participants with AF receiving care at an urban hospital in Northern California.

Aim 3. Analyze the type of treatment received (rate or rhythm control) among Hispanics/Latinos and non-Hispanics.

The study premise is that AF is under diagnosed and under treated in racial and ethnic minorities specifically Hispanics/Latino. Findings will inform interventions to screen AF, design preventive measures for AF, and cardiovascular disease risk reduction in racial and ethnic minorities.

Significance

In 2022 the WHO defined health equity as the ability for everyone to have a fair chance and just opportunity to be healthy. Steps to achieve equity include removing obstacles, (such as poverty, discrimination, and their consequences), and enabling fair pay, quality education and housing, safe environments, and access to healthcare. Equity involves the recognition and management of AF across minority populations with a focus on interventions to promote an improved quality of life for people diagnosed with AF.

Positive behavioral changes and other timely interventions enable people to monitor and maintain their health (Murdaugh et al., 2019). Previous studies show that education and intervention are effective, if they emphasize behavior rather than knowledge alone (Murdaugh et al., 2019). Previous research has not described

preferences of AF treatment modalities or self-assessed symptom burden in ethnic minorities. Research is needed to facilitate the adoption and maintenance of AF screening programs, as well as prevention and management resources in minority adults living in the United States, specifically in South Bay California.

Current treatment guidelines emphasize patient symptoms in basing clinical treatment decisions (Gleason et al., 2019), although, studies have found great variability in symptomology among AF presentations. Research has also demonstrated that therapies for AF, including medications for rate and rhythm control, cardioversions, and ablations, are related to improvements in symptom experience, quality of life, functional status, and emotional status (Gleason et al., 2019). However, the effects of therapies on symptomatology and patient-reported outcomes are variable and very little is known about influence of individual characteristics, including ethnicity, race, gender, age, employment, and education level, on these outcomes (Gleason et al., 2019). Differences in clinical outcomes based on various treatments, further analyzed by gender, age, and education are well-documented in other cardiovascular diseases (Gleason et al., 2019), but these have been seldom examined in AF. Current AF management approaches may be widening the health disparities gap by failing to consider differences in patient-reported outcomes by these key characteristics.

The American Association of Colleges of Nursing (AACN) goals for nurses include addressing pervasive inequities in healthcare (AACN, 2021), so that nurses can meet the needs of all individuals in a diverse American society. Nurse Practitioners can strengthen routine procedures to assess and respond to social needs through screening, referrals, and social resources for the communities they serve. Clinicians can partner with

public health workers to develop health-promotion strategies that reach beyond individual clinical services to communities, in turn transforming living and working environments to improve health and healthy behaviors.

Finally, nursing research must include mechanisms by which social factors influence health, and investigate which strategies are most valuable. Nurses must form key networks for local, state, and national policymakers to help identify crucial issues of health equity for those living in underserved populations. Personal impetus stems from Pope Francis Laudato Si, numbers 49, 91: Concern for the environment needs to be linked to a sincere love for our fellow human beings and an unwavering commitment to solving the problems in society.

Research Conceptual Framework

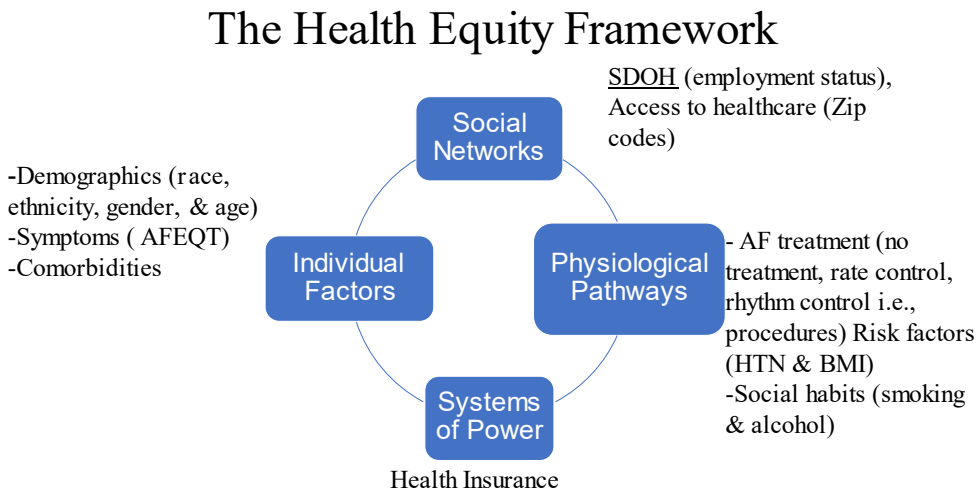

Figure 1. The Health Equity Framework. Adapted from Peterson et al. (2021). The health equity framework: A science- and justice-based model for public health researchers and practitioners. *Health Promotion Practice, 22*(6), 741–746. https://doi.org/10.1177/1524839920950730

Chapter 2

Review of the Literature

Search Methodology

The literature review included one systematic review, seven randomized controlled trials, 22 cross-sectional studies, and three longitudinal studies. A keyword search was performed within four major databases including CINAHL, Medline (PubMed, Ovid) EBSCOhost, EMBASE (Elsevier) and Google Scholar for: *atrial fibrillation, atrial fibrillation symptoms, atrial fibrillation management, AF treatment modalities, AF* and *Hispanics, AF screening, SDOH* and *AF in Hispanic Americans*. The article selection process for the literature review can be found in Appendix A. Final article selection was based on (a) relevance to the thesis question of interest, (b) citation frequency by AHA/ACC/Heart Rhythm Society management guideline (January et al., 2019), and (c) evidence with a level A-B grading. The reference lists of all included publications were then reviewed to identify three additional eligible studies. The author selected these steps to better capture the most available data and the highest quality of evidence.

A review of 33 studies on the AF screening, management, environmental and demographic implications influencing outcomes were found. The diagnosis is typically made by capturing the presence of AF on a 12-lead ECG or an ECG rhythm strip. Studies support that White people are more likely to be diagnosed with AF when compared to other races. Similarly, men are diagnosed with AF more frequently than women, who are more likely to have worse outcomes (Hindricks et al., 2021). AF in Hispanics is not well understood perhaps related to poor screening or poor enrollment in clinical trials and

SDOH limiting their access to medical care.

Demographics

Studies indicate the prevalence of AF increases with age. It is uncertain whether the prevalence of AF differs by race and ethnicity, although multiple studies suggest it is primarily a White disease. Perhaps lack of screening and lack of enrollment in longitudinal studies for Hispanics and other ethnic minorities are responsible for these skewed data. Risk factors for AF include pre-existing heart disease, hypertension, diabetes, stroke, cardiothoracic surgery, sleep apnea, obesity, hyperlipidemia, hyperthyroidism, smoking, alcohol use, drug use, and ECG features of left ventricular hypertrophy or left atrial enlargement (Fitzmaurice et al., 2007).

Atrial Fibrillation Screening

Clinical screening for AF requires minimal resources, and typically includes physical examination with palpation and auscultation for an irregular heartbeat followed by confirmatory ECG. Treatment for AF with the oral anticoagulant Warfarin is also inexpensive, reduces stroke risk by 68%, and has been shown to reduce mortality by 25% when compared to placebo (Fitzmaurice et al., 2007). However, in 2022, the USPSTF established that there is not enough evidence on the advantages of AF screening in asymptomatic adults, younger than 50 years of age, without a personal history of stroke or transient ischemic attack.

Currently, several AF screening formats are available, including external monitors of varying duration (from 24 hours to 30 days), bio-wearable devices (such as the Apple iWatch and Kardia Mobile gadgets), as well as subcutaneous implantable cardiac rhythm monitors. Bio-wearables have gained FDA approval for use, and have demonstrated

efficacy in AF diagnosis, although there is debate regarding risk of stroke in cases of subclinical AF, (described as asymptomatic AF incidentally detected when monitoring is being performed for other non-AF related issues), and in some cases these devices have been associated with increased anxiety.

Research has shown that there is no significant difference between physical exam including pulse palpation versus ECG in screening for the detection of new AF cases (Halcox et al., 2017; USPSTF, 2022). However, data from The Screening for AF in the Elderly (SAFE) trial found a statistically significant increased AF detection rate (0.6% absolute increase) using a Zio-patch (continuous 2-week external ambulator monitor) when compared to in-office ECG (USPSTF, 2022). The Assessment of Remote Heart Rhythm Sampling Using the AliveCor Heart Monitor to Screen for Atrial Fibrillation (REHEARSE-AF) trial found a statistically significant 2.8% absolute risk increase in detection of AF using single handheld twice weekly single-lead ECG versus no screening in 12 months (USPSTF, 2022). The STROKESTOP trial found a statistically significant 1% absolute risk increased detection of AF at 6 months continuous screening (USPSTF, 2022).

Chew et al. (2022) found that patients older than 65 years with detection of AF episodes on a cardiac implanted electronic device (CIED) lasting for over 24 hours had an increased risk of cardiovascular hospitalization with an adjusted hazard ratio 1.14 (95% CI 1.12 to 1.13, $p < .001$); as well as ischemic stroke, adjusted HR of 1.22 (95% CI 1.22 to 1.23, $p < .001$); and all-cause mortality, adjusted HR 1.22 (95% CI 1.22 to 1.22, $p < .001$). Similar findings were reported in the ASSERT trial with subclinical AF duration > 24 hours having a clinically meaningful risk for stroke with adjusted hazard ratio of

3.24 (95% CI 1.51 to 6.95, p = .003; Van Gelder et al., 2017).

New digital technologies for diagnosing AF show potential for innovative screening. Continuous ECG screening performed using the Zio-patch monitor resulted in a higher rate of AF diagnosis and increased healthcare utilization, including more frequent cardiology visits, greater initiation of anticoagulants and antiarrhythmic drugs, as well as a small increase in pacemaker placements (Steinhubl et al., 2018). Early recognition of AF could encourage the implementation of strategies to prevent its progression, such a treatment of sleep apnea or morbid obesity (Steinhubl et al., 2018). In summary, AF can impair quality of life well beyond symptom burden or disease severity.

Risks of Atrial Fibrillation Screening

Increased resource utilization following ECG screening has been used by the USPSTF as an argument against screening people younger than 55 years of age (USPSTF, 2022). Additionally, there was a significantly increased risk of pacemaker implantations post AF screening (Steinhubl et al., 2018). Although adequate anticoagulation lowers the risk of stroke, studies have found it is not started in a timely manner (Fang et al., 2005). Additionally, some patients may respond poorly to medical therapy for AF, resulting in serious adverse effects and further extracardiac consequences (Hindricks et al., 2021; Wyse et al., 2002).

Benefits of Atrial Fibrillation Screening

Enhanced surveillance over a period of 50 years found an increased AF prevalence of 25.7% per 1000 person-years in men, and 11.8% per 1000 person-years in women (p-trend < .0001) in the Framingham community (Schnabel et al., 2015). This supports the implementation of measures to enhance the early detection of AF using

targeted screening programs and the need to counteract risk factors. Although there may be an immediate cost increase due to increased healthcare utilization it is not as costly as the potential debilitating consequences of stroke, hospitalization, and thrombectomy or tissue plasma activator for emergency use (Steinhubl et al., 2018).

The STROKESTOP study found significantly lower stroke, systemic embolism, bleeding, and all-cause mortality in the AF screening group when compared to no screening (USPSTF, 2022). Early recognition of AF may encourage the implementation of strategies to prevent its progression such as therapeutic lifestyle modifications, including sleep apnea treatment, blood pressure control and obesity management (Steinhubl et al., 2018). Such modifications, in addition to several interventions targeting AF rhythm control, could be considered successful indicators in AF management (Chew et al., 2022).

Five studies reported maintaining sinus rhythm improved cardiovascular outcomes (Kirchhoff et al., 2020, Marrouche et al., 2018, Turagam et al., 2019, Van Gelder et al., 2002; Wyse et al., 2002). In the ASSERT trial, clinically meaningful risk emerged with AF durations > 24 hours (Van Gelder et al., 2017). Challenges exist in clinical practice with lack of explicit differential measures of AF (longest duration of AF, number of AF episodes during a monitoring period, and proportion of time in AF during a monitoring period expressed as a percentage). Additional research is necessary to uncover individual characteristics (i.e., age, comorbidities, and overall AF) that influence stroke risk in addition to the duration of AF (Steinhubl et al., 2018).

Atrial Fibrillation Symptoms

People with AF are more likely to experience symptoms due to poor rate control (Wyse et al., 2001). Therapy to maintain sinus rhythm is chosen with the goal of reducing symptoms and risk of stroke, improving exercise tolerance and quality of life, and in certain patients, improving survival (Wyse et al., 2001). A common symptom in patients with AF is reduction in exercise capacity or tolerance (Atwood et al., 2007). Wyse et al., (2002) found that regardless of symptoms, a history of AF was a significant independent predictor of mortality with a relative risk 1.2 (95% CI 1.03 to 1.40, $p = .020$).

Atrial Fibrillation Management

Risk for thromboembolic stroke must be assessed in every patient with AF to implement preventive measures. Medication therapy management is important and must be guided using assessment instruments and strategies to prevent strokes. Additionally, medication management for rate control and rhythm control requires vigilance in drug side effects, interactions, and alternative therapies to minimize interactions.

Anticoagulation

Guidelines recommend individualizing shared decision-making in discussions of absolute risks, relative risk of stroke, and bleeding, as well as the patient's preferences (January et al., 2019). The CHA2DS2-VASc scoring system is frequently used to assess thromboembolic risk and initiate anticoagulant therapy, regardless of whether AF is paroxysmal, persistent, or permanent. To prevent thromboembolism, it is recommended to start a factor Xa inhibitor or direct thrombin inhibitor before cardioversion followed by long-term anticoagulation for patients with AF and CHA2DS2-VASc score 2 or greater in men or 3 or greater in women (January et al., 2019). Percutaneous left atrial appendage occlusion devices (Watchman or Amplatzer Amulet) should be considered for AF

patients with increased risk for stroke or thromboembolic events and who have a contraindication to long-term anticoagulation (January et al., 2019). Some patients undergoing cardiothoracic surgery may have surgical excision of the left atrial appendage to decrease the risk of thrombus formation if they develop AF, a common occurrence post cardiothoracic surgery (January et al., 2019).

Active monitoring was associated with a higher rate of initiation of anticoagulation therapy and treatment for AF (Steinhubl et al., 2018). In the Stroke Prevention using an ORal Thrombin Inhibitor in atrial Fibrillation (SPORTIF) trials, women older than 75 diagnosed with AF had more risk factors for stroke than men, were prone to more anticoagulant-related bleeding, and had a higher thromboembolism rate due to more frequent interruption of anticoagulant therapy. They were also less likely to receive cardiovascular medications (Gomberg-Maitland et al., 2006). Conclusions must be viewed with caution due to the small sample of females (31%).

Treatment for Rate and Rhythm Control

The main goal of AF management is preventing stroke and managing symptoms. Symptoms are managed by controlling the heart rate and restoring normal heart rhythm. Two randomized control trials: the RAte Control versus Electrical cardioversion for persistent atrial fibrillation (RACE) and the Atrial Fibrillation Follow-up Investigation of Rhythm Management (AFFIRM) found improved symptom management in patients with AF that had ventricular rate control (hazard ratio of 0.73, 90% CI 0.37-1.01) and sinus rhythm restoration (hazard ratio of 1.34, 95% CI 1.12 to 1.12) and prevented major adverse cardiac events (Van Gelder et al., 2002; Wyse et al., 2002). Restoring normal rhythm includes electrical or pharmacological cardioversion and cardiac ablation.

Catheter-based ablation techniques are more common due to their minimally invasive approach; although surgical ablations are also often elected (despite greater morbidity associated with thoracotomy). The Early Treatment of Atrial Fibrillation for Stroke Prevention Trial 4 (EAST-AFNRT 4) demonstrated early pharmacological and nonpharmacological strategies reduced arrhythmia recurrence and improved cardiovascular outcomes (Kirchhof et al., 2020); although rhythm control strategies, including ablation, have variable efficacy (Chew et al., 2022).

Rate control in the absence of hypotension, CHF, and accessory pathways involving using intravenous beta blockers or calcium channel blockers is often recommended as a first line strategy in the acute setting (January et al., 2019). For patients with CHF in the absence of accessory pathway, digoxin or amiodarone may be considered (January et al., 2019). Antiarrhythmic therapy should be used with caution in patients with sinus or AV node dysfunction unless pacemaker is present (January et al., 2019).

The AFFIRM study found in high-risk patients with AF, the management of AF with rhythm control using cardioversion did not offer a significant survival advantage when compared to rate control (Wyse et al., 2002). Nonetheless, the quality of life was improved in the rhythm control strategy (cardioversion) due to lower risk of adverse drug effects (Wyse et al., 2002).

Wyse et al. (2002) compared patients who choose either rate versus rhythm control upon diagnosis of AF. Some patients chose rate control using drugs (i.e., beta blockers and calcium channel blockers, and digoxin). When drugs failed, they opted for radiofrequency ablation to modify or eliminate atrioventricular conduction (Wyse et al.,

2002). Other patients chose rhythm control due to worsening symptoms stemming from having both AF and CHF. Wyse et al. (2002) reported no significant difference in mortality between rhythm control and rate control in a study of adults 65 years or older with high risk for stroke. Rhythm control and rate control for AF did not show a significant difference in death, disabling stroke, disabling anoxic encephalopathy, major bleeding, or cardiac arrest (Wyse et al., 2002).

Restoration of sinus rhythm for symptoms and quality of life improvement with various antiarrhythmic drugs, including flecainide, propafenone, sotalol, dofetilide, or amiodarone is recommended for pharmacologic cardioversion (January et al., 2019). Additionally, some patients had difficulty maintaining sinus rhythm or experienced intolerable side effects with medications, which led them to abandon the rhythm control strategy and opted for other treatment options (Wyse et al., 2002).

Cardioversion. AF progresses from paroxysmal to persistent over time due to electrical and structural remodeling (January et al., 2014). If medical therapy fails, electrical cardioversion using external energy is often considered. This is considered to be a noninvasive elective procedure wherein patients are temporarily sedated and typically receive 50 to 200 Joules of electrical current through the chest wall, in order to abruptly stop the cardiac arrhythmia, which allows restoration of normal sinus rhythm.

Catheter Ablation. Catheter ablation has become an important treatment option for patients with AF, particularly those who have failed or cannot tolerate antiarrhythmic medications; although as technology continues to evolve, ablation is increasingly becoming a reasonable first line treatment option. The decision to undergo an ablation may be influenced by factors. Pulmonary vein isolation is the cornerstone of any AF

ablation, wherein the electrical connections between the pulmonary veins and the left atrium are interrupted. This procedure aims to correct the abnormal electrical signals causing AF (which typically originate in and emanate from the pulmonary veins) reducing symptoms and minimizing AF recurrence. The pulmonary vein-left atrial junctions are the classic ablation site, targeting myocardial sleeves that extended further into the pulmonary veins; although AF triggers can also arise from other anatomic sites, including the posterior left atrium, the Ligament or Vein of Marshall, from within the coronary sinus, the superior vena cava, and other site, including the interatrial septum, and the appendages (January et al., 2014).

Catheter ablation for AF is reasonable in symptomatic patients and has been shown to lower mortality and reduce hospitalization in AF patient with CHF and reduced left ventricular ejection fraction (January et al., 2019).

Research has shown that catheter ablation is superior to medical therapy in enhancing patient freedom from recurrence of atrial arrhythmias in both the short and long term, regardless of AF type (Mohanty et al., 2014; Skelly et al., 2015). However, it is worth noting that repeat ablation procedures are sometimes required due to the complexity of the condition.

Catheter ablation has demonstrated its potential to improve exercise performance and quality of life even in asymptomatic patients with long-standing persistent AF, highlighting its broader impact on patients' overall well-being beyond symptom relief (Mohanty et al., 2014; Skelly et al., 2015). Overall, catheter ablation is important and effective tool in the management of AF, providing benefits in rhythm control, symptom improvement and potential long-term outcomes for patients with this arrhythmia. It is

essential for healthcare providers to consider individual patient preferences and factors when determining the most appropriate management approach for AF.

Differences in Atrial Fibrillation Management in Rural and Urban Areas

The disparities in AF care between rural and urban areas are concerning and can have significant implications for patient outcomes. Research has shown that adults with AF living in rural areas may not consistently receive primary care that adheres to clinical guidelines, which can lead to suboptimal management of the condition. Such that patients living in rural communities had an overall higher in-hospital mortality rates compared to their hospitalized urban counterparts (O'Neal et al, 2018; Rush et al., 2019).

One of the challenges faced by rural patients with AF is the higher prevalence of sleep apnea and decreased exercise tolerance, which can complicate the management of the condition and contribute to poor health outcomes (O'Neal et al., 2018). Additionally, rural patients had limited access to specialists and healthcare facilities, which further impacted the quality of care they received. Urban hospitals were more likely to report direct external electrical cardioversion and catheter ablation procedures than rural hospitals independent of sex, race, or region (O'Neal et al., 2018). A higher percentage of patients admitted for AF died in rural (1.3%) versus urban hospitals (1%, $p < .001$) independent of treatment with either external electrical cardioversion or catheter ablation procedures performed (OR = 1.14, 95% CI 1.01 to 1.28; O'Neal et al., 2018). Urban hospitals tend to be more equipped to perform specialized procedures such as direct external electrical cardioversion and catheter ablation for AF. As a result, patients in urban areas may have better access to these treatments compared to their rural counterparts.

The higher in-hospital mortality rates observed in rural hospitals for AF patients are a cause of concern and highlight the need for improvements in healthcare access and delivery in rural communities (O'Neal et al., 2018; Rush et al., 2019). Efforts to address these disparities may involve increasing the availability of specialized care in rural areas, improving care coordination between rural and urban facilities, and promoting awareness and education about AF management among healthcare providers in rural settings.

Overall, addressing the disparities in AF care between rural and urban areas is crucial to ensure that all patients receive timely and appropriate treatment for this condition, regardless of their geographic location.

Gender Differences

The differences in AF risk, incidence, and treatment between men and women highlight the importance of considering gender-specific factors in the management of AF. Research has shown that women with AF have higher annual incidence rates of thromboembolism (stroke and peripheral embolism) compared to men, even when controlling for risk factors (Fang et al., 2005). This suggests that women may have a greater independent risk of thromboembolism associated with AF.

Treatment options for women with AF may also be unequal; with studies indicating that less than 50% of women with indication for anticoagulation are prescribed an anticoagulant (Shantsila et al., 2015). Despite similar proportions of time in anticoagulation therapeutic range, women have been found to have a higher risk of stroke and thromboembolism compared to men in certain trials (the SPORTIF III and SPORTIF V); indicating potential differences in treatment response between genders (Shantsila et al., 2015). In the Framingham Heart community study after 50-year surveillance there

was an observed increased AF incidence (3.7 per 1000 person-years in men, $p = .006$; 1.58 per 1000 person-years in women, $p = .130$) and increased AF prevalence 25.7% per 1000 person-years in men, 11.8% per 1000 person-years in women with a statistically significant trend across time periods p-trend < .0001 (Schnabel et al., 2015).

Gender differences in cardiac electrical signaling, such as maximum sodium current (I *Na*) and outward potassium current (I*to),* may contribute to the variations in AF risk and incidence observed between men and women (Ni et al., 2018). Delayed and early afterdepolarizations found in male pulmonary veins can trigger reentrant arrhythmia such as AF (Gillis, 2017). These differences in currents may affect the action potential duration, refractory period, and likelihood of reentry, which can trigger and sustain arrhythmias like AF.

Women with AF have been found to have higher resting heart rate, shorter PR duration and longer QT intervals, all of which may impact their risk for sudden cardiac death (Gillis, 2017). On the other hand, men have been shown to have increased outward potassium current (I*to*) which make them more susceptible to AF (Gillis, 2017). Mathematical models have shown gender differences, for example males have increased transient outward potassium current (I*to*; rapidly activating and inactivating left atrium potassium gradient responsible for repolarization), localized to the posterior atrium wall known to be the site of rhythm disturbances (Gillis, 2017; Ni et al., 2018).

Given these gender differences in AF risk and response to treatment, it is essential for healthcare providers to consider individualized management strategies for both men and women with AF. Understanding these gender differences can help tailor treatment plans and improve outcomes for patients with AF, regardless of their gender. Further

research is needed to better understand the underlying mechanisms behind these gender differences and to develop targeted interventions for improved AF management.

Risk Factors for Atrial Fibrillation

Comorbid conditions AF and CHF share similar risk factors and when co-existing worsen outcomes. In the Framingham study, 40% of patients with AF will develop CHF and vice versa (Wang et al., 2003). Opportunistic screening for AF is recommended in people with hypertension, obstructive sleep apnea (January et al., 2019). Prominent risk factors for AF are increasing age and burden from other comorbidities including diabetes mellitus, coronary artery disease, chronic kidney disease, obesity, and obstructive sleep apnea. Modifiable risk factors are contributors to AF development and progression (January et al., 2019). AF can co-occur with depression in 16-20% due to severe symptoms and decreased quality of life or drug side effects (January et al., 2019). AF-related hospitalizations range from 10-40% annually and are related to CHF, myocardial infarction, or AF related symptoms and treatment associated complications (January et al., 2019).

Hypertension

In the 50 years of the Framingham surveillance study, women with AF were older and had a beneficial risk profile, except for worse blood pressure control despite having a higher proportion of hypertension treatment, resulting in a 36.9% prevalence of new onset AF p-trend < .0001 (Schnabel et al., 2015).

Alcohol

People with new onset AF had a 5.4% prevalence of heavy alcohol use (*p*-trend of .0005) with a decreasing trend direction over the 50 years of the Framingham study (Schnabel et al., 2015).

Smoking

People with new onset AF had similar risk factors in both males and females, except smoking declined in men but did not decline in women with both sexes demonstrating 2.7% prevalence of smoking *p*-trend of .0002, with a decreasing trend direction over the 50 years of the Framingham study (Schnabel et al., 2015). Cigarette smoking and exposure to secondhand smoke can increase stroke risk. Smoking cessation is crucial in the management of patients with a diagnosis of AF.

Obstructive Sleep Apnea

Obstructive sleep apnea facilitates AF with intermittent hypoxemia, hypercapnia, intrathoracic pressure shifts, sympathovagal imbalance, oxidative stress, inflammation, and neurohormonal activation (January et al., 2019).

Body Mass Index

People with new onset AF both sexes demonstrating 35.4% prevalence of obesity (body mass index greater than 30, *p*-trend of .0001) with an increasing trend over the 50 years of the Framingham study (Schnabel et al., 2015). Atrial remodeling during obesity was associated with AF from progressive obesity, changes in atrial size, conduction, histology, and expression of profibrotic mediators (Heart Rhythm Society, 2019). A diet rich in fruit and vegetables and low-fat dairy, reduction in saturated fat, five times weekly moderate physical activity for 30 minutes, limiting alcoholic drinks to less than 2 in men and 1 in women is recommended to decrease stroke risk.

Hispanics/Latino

Hispanic/Latinos' communities encompass more than a quarter of the Santa Clara residents, the third largest group (Santa Clara Public Health Department, 2018). Latino families rank highest living below poverty line (19% compared to other groups in the Santa Clara County), and a lower percentage of Latino families receive routine health screening compared to other ethnicities (Santa Clara Public Health Department, 2018). In 2015-2016, a greater percentage of Latino middle and high school students were overweight (21%) or obese (20%) compared to the county overall (Santa Clara Public Health department, 2018). A higher percentage (11%) of Latino adults were diagnosed with diabetes in Santa Clara County, and although a lower percentage of Latinos were diagnosed with high blood pressure in the county overall (27%); higher rates possibly masked by the lower health screening found in the Latino community (Santa Clara Public Health department, 2018). Mountainview City, located in Santa Clara County, has a population consisting of 81.7 thousand people; 35.9 thousand are White, 25.9 thousand Asian, and 12 thousand Hispanics (Deloitte et al., 2021).

Rural Patients Access to Care and Transportation

Rush et al. (2019) included in their study three rural communities with variability in access to care and transportation. Two communities had in-town public transit routes, as well as special transit options for non-emergency medical appointments. The transit option for medical appointments provided residents with accessible transportation to larger nearby centers but it did not provide transport to the urban-based AF clinic (Rush et al., 2019). The third community had public transportation between two small towns on Friday mornings and afternoons (Rush et al., 2019).

Social Determinants of Health

Studies that evaluated SES (i.e., neighborhood, level median household income, education level, employment status, and receipt of social services) and AF incidence did not observe statistically significant relationships; possibly due to lower enrollment of underserved populations and limitations in AF ascertainment (Essien et al., 2021; Shulman et al., 2017). Shulman et al. (2017) findings suggest non-Hispanic Whites are at higher risk for AF independent of SES (n = 9504 non-Hispanic Whites; mostly older males with high SES; hazard ratio = 0.99, p = .061; n = 20,960 Hispanics). The likelihood ratio test comparing original cox regression model and interaction between SES and race/ethnicity resulted in $\chi^2 = 4$, p = .135. Hispanic/Latino adults with stroke/TIA have suboptimal control of modifiable vascular risk factors with only 30% participants having a healthy diet (Bai et al., 2021). Additionally, modifying lifestyle factors can produce a reduction in circulating IL-6 (inflammatory markers known to worsen cardiovascular disease) noted in more active individuals at leisure time (Broyles et al., 2012; Pires et al., 2012).

Pharmacy Deserts

The segregation of residential neighborhoods by race and ethnicity may influence access to pharmacies and in turn influence access to prescription medications within a community. Pharmacy deserts refer to communities with low access to pharmacies more commonly seen in Black or Hispanic communities in the years 2000-2012 (Qato et al., 2014). A study conducted during the year 2000 indicated the number of pharmacies in was lower (p <.50) in segregated Hispanic and Black low-income communities and federally designated medically underserved areas than in segregated White communities

and integrated communities (Qato et al., 2014). Public policy to improve access to prescription medications must address factors beyond insurance coverage and medication affordability. A study in Pennsylvania revealed 39% of census tracts (county regions) were pharmacy deserts ($p < .001$) with pharmacy desert regions having significantly more females, married and White elderly, and fewer Blacks and Hispanics; compared to pharmacy non-deserts (Pednekar & Peterson, 2018).

In New York City health districts, White residents had substantially greater geographical access to pharmacies than Black residents (Cooper et al., 2009). One study used the Haversine formula, which considers the spherical shape of the earth, to calculate the distance between household of enrollee and each community pharmacy in Pennsylvania with the distance in miles considered as the distance required for an enrollee to visit a nearest community pharmacy (Pednekar & Peterson, 2018).
. Details of sociodemographic characteristics and distance to a nearby community pharmacy for enrollees were aggregated at census tract level, defined *pharmacy desert* if it had more than 33% of enrollees living more than one mile from a nearby community pharmacy (Pednekar & Peterson, 2018).

Fewer pharmacies were seen in minority dense populations than White or diverse neighborhoods. In 2015, the mean number of pharmacies in White or diverse neighborhoods was 1.15 and 1.23 respectively. By contrast, in Black and Hispanic/Latino neighborhoods the mean was 0.85 and 0.97 respectively ($p < .05$; Guadamuz et al., 2021).

Education Attainment

Education attainment can affect coping and problem solving, which in turn can

affect diet, exercise, smoking, health, and disease affecting health outcomes. Education attainment can also affect work, work conditions, work related resources, and income leading to stress, health insurance, sick leave, housing and neighborhood, diet, and exercise options. Furthermore, educational attainment can affect control beliefs, social standing, and social networks. Consequently, affecting coping, response to stress, health related behaviors, social and economic resources, social support, and norms of healthy behavior (Egerter et al., 2011).

Insurance Coverage

The Protecting Medicare and American Farmers from Sequester Cuts Act (S.610) became Public Law No.: 117-71 on December 10, 2021. This law made several budgetary, technical, and procedural changes to Medicare and increased the debt limit. It exempted Medicare from sequestration (across the board spending reductions) until March 31, 2022. It temporarily extended other provisions under Medicare, including a payment increase under the physician fee schedule; and required any debits recorded for fiscal year 2022 on the statutory pay-as-you-go (PAYGO) scorecards to be deducted from the scorecards for 2022 and added to the scorecards for 2023 to offset deficit.

The American Medical Association relative value scale was flagged for electrophysiology ablation services due to growth in volume in the Medicare reassessment (American College of Cardiology [ACC], 2021). Growing services reflect evolving patterns of care and reflect performance of services. 3D mapping, left atrial pacing, and ICE are nearly universally performed for AF ablation and starting 2022 they are not reported separately but instead it is bundled services (ACC, 2021). Therefore, AF ablation service bundles in Current Procedural Terminology (CPT) code 93656

(including catheter ablation, 3D mapping, and ICE), and the relative value units decreased from 26.44 in 2021 to 19.77 in 2022. Medicare paid $32.4085 per relative value unit in 2021 and in 2022 conversion factor is $34.6062 (ACC, 2021). Reducing reimbursement has the potential to discourage clinicians from providing such services to the already undertreated Hispanic minority.

Social factors affecting health often play out over decades or even generations (Broyles et al., 2012). Although we may be able to use intermediate biomarkers—such as C-reactive protein or IL-6 - or certain behaviors as proxies for health outcomes, it could be two decades or more after the relevant exposures (e.g., childhood adversity) before even these intermediate markers manifest (Broyles et al., 2012). Moreover, in research participants followed for a few years only, missing the long-time lag among variables represents both a scientific and a political challenge. Funders and politicians want results within timeframes. The Office of Management and Budget generally requires a five-year-or-less time window for assessing policy impact (Broyles et al., 2012). The Federal Reserve Bank has recently collaborated with Robert Wood Johnson Foundation to convene a series of national and regional forums to discuss intersections between community development and health improvement.

Research Gaps

The USPSTF did not find any trials that compared screening AF with consumer-oriented devices versus no screening (USPSTF, 2022). Studies fail to enroll younger patients without risk factors for stroke (patients with only AF) especially those with paroxysmal AF. Patients with AF often need treatment for decades and adverse effects may increase with longer use of antiarrhythmic drugs. Trials did not answer the question

of the degree to which subclinical AF increased stroke risk and the duration of subclinical AF that warrants anticoagulation therapy.

Other research gaps include the optimal strategy for screening, the optimal population to be screened, and the association between subclinical AF or AF detected on consumer devices and stroke risk. More trials must enroll diverse participants such as, Hispanics/Latinos to assess the detection of AF or the benefits and harms of screening in different populations. It is also important to understand the risk of stroke associated with subclinical AF or AF detected with use of consumer devices, and the risk of AF on stroke and potential benefit with subclinical AF.

Data on the effects of socioeconomic status on receipt of other non-pharmacological AF therapies, for example percutaneous or surgical closure of the left atrial appendage, are limited and require further investigation. Catheter-based or surgical therapies for AF do not specify participant income level or insurance status, limiting the generalizability of trial findings to economically diverse populations. The inclusion of social risk factors in AF clinical trials and registries has so far been limited and marks an important area for future study.

A meta-analysis found that in the general population, moderate evidence radiofrequency ablation is superior to medical therapy for enhancing freedom from recurrence of atrial arrhythmia in both short and long term regardless of AF type (Skelly et al., 2015). Yet improvements in health-related quality of life were not possible due to heterogeneity across studies for instruments employed (Skelly et al., 2015). Studies with sufficient power are needed to effectively identify whether catheter ablation versus other treatments will benefit certain patient subgroups more than others and whether there are

subgroups for whom catheter ablation might be best used as first versus second line treatment (Skelly et al., 2015).

Major research gaps remain about effective strategies to increase disease awareness, treatment adherence, and outcomes in individuals with AF residing in rural areas. One potential strategy to improve outcomes in rural settings is the use of clinical decision support tools. When studying Hispanics/Latinos, health literacy, literacy, and local language proficiency have not been included as factors in AF awareness in clinical trials or registry-based studies. Their importance is underscored by an international survey of physicians in which 46% of respondents considered their patients to be unable to explain AF adequately (Skelly et al., 2015). Low health literacy and local language proficiency are associated with decreased patient-centered communication and, in turn, diminished shared decision-making.

Measurement of health literacy and local language proficiency as part of clinical trials, registries, and community-based studies will facilitate assessing the role of risk factors in AF. Other areas meriting investigation include longitudinal, patient-centered educational interventions, as well as the effect of language-concordant care (in which the patient and clinician speak the same language) on outcomes in individuals with AF as well as literacy and local language proficiency. America's future of more equitable and high-quality care for Hispanic/Latino patients with this increasingly common and potentially debilitating cardiac condition is vital.

Future Research

It is important to substantiate new ECG technology with the use of smartphone

and smart watches and improve the clinical trial participation by removing barriers to enrollment and participation of ethnic minority populations. AF is common in people with multiple comorbidities, but it may also occur in people with minimal comorbid conditions with variable AF duration. Understanding the difference in presentations and risks in Hispanic/Latinos is important to provide individualized interventions.

Chapter 3

Methodology

Rhythm management decisions in Hispanics with AF have not been widely reported. The purpose of this study was to explore the SDOH, select sociodemographics, and symptom burden in Hispanic/Latino adults compared to non-Hispanic/Latino adults with AF who obtain rhythm and rate control treatment. In this chapter, the design, procedures, and protection of human subjects are presented.

Specific Aims

Aim 1. Describe select sociodemographic (race, ethnicity, age, gender) and clinical characteristics (hypertension, body mass index, diagnosis, smoking status, alcohol use), symptoms, SDOH (insurance, employment status, residence zip code, travel distance to hospital), and AF management (drugs, interventions) in adult Hispanic/Latino participants with AF receiving care at an urban purpose hospital in Northern California.

Aim 2. Examine associations among select sociodemographic (race, ethnicity, age, gender) and clinical characteristics (hypertension, body mass index, diagnosis, smoking status, alcohol use), symptoms, SDOH (insurance, employment status, residence zip code, travel distance to hospital), and AF management (drugs, interventions) in adult Hispanic/Latino participants with AF receiving care at an urban hospital in Northern California.

Aim 3. Analyze the type of treatment received (rate or rhythm control) among Hispanics/Latinos and non-Hispanics.

The study premise is AF is under diagnosed and under treated in racial and ethnic minorities specifically Hispanics/Latinos. Findings will inform interventions to screen for

AF, design preventive measures, and reduce cardiovascular disease risk in racial and ethnic minorities.

Research Design

A descriptive cross-sectional correlational design with retrospective data was used in this study. This design is appropriate to examine relationships of an existing outcome variable of interest and associated independent variables or risk factors (Polit & Beck, 2017). The rationale for this study design is: Although much is known about the prevalence of and risk factors for AF, the literature lacks consistency of findings related to the relationships in AF treatment options among race/ethnicity, gender, and SES among Hispanics/Latinos with AF. This study provides an opportunity to gain a better understanding of the relationship among these variables in a sample of AF patients. This design is cost effective with an appropriate study setting to analyze existing data. The research methodology for this quantitative study used clinical data extracted from EPIC electronic health records and patient reported symptoms (AFEQT scores or clinician described symptoms) to answer questions of clinical importance to patients.

Sample and Sampling

A purposive sample of adults ($N = 750$) receiving AF treatment at a community hospital located in Santa Clara County in Northern California from June 1, 2020 to June 1, 2022 provided data for this study.

Inclusion Criteria

Adults ages 21 years and older with ECG-confirmed AF.

Exclusion Criteria

Those with an active thyroid disorder were excluded.

Sample Size Considerations

Binomial logistic regression was used to estimate the minimum sample size for this study. There is no agreement in determining sample size for binomial logistic regression, due to the complexities in estimating a priori the number of predictors to include in the regression or proportions of patients that will fall into each of the dependent variable categories (Osborne, 2015). Some investigators use a minimum of 10 events (participants in the smallest group) per independent variable (Peduzzi et al., 1996), others estimate 20 (Austin & Steyerberg, 2017) or even 30-50 events per independent variable to obtain acceptable estimates (Harlow, 2005; Wright, 1995). Other investigators believe that not only the number of events per variable is important, but also the overall sample size (de Jong et al., 2019). Given that logistic regression suffers from small sample bias, with the degree of the bias based on the number of cases in the less frequent of the two categories, the investigator considered the less frequent of the two categories of each dependent variable to decide the number of predictors to include in the logistic regression models. In the current study, the sample size was estimated based on 10 events per variable (Peduzzi et al., 1996) and available data regarding the proportion of Hispanic patients in Santa Clara County for the year 2021 (U.S. Census Bureau, 2022). This method, including 13 predictors and a 15% attrition rate, yielded a sample size of N = 598; which was considered to be sufficient to detect a moderate standardized effect size (d = .32) using a two-tailed significance test with a power of .80 and a significance level of .05 (Cohen, 1988; Polit & Beck, 2017).

Data Collection Procedures

Data collection was done electronically. AF procedures, medications, diagnoses,

demographics, and AF questionnaire were collected via electronic health records (EHR). The EPIC systems EHR prioritizes analytic functionality and ensures the EHR data is accurate. A computer search of hospital records was conducted to identify AF patients receiving prescriptions of Digoxin, beta blockers class I, II, III or IV, antiarrhythmic drugs, aspirin, Warfarin, or other direct oral anticoagulants. A subject was included if there was hospital documentation referring to AF or confirmatory ECG within the previous five years.

Potential participants were screened using a demographic report to ensure they met inclusion criteria. Case notes were reviewed for patients identified in the computer searches for evidence of AF. The AFQOL questionnaire was administered prior to AF surgical interventions and was analyzed retrospectively. This technique was used to identify differences on select variables among those who received treatment for AF; data included people self-identified as Hispanics/Latino, White, Asian, Black, and Other.

Data Extraction

Sociodemographic and clinical characteristics, SDOH, AF diagnosis and treatment (pharmacological and surgical), and AF symptoms and quality of life (using the AFEQT) were extracted via EHR by querying EPIC. The AFEQT instrument was stored in EPIC. All data was extracted retrospectively.

Measures

Sociodemographic and Clinical Variables

Age (in years), race (White, Black/African American, Asian, American Indian, Othern race), ethnicity (Hispanic/Latino, non-Hispanic/non-Latino), gender (male, female, other), health plan (Medicare, MediCal, private, other insurance), body mass

index (undeweight, healthy, overwheight, obese, morbid obese), hypertension diagnosis (yes, no), smoking (current, former, never), and alcohol use (current, former, never). Admitting, primary, and secondary diagnoses were grouped based on ICD-10 Codes as follows: infectious, parasitic diseases (A00-B99), neoplasms (C00-D49), blood, blood-forming organ, immune diseases (D50-D49), endocrine, nutritional, metabolic diseases (E00-E89), mental, behavioral, neurodevelopmental diseases (F01-F99), nervous system diseases (G00-G99), eye diseases, adnexa (H00-H59), ear, mastoid process diseases (H60-H95), circulatory system diseases (I00-I99), respiratory system diseases (J00-J99), digestive system diseases (K00-K95), skin, subcutaneous tissue diseases (L00-L99), musculoskeletal, connective tissue diseases (M00-M99), genitourinary system diseases (N00-N99), congenital malformations, deformations, chromosomal abnormalities (Q00-Q99), symptoms, signs, abnormal clinical/lab findings (R00-R99), injury, poisoning, other consequences of external causes (S00-T88), special purpose code for Covid-19 (U00-U85), and factors influencing health status, contact with health services (Z00-Z99).

Atrial Fibrillation Diagnosis

Diagnosis of AF was measured using ECG documentation, with categories including chronic unspecified, long-standing, and other persistent.

Social Determinants of Health

Measures of SDOH include employment status (employed, not employed), access to healthcare (measured via average travel distance from residence to hospital, in miles, and using residence and hospital zipcodes), and type of community (urban, suburban, large town, rural, international; U.S. Department of Agriculture, 2020).

Atrial Fibrillation Treatment

AF treatments measures include in-hospital antiarrhythmic drugs (none, Amiodarone, Flecainide, Propafenone, Sotalol, unknown), in-hospital rate control drugs (none, Metoprolol, Diltiazem, Digoxin, Carvedilol), catheter ablation (yes, no), prior AF surgical ablation (yes, no), and cardioversion (yes, no).

Atrial Fibrillation Symptoms

AF symptoms were measured using the AFEQT patient questionnaire and clinician documented symptoms. The 42-item AFEQT patient questionnaire measures patients' perception of their symptoms, functional impairment in daily activities, treatment concerns and treatment satisfaction. Answers are rated on a 7-point Likert scale ranging from severe symptoms/limitations to no symptoms/limitations; overall score ranges from 0 (most severe symptoms/limitations) to 100 (no symptoms/limitations). An AFEQT Cronbach's alpha reliability coefficient greater than 0.80 is considered acceptable and 0.90 or higher is excellent (Spertus et al., 2011).

Data Analysis Plan

Descriptive analysis (frequency, percentage, range) was conducted to determine the completeness of the data and correct data errors. All study variables were examined for normality, missing data, and outliers. Due to the large sample size ($N = 750$), normality was assumed for all continuous variables (Tabachnick & Fidell, 2013). Statistical analysis was conducted using IBM SPSS Statistics for Windows, version 28.0.

Aim 1

To describe the study participants, descriptive analysis was employed, including frequencies and bar charts with categorical variables (nominal, ordinal), and measures of

dispersion (mean, standard deviation, range) and histograms with continuous variables (ratio, scale).

Aim 2

To examine associations between participants' characteristics, bivariate analysis of categorical variables was conducted using *Chi*-square tests (e.g., Fisher's Exact Tests with small groups, or Yate's continuity correction for 2 x 2 tables). For significant associations, effect sizes were calculated and reported as *Phi* coefficient (2 x 2 tables) or *Cramer's V* (larger tables). Bivariate analysis of categorical and continuous variables was conducted via independent samples *t*-test; effect sizes were reported for significant associations (Cohen's *d*). Bivariate analysis was conducted between participants' sociodemographic and clinical characteristics, SDOH, AF symptoms, and ethnicity; as well as between participants' sociodemographic and clinical characteristics, SDOH, AF symptoms, and each of the AF treatments (in-hospital antiarrhythmic drugs, in-hospital rate control drugs, catheter ablation, surgical ablation, cardioversion).

Aim 3

To analyze the type of treatment received (rate or rhythm control) among Hispanics/Latinos and non-Hispanics a binomial logistic regression was planned. The bivariate analysis (*Chi*-square test and *t*-test) revealed no significant association between ethnicity (Hispanic/Latino, non-Hispanics) and AF treatment received; thus, a binomial logistic regression to analyze the treatment received by ethnicity was not done. Instead, binomial logistic regressions were conducted with AF treatments (rate and rhythm control, i.e., in-hospital antiarrhythmic drugs, in-hospital rate control drugs, catheter ablation, and cardioversion) to identify factors that increased the likelihood of receiving

each of the AF treatments in this particular population. Variables significant in the bivariate analysis ($p < .05$) and variables important in the literature review were considered for entry in each of the regression analyses. Binomial logistic regression test assumptions were assessed.

Human Subjects Protection

The Institutional Review Board (IRB) at the University of San Diego and community hospital reviewed and approved this research study (see Appendix B). The requirements for informed consent were waived because personal identification information was removed after cohort generation, in accordance with strict confidentiality guidelines.

Ethical Concerns

Hispanics/Latinos belong to a minority group whose rights have been socially devalued. There is no clear understanding of AF in Hispanics/Latinos mainly due to lack of enrollment in research. Hispanics/Latinos are a vulnerable population and inclusion in research may add a potential for harm if informed consent is not obtained prior to research enrollment; on the balance is the increased knowledge of AF and AF treatments in this population.

Chapter 4

Results

The purpose of this study was to explore the SDOH, select sociodemographics, and symptom burden in Hispanic/Latino adults compared to non-Hispanic/Latino adults with AF who obtain rhythm and rate control treatment. Data collection was performed retrospectively via extraction from EHR. In this chapter, research findings using descriptive, bivariate, and multivariate statistical analyses are presented and discussed.

Sample Characteristics

Aim 1. Describe select sociodemographic (race, ethnicity, age, gender) and clinical characteristics (hypertension, body mass index, diagnosis, smoking status, alcohol use), symptoms, SDOH (insurance, employment status, residence zip code, travel distance to hospital), and AF management (drugs, interventions) in adult Hispanic/Latino participants with AF receiving care at an urban hospital in Northern California.

Sociodemographic and clinical characteristics of 750 adult participants receiving care for AF at an urban hospital in Northern California—overall and by ethnicity—are presented in Table 1. Slightly more women (50.7%, $n = 380$) than men (49.3%, $n = 370$) participated in the study. Average age was 78.1 years ($SD = 12.75$), with ages ranging between 26 and 104 years. Mean age was about 9 years younger for Hispanic versus non-Hispanic participants ($M = 72.49$ vs. $M = 81.64$, a difference of 9.15 years). The study sample was diverse, with participants self-identifying as White (58.8%, $n = 441$), Hispanic or Latino (39%, $n = 289$), Other race (34.7%, $n = 260$), Asian (5.3%, $n = 40$), and Black or African American (0.9%, $n = 7$). Thirty-nine participants ($n = 289$) self-identified as Hispanic or Latino, which is higher than the value reported by the U.S.

Census for Santa Clara County for the year 2021. The most common insurance carriers were Medicare (60%, *n* = 450) and Private (34.7%, *n* = 260); 3.6% had MediCal; 14.4% (*n* = 34) were employed, (95.9%, *n* = 719) lived in an urban area compared to 0.4% (*n* = 3) living in a rural area.

All participants had a primary or secondary diagnosis of AF. Many participants were admitted with symptoms, signs, or abnormal clinical/lab findings (41.2%, *n* = 309) or a circulatory system disease (21.1%, *n* = 158). The most common primary diagnoses (after admission) were circulatory system diseases (34.9%, *n* = 262), followed by infectious (11.2%, *n* = 84). The most common secondary diagnoses were circulatory system diseases (90.7%, *n* = 680) and endocrine, nutritional, and metabolic diseases (6.4%, *n* = 48). Over three quarters (86.3%, *n* = 647) had a hypertension diagnosis, 60.5% (*n* = 332) did not smoke, and 76.4% (*n* = 191) consumed alcohol. Slightly less than one third (30.7%, *n* = 114) had a healthy weight, with 25.1% (*n* = 93) being overweight, 32.3% (*n* = 120) obese, and 8.6% (*n* = 32) morbid obese. Average body mass index was 28.86 (*SD* = 7.78).

In terms of AF classification, 41.5% had unspecified AF (*n* = 331) and 37.9% permanent AF (*n* = 284). About 19% (*n* = 142) had AF-related symptoms and 20% received in-hospital antiarrhythmic drugs, with Amiodarone being the most common drug administered (*n* = 118). About 66% received in-hospital rate control drugs, with Metoprolol being the most common drug administered (*n* = 139). Only 6.7% (*n* = 50) had a prior AF catheter ablation; most (99.7%, *n* = 748) had a prior AF surgical ablation (see Table 1).

Table 1

Sociodemographic and Clinical Characteristics, Social Determinants of Health, and Symptom Burden of Study Population Overall and by Ethnicity (N = 750)

	Overall		**Hispanic**		**Non-Hispanic**			
Characteristic	***n***	***%***	***n***	***%***	***n***	***%***	χ^2	***p***
Gender							451.90	**< .001**[f]
Male	370	49.3	0	0.0	365	100.0		
Female	380	50.7	289	76.3	90	23.7		
Race							649.63	**< .001**
White	441	58.8	32	7.3	404	92.7		
Black, African American	7	0.9	0	0.0	7	100.0		
Asian	40	5.3	5	12.5	35	87.5		
American Indian	2	0.3	2	100.0	0	0.0		
Other race	260	34.7	250	96.5	9	3.5		
Ethnicity[a]							--	**--**
Hispanic, Latino (White, Asian, American Indian Other)	289	38.8	--	--	--	--		
Non-Hispanic, non-Latino (White, Black, Asian, Other)	455	61.2	--	--	--	--		
Insurance							58.05	**< .001**
Medicare	450	60.0	130	29.2	315	70.8		
MediCal	27	3.6	23	85.2	4	14.8		
Private	260	34.7	127	49.0	132	51.0		
Other insurance[b]	13	1.7	9	69.2	4	30.8		

Characteristic	Overall		Hispanic		Non-Hispanic			
	n	%	*n*	%	*n*	%	χ^2	*p*
Employment Status[c]							4.19	**.041**[f]
Employed	34	14.4	17	51.5	16	48.5		
Unemployed	202	85.6	63	31.5	137	68.5		
Type of Community[d]							17.68	**< .001**
Urban area	719	95.9	268	37.6	445	62.4		
Suburban area	16	2.1	12	75.0	4	25.0		
Large town	9	1.2	7	77.8	2	22.2		
Rural area	3	0.4	0	0.0	3	100.0		
International area	1	0.1	1	100.0	0	0.0		
Homeless			1	50.0	1	0.0		
Admitting Diagnosis[e]							11.78	.829[g]
Infectious, parasitic diseases	11	1.5	4	36.4	7	63.6		
Neoplasms	11	1.5	2	18.2	9	81.8		
Blood, blood-forming organ, immune diseases	9	1.2	2	22.2	7	77.8		
Endocrine, nutritional, metabolic diseases	34	4.5	14	42.4	19	57.6		
Mental, behavioral, neurodevelopmental diseases	1	0.1	0	0.0	1	100.0		
Nervous system diseases	7	0.9	3	42.9	4	5.1		
Eye diseases, adnexa	5	0.7	2	40.0	3	60.0		
Circulatory system diseases	158	21.1	67	42.7	90	57.3		
Respiratory system diseases	26	3.5	8	30.8	18	69.2		

Characteristic	Overall		Hispanic		Non-Hispanic			
	n	%	*n*	%	*n*	%	χ^2	*p*
Admitting Diagnosis (*Cont.*)								
Digestive system diseases	51	6.8	15	29.4	36	70.6		
Skin, subcutaneous tissue diseases	10	1.3	4	40.0	6	60.0		
Musculoskeletal, connective tissue diseases	43	5.7	14	33.3	28	66.7		
Genitourinary system diseases	20	2.7	7	35.0	13	65.0		
Congenital malformations, deformations, chromosomal abnormalities	1	0.1	1	100.0	0	0.0		
Symptoms, signs, abnormal clinical/lab findings	309	41.2	121	39.4	186	60.6		
Injury, poisoning, other consequences of external causes	24	3.2	10	43.5	13	56.5		
Special purpose codes (Covid-19)	5	0.7	3	60.0	2	40.0		
Factors influencing health status, contact with health services	25	3.3	12	48.0	13	52.0		
Primary Diagnosis[e]							30.37	.022[g]
Infectious, parasitic diseases	84	11.2	42	50.0	42	50.0		
Neoplasms	29	3.9	7	24.1	22	75.9		
Blood, blood-forming organ, immune diseases	7	0.9	2	28.6	5	71.4		
Endocrine, nutritional, metabolic diseases	19	2.5	13	68.4	6	31.6		
Mental, behavioral, neurodevelopmental diseases	5	0.7	1	20.0	4	80.0		
Nervous system diseases	12	1.6	4	33.3	8	66.7		

Characteristic	Overall		Hispanic		Non-Hispanic			
	n	%	*n*	%	*n*	%	χ^2	*p*
Primary Diagnosis (*Cont.*)								
Eye diseases, adnexa	3	0.4	1	33.3	2	66.7		
Ear, mastoid process diseases	1	0.1	0	0.0	1	100.0		
Circulatory system diseases	262	34.9	104	40.3	154	59.7		
Respiratory system diseases	31	4.1	11	35.5	20	64.5		
Digestive system diseases	65	8.7	19	29.2	46	70.8		
Skin, subcutaneous tissue diseases	9	1.2	3	33.3	6	66.7		
Musculoskeletal, connective tissue diseases	28	3.7	6	22.2	21	77.8		
Genitourinary system diseases	29	3.9	8	27.6	21	72.4		
Congenital malformations, deformations, chromosomal abnormalities	2	0.3	1	50.0	1	50.0		
Symptoms, signs, abnormal clinical/lab findings	59	7.9	21	35.6	38	64.4		
Injury, poisoning, other consequences of external causes	60	8.0	22	37.3	37	62.7		
Special purpose codes (Covid-19)	21	2.8	14	66.7	7	33.3		
Factors influencing health status, contact with health services	24	3.2	10	41.7	14	58.3		
Secondary Diagnosis[e]							2.91	.745
Neoplasms	2	0.3	1	50.0	1	50.0		
Blood, blood-forming organ, immune diseases	8	1.1	3	37.5	5	62.5		
Endocrine, nutritional, metabolic diseases	48	6.4	23	48.9	24	51.1		

Characteristic	Overall		Hispanic		Non-Hispanic			
	n	***%***	***n***	***%***	***n***	***%***	χ^2	***p***
Secondary Diagnosis (*Cont.*)								
Mental, behavioral, neurodevelopmental diseases	5	0.7	2	40.0	3	60.0		
Nervous system diseases	7	0.9	3	42.9	4	57.1		
Circulatory system diseases	680	90.7	257	38.1	418	61.9		
Hypertension Diagnosis							2.68	.102
Yes	647	86.3	257	40.1	384	59.9		
No	103	13.7	32	31.1	71	68.9		
Smoking Status							5.10	.081
Never smoked	332	60.5	136	41.2	194	58.8		
Former smoker	195	35.5	74	38.3	119	61.7		
Current smoker	22	4.0	14	63.6	8	36.4		
Alcohol Use Status							96.44	**< .001**
Never	30	12.0	29	96.7	1	3.3		
Former	29	11.6	27	93.1	2	6.9		
Current	191	76.4	48	25.4	141	74.6		
Body Mass Index, kg/m^2							12.64	**.012**
Underweight (< 18.5)	12	3.2	3	25.0	9	75.0		
Healthy weight (18.5-24.9)	114	30.7	34	30.1	79	69.9		
Overweight (25.0-29.9)	93	25.1	47	51.1	45	48.9		
Obese (30.0-39.9)	120	32.3	50	42.0	69	58.0		
Morbid obese (≥ 40)	32	8.6	17	53.1	15	46.9		

Characteristic	Overall		Hispanic		Non-Hispanic			
	n	*%*	*n*	*%*	*n*	*%*	χ^2	*p*
AF Classification							3.57	.471
Chronic unspecified AF	75	10.0	27	36.0	48	64.0		
Long-standing persistent AF	9	1.2	1	11.1	8	88.9		
Other persistent AF	71	9.5	30	42.9	40	57.1		
Permanent AF	284	37.9	111	39.5	170	60.5		
AF unspecified	311	41.5	120	38.8	189	61.2		
AF Related Symptoms							10.31	**.001**[f]
Yes	142	18.9	72	51.1	69	48.9		
No	608	81.1	217	36.0	386	64.0		
Activity Limitation							5.35	**.021**[f]
Yes	73	9.7	38	52.1	35	47.9		
No	677	90.3	251	37.4	420	62.6		
Treatment Concerns							1.41	.236[f]
Yes	34	4.5	17	50.0	17	50.0		
No	716	95.5	272	38.3	438	61.7		
AFEQT Patient Questionnaire							0.11	.746[f]
Yes	30	4.0	13	43.3	17	56.7		
No	720	96.0	276	38.7	438	61.3		
In-hospital Antiarrhythmic Drugs							2.41	.121[f]
Yes	146	19.5	65	44.8	80	55.2		
No	604	80.5	224	37.4	375	62.6		

Characteristic	Overall		Hispanic		Non-Hispanic			
	n	*%*	*n*	*%*	*n*	*%*	χ^2	*p*
In-hospital Antiarrhythmic Drugs							4.89	.408
None	604	80.5	224	37.4	375	62.6		
Amiodarone	118	15.7	52	44.1	66	55.9		
Flecainide	18	2.4	9	50.0	9	50.0		
Propafenone	6	0.8	2	33.3	4	66.7		
Sotalol	3	0.4	1	50.0	1	50.0		
Unknown type of drug	1	0.1	1	100.0	0	0.0		
In-hospital Rate Control Drugs							0.37	.543[f]
Yes	495	66.0	186	38.0	304	62.0		
No	255	34.0	103	40.6	151	59.4		
In-hospital Rate Control Drugs							6.50	.595[g]
None	255	34.0	103	40.6	151	59.4		
Metoprolol	139	18.5	55	39.9	83	60.1		
Diltiazem	48	6.4	20	42.6	27	57.4		
Diltiazem, Metoprolol	44	5.9	19	43.2	25	56.8		
Digoxin, Metoprolol	40	5.3	12	30.0	28	70.0		
Digoxin, Diltiazem, Metoprolol	32	4.3	13	40.6	19	59.4		
Carvedilol	29	3.9	11	37.9	18	62.1		
Digoxin, Diltiazem	22	2.9	4	18.2	18	81.8		
All other combinations	141	18.8	52	37.7	86	62.3		

Characteristic	Overall		Hispanic		Non-Hispanic			
	n	***%***	***n***	***%***	***n***	***%***	χ^2	***p***
Prior AF Catheter Ablation							0.08	.782[f]
Yes	50	6.7	18	36.0	32	64.0		
No	700	93.3	271	39.0	423	61.0		
Prior AF Surgical Ablation							< .001	> .999[f]
Yes	748	99.7	1	50.0	1	50.0		
No	2	0.3	288	38.8	454	61.2		
Cardioversion							2.44	.118[f]
Yes	17	2.3	3	17.6	14	82.4		
No	733	97.7	286	39.3	441	60.7		
	M	***SD***	***M***	***SD***	***M***	***SD***	***t***	***p***
Age, years	78.10	12.75	72.49	14.72	81.76	9.95	-8.87	**< .001**
Travel distance to hospital, miles	13.61	1.07	18.14	23.21	11.18	36.08	2.75	**.006**
Body mass index, kg/m^2	28.86	7.78	29.90	8.04	28.14	7.58	2.14	**.033**

Note. [a]Ethnicity (Hispanic/Latino vs. Non-Hispanic/Non-Latino was self-report). Six (n = 6) did not report ethnicity. [b]Other insurance = Uninsured, self-pay, workers compensation, international insurance. [c]Unemployed = Retired, disabled, student, other not seeking work. Employed = Full-time, part-time, self-employed. [d]Residence type based on the 2020 definition of the US Department of Agriculture (https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes/). [e]**ICD-10 Codes:** Infectious, parasitic diseases (A00-B99), Neoplasms (C00-D49), Blood, blood-forming organ, immune diseases (D50-D49), Endocrine, nutritional, metabolic diseases (E00-E89), Mental, behavioral, neurodevelopmental diseases (F01-F99), Nervous system diseases (G00-G99), Eye diseases, adnexa (H00-H59), Ear, mastoid process diseases (H60-H95), Circulatory system diseases (I00-I99), Respiratory system diseases (J00-J99), Digestive system diseases (K00-K95), Skin, subcutaneous tissue diseases (L00-L99), Musculoskeletal, connective tissue diseases (M00-M99), Genitourinary system diseases (N00-N99), Congenital malformations, deformations, chromosomal abnormalities (Q00-Q99), Symptoms, signs, abnormal clinical/lab findings (R00-R99), Injury, poisoning, other consequences of external causes (S00-T88), Special purpose codes (i.e., Covid-19, U00-U85), Factors influencing health status, contact with health services (Z00-Z99). p-value is Fisher's Exact tests, unless otherwise specified. [f]Yate's Continuity Correction. [g]Monte Carlo Sig. (2-sided).

Sample Characteristics by Ethnicity

Aim 2. Examine associations among select sociodemographic (race, ethnicity, age, gender) and clinical characteristics (hypertension, body mass index, diagnosis, smoking status, alcohol use), symptoms, SDOH (insurance, employment status, residence zip code, travel distance to hospital), and AF management (drugs, interventions) in adult Hispanic/Latino participants with AF receiving care at an urban hospital in Northern California.

Independent samples *t*-tests were run to identify differences in ethnicity (Hispanic/Latino vs. non-Hispanic/non-Latino) in terms of study participants' age and travel distance to hospital. One hundred forty-six participants received in-hospital antiarrhythmic drugs and 604 did not. There were several outliers in the data, as assessed by inspection of a boxplot; further inspection of the mean and 5% trimmed mean revealed outliers were not significant for age or travel distance to hospital. Age for each level of ethnicity was normally distributed, as assessed by histograms and normal Q-Q plots, and without homogeneity of variances, as assessed by Levene's test for equality of variances ($p < .001$). Non-Hispanic or non-Latino participants were older ($M = 81.76$, $SD = 9.95$) than those who were Hispanic or Latino ($M = 72.49$, $SD = 14.72$), a statistically significant mean difference of 9.27 years (95% CI 11.33 to -7.22), Welch t (506) = -8.87, $p < .001$, Cohen's $d = -.764$, moderate effect size (see Table 1).

Travel distance to hospital for each level of ethnicity was non-normally distributed, as assessed by histograms and normal Q-Q plots. Due to the large sample size and robustness of the t-test, normality was assumed. There was homogeneity of variances, as assessed by Levene's test for equality of variances ($p = .126$). Non-Hispanic

or non-Latino participants travel less distance to the hospital (M = 11.18, SD = 36.08) than those who were Hispanic or Latino (M = 18.14, SD = 23.21), a statistically significant mean difference of 6.97 miles (95% CI 1.99 to 11.95), $t(570) = 2.75$, $p = .006$, Cohen's $d = .253$, small effect size.

In addition, *Chi*-square tests were run to identify differences in ethnicity (Hispanic/Latino vs. non-Hispanic/non-Latino) in terms of participants' categorical variables. There was a statistically significant association between participants ethnicity (Hispanic, non-Hispanic) and gender, $\chi^2 = 451.90$, $p < .001$, *Phi* = .782, large effect size (see Table 1; Cohen, 1988). None of the male participants self-identified as Hispanic or Latino, while 76.3% (n = 289) of female participants identified as Hispanic or Latina. Unsurprisingly, a significant association was found between race and ethnicity, $\chi^2 = 649.63$, $p < .001$, *Cramer's V* = .871, large effect size. Among White participants, 92.7% (n = 404) self-identified as non-Hispanic or non-Latino, and among Other race participants 96.5% (n = 250) self-identified as Hispanic or Latino.

A significant association was also found between insurance and ethnicity, $\chi^2 = 58.05$, $p < .001$, *Cramer's V* = .280, small effect size. Among participants with Medicare, 70.8% (n = 315) self-identified as non-Hispanic or non-Latino; 29.2% (n = 130) self-identified as Hispanic or Latino. By contrast, among those with MediCal, 85.2% self-identified as Hispanic or Latino. About half of participants with private insurance self-identified as Hispanic or Latino (49%, n = 127) and half as non-Hispanic or non-Latino (51%, n = 132), using adjusted residuals for group significance.

A significant association was found between employment status and ethnicity, $\chi^2 = 17.68$, $p < .001$, *Cramer's V* = .147, small effect size (limited practical significance);

the group with the highest proportion was non-Hispanic, unemployed participants (68.5%, $n = 137$).

Significant associations were also found between ethnicity and type of community where participants lived (i.e., urban, suburban, large town, rural, homeless, international = outside the United States), $\chi^2 = 17.68$, $p < .001$, *Cramer's V* = .158, small effect size (with limited practical significance); alcohol status (i.e., never, former, current), $\chi^2 = 96.44$, $p < .001$, *Cramer's V* = .600, medium effect size, with the highest proportion of current alcohol users being non-Hispanic or non-Latino (74.6%, $n = 141$); body mass index, $\chi^2 = 12.64$, $p < .012$, *Cramer's V* = .186, small effect size; among those with healthy weight, 69.9% were non-Hispanic or non-Latino.

There were also statistically significant associations between participants' ethnicity (Hispanic, non-Hispanic) and AF related symptoms, $\chi^2 = 10.31$, $p = .001$, *Phi* = .121, small effect size, and ethnicity and activity limitation, $\chi^2 = 5.35$, $p = .021$, *Phi* = .089, small effect size; more Hispanics reported activity limitation (see Table 1).

Atrial Fibrillation Treatment by Ethnicity

Ethnicity was not significantly associated with any of the AF pharmacological and non-pharmacological care treatments evaluated (rate or rhythm control, i.e., in-hospital antiarrhythmic drugs, in-hospital rate control drugs, prior catheter ablation, prior surgical ablation, and cardioversion; see Table 1). AF treatment was the same for Hispanics and non-Hispanics, with no preference for rate or rhythm control interventions.

Atrial Fibrillation Treatment

Aim 3. Analyze the type of treatment received (rate or rhythm control) among Hispanics/Latinos and non-Hispanics.

Since the bivariate analysis revealed no significant associations between ethnicity and AF treatment received; a binomial logistic regression to analyze treatment received by ethnicity was not done. Instead, four binomial logistic regressions were conducted with AF treatments (i.e., in-hospital antiarrhythmic drugs, in-hospital rate control drugs, catheter ablation, and cardioversion) to identify factors that increased the likelihood of receiving each of the AF treatments in this population. Binomial logistic regression was not done with surgical ablation because the sample size was not sufficient to conduct the test. To assist in selecting factors fir the regression analysis, bivariate analysis was done between participants' characteristics and each of the treatments received. Ethnicity was included in all regression models due to its importance in the literature review.

In-Hospital Antiarrhythmic Drugs

Bivariate analysis (*Chi*-square and *t*-tests) revealed gender ($p = .003$), AF-related symptoms ($p = .005$), in-hospital rate control drugs ($p < .001$), and cardioversion ($p = .009$) were significantly associated with receiving in-hospital antiarrhythmic drugs; none of the other variables evaluated were associated with receiving in-hospital antiarrhythmic drugs (see Table 2). Among males, 16.2% ($n = 60$) received in-hospital antiarrhythmic drugs and 83.8% ($n = 310$) did not. Among females, 22.6% ($n = 86$) received in-hospital drugs and 77.4% ($n = 294$) did not. Among participants with AF related symptoms, 28.2% ($n = 40$) received in-hospital antiarrhythmic drugs and 71.8% ($n = 102$) did not. Among those receiving in-hospital rate control drugs, 24.2% ($n = 120$) also received antiarrhythmic drugs and 75.8% ($n = 375$) did not. Among those not receiving cardioversion, 18.8% ($n = 138$) received in-hospital antiarrhythmic drugs, and 81.2 ($n = 595$) did not.

Table 2

Sociodemographic and Clinical Characteristics, Social Determinants of Health, and Symptom Burden of Study Population by ***In-hospital Antiarrhythmic Drugs*** *(N = 750)*

	Yes		No			
Characteristic	***n***	***%***	***n***	***%***	χ^2	***p***
Gender					4.52	**.033**[e]
Male	60	16.2	310	83.8		
Female	86	22.6	294	77.4		
Race					5.31	.217
White	83	18.8	358	81.2		
Black, African American	0	0.0	7	100.0		
Asian	4	10.0	36	90.0		
American Indian	0	0.0	2	100.0		
Other race	59	22.7	201	77.3		
Insurance					0.76	.867
Medicare	91	20.2	359	79.8		
MediCal	6	22.2	21	77.8		
Private	47	18.1	213	81.9		
Other insurance[a]	2	15.4	11	84.6		
Employment Status[b]					0.04	.840[e]
Employed	8	23.5	26	76.5		
Unemployed	41	20.3	161	79.7		
Type of Community[c]					2.64	.757
Urban area	144	20.0	575	80.0		
Suburban area	1	6.3	15	93.8		
Large town	1	11.1	8	88.9		
Rural area	0	0.0	3	100.0		
International area	0	0.0	1	100.0		
Homeless	0	0.0	2	100.0		
Admitting Diagnosis[d]					19.63	.231[f]
Infectious, parasitic diseases	2	18.2	9	81.8		
Neoplasms	2	18.2	9	81.8		
Blood, blood-forming organ, immune diseases	0	0.0	9	100.0		
Endocrine, nutritional, metabolic diseases	11	32.4	23	67.6		

Characteristic	Yes		No		χ^2	*p*
	n	%	*n*	%		
Admitting Diagnosis (*Cont.*)						
Eye diseases, adnexa	1	20.0	4	80.0		
Circulatory system diseases	34	21.5	124	78.5		
Respiratory system diseases	3	11.5	23	88.5		
Digestive system diseases	11	21.6	40	78.4		
Skin, subcutaneous tissue diseases	2	20.0	8	80.0		
Musculoskeletal, connective tissue diseases	8	18.6	35	81.4		
Genitourinary system diseases	2	10.0	18	90.0		
Congenital malformations, deformations, chromosomal abnormalities	1	100.0	0	0.0		
Symptoms, signs, abnormal clinical/lab findings	59	19.1	250	80.9		
Injury, poisoning, other consequences of external causes	5	20.8	19	79.2		
Special purpose codes (Covid-19)	1	20.0	4	80.0		
Factors influencing health status, contact with health services	1	4.0	24	96.0		
Primary Diagnosis[d]					22.37	.166[f]
Infectious, parasitic diseases	24	28.6	60	71.4		
Neoplasms	4	13.8	25	86.2		
Blood, blood-forming organ, immune diseases	1	14.3	6	85.7		
Endocrine, nutritional, metabolic diseases	4	21.1	15	78.9		
Mental, behavioral, neurodevelopmental diseases	1	20.0	4	80.0		
Nervous system diseases	1	8.3	11	91.7		
Eye diseases, adnexa	1	33.3	2	66.7		
Ear, mastoid process diseases	0	0.0	1	100.0		
Circulatory system diseases	51	19.5	211	80.5		
Respiratory system diseases	8	25.8	23	74.2		
Digestive system diseases	15	23.1	50	76.9		
Skin, subcutaneous tissue diseases	1	11.1	8	88.9		

Characteristic	Yes		No			
	n	%	*n*	%	χ^2	*p*
Primary Diagnosis (*Cont.*)						
Musculoskeletal, connective tissue diseases	8	28.6	20	71.4		
Genitourinary system diseases	4	13.8	25	86.2		
Congenital malformations, deformations, chromosomal abnormalities	2	100.0	0	0.0		
Symptoms, signs, abnormal clinical/lab findings	8	13.6	51	86.4		
Injury, poisoning, other consequences of external causes	9	15.0	51	85.0		
Special purpose codes (Covid-19)	3	14.3	18	85.7		
Factors influencing health status, contact with health services	1	4.2	23	95.8		
Secondary Diagnosis[d]					2.62	.744
Neoplasms	1	50.0	1	50.0		
Blood, blood-forming organ, immune diseases	1	12.5	7	87.5		
Endocrine, nutritional, metabolic diseases	7	14.6	41	85.4		
Mental, behavioral, neurodevelopmental diseases	1	20.0	4	80.0		
Nervous system diseases	1	14.3	6	85.7		
Circulatory system diseases	135	19.9	545	80.1		
Hypertension Diagnosis					0.91	.341[e]
Yes	130	20.1	517	79.9		
No	16	15.5	87	84.5		
Smoking Status					0.15	.951
Never smoked	83	25.0	249	75.0		
Former smoker	46	23.6	149	76.4		
Current smoker	5	22.7	17	77.3		
Alcohol Use Status					2.98	.213
Never	10	33.3	20	66.7		
Former	10	34.5	19	65.5		
Current	44	23.0	147	77.0		

Characteristic	Yes		No			
	n	*%*	*n*	*%*	χ^2	*p*
Body Mass Index, kg/m^2					0.60	.972
Underweight (< 18.5)	2	16.7	10	83.3		
Healthy weight (18.5-24.9)	29	25.4	85	74.6		
Overweight (25.0-29.9)	24	25.8	69	74.2		
Obese (30.0-39.9)	28	23.3	92	76.7		
Morbid obese (≥ 40)	7	21.9	25	78.1		
AF Classification					7.69	.094
Chronic unspecified AF	10	13.3	65	86.7		
Long-standing persistent AF	0	0.0	9	100.0		
Other persistent AF	10	14.1	61	85.9		
Permanent AF	67	23.6	217	76.4		
AF unspecified	59	19.0	252	81.0		
In-hospital Rate Control Drugs					20.29	**< .001**[e]
Yes	120	24.2	375	75.8		
No	26	10.2	229	89.8		
In-hospital Rate Control Drugs					30.89	**< .001**[f]
None	26	10.2	229	89.8		
Metoprolol	36	25.9	103	74.1		
Diltiazem	7	14.6	41	85.4		
Diltiazem, Metoprolol	15	34.1	29	65.9		
Digoxin, Metoprolol	12	30.0	28	70.0		
Digoxin, Diltiazem, Metoprolol	8	25.0	24	75.0		
Carvedilol	7	24.1	22	75.9		
Digoxin, Diltiazem	6	27.3	16	72.7		
All other combinations	29	20.6	112	79.4		
Prior AF Catheter Ablation					1.05	.306[e]
Yes	13	26.0	37	74.0		
No	133	19.0	567	81.0		
Prior AF Surgical Ablation					< .001	> .999[e]
Yes	0	0.0	2	100.0		
No	146	19.5	602	80.5		

Characteristic	Yes		No			
	n	***%***	***n***	***%***	χ^2	***p***
Cardioversion					6.74	**.009**[e]
Yes	8	47.1	9	52.9		
No	138	18.8	595	81.2		
AF Related Symptoms					7.79	**.005**[e]
Yes	40	28.2	102	71.8		
No	106	17.4	502	82.6		
Activity Limitation					3.83	.050[e]
Yes	21	28.8	52	71.2		
No	125	18.5	552	81.5		
Treatment Concerns					1.63	.201[e]
Yes	10	29.4	24	70.6		
No	136	19.0	580	81.0		
AFEQT Patient Questionnaire					1.57	.211[e]
Yes	9	30.0	21	70.0		
No	137	19.0	583	81.0		
	M	***SD***	***M***	***SD***	***t***	***p***
Age, years	77.32	12.05	78.29	12.92	0.83	.409
Travel distance to hospital, miles	11.36	16.80	14.15	31.31	1.04	.300
Body mass index, kg/m^2	28.44	8.17	28.99	7.67	0.59	.555

Note. [a]Other insurance = Uninsured, self-pay, workers compensation, international insurance. [b]Unemployed = Retired, disabled, student, other not seeking work. Employed = Full-time, part-time, self-employed. [c]Residence type based on the 2020 definition of the US Department of Agriculture (https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes/). [d]**ICD-10 Codes:** Infectious, parasitic diseases (A00-B99), Neoplasms (C00-D49), Blood, blood-forming organ, immune diseases (D50-D49), Endocrine, nutritional, metabolic diseases (E00-E89), Mental, behavioral, neurodevelopmental diseases (F01-F99), Nervous system diseases (G00-G99), Eye diseases, adnexa (H00-H59), Ear, mastoid process diseases (H60-H95), Circulatory system diseases (I00-I99), Respiratory system diseases (J00-J99), Digestive system diseases (K00-K95), Skin, subcutaneous tissue diseases (L00-L99), Musculoskeletal, connective tissue diseases (M00-M99), Genitourinary system diseases (N00-N99), Congenital malformations, deformations, chromosomal abnormalities (Q00-Q99), Symptoms, signs, abnormal clinical/lab findings (R00-R99), Injury, poisoning, other consequences of external causes (S00-T88), Special purpose codes (i.e., Covid-19, U00-U85), Factors influencing health status, contact with health services (Z00-Z99). *p*-value is Fisher's Exact tests, unless otherwise specified [e]Yate's Continuity Correction Sig. (2-sided). [f]Monte Carlo Sig. (2-sided).

A binomial logistic regression was conducted to ascertain the effects of gender, ethnicity, AF-related symptoms, receiving in-hospital rate control drugs, and a cardioversion on the likelihood that participants received in-hospital antiarrhythmic drugs. There were no standardized residuals with values greater than 2.5 *SD*s (outliers), which were kept in the analysis. A test of the overall model against a constant-only model was statistically significant, $\chi^2(5) = 41.06$, $p < .001$. The model explained 8.6% (Nagelkerke's R^2) of the variance in receiving (or not) in-hospital antiarrhythmic drugs, and correctly classified 80.8% of the cases; specificity was 100% and sensitivity only 3.45%. The area under the ROC curve was .655 (95% CI .605 to .705), which is a poor (close to acceptable) level of discrimination according to Hosmer and Lemeshow (2000). Of the five predictor variables, three were statistically significant: AF related symptoms, in-hospital rate control drugs, and cardioversion (see Table 3).

Participants who reported having AF symptoms ($p = .038$), had in-hospital rate control drugs ($p < .001$) and cardioversion performed ($p = .017$) were more likely to receive in-hospital antiarrhythmic drugs. The odds of receiving in-hospital antiarrhythmic drugs were 3.43 times higher for participants who had a cardioversion performed, 2.89 times higher for participants who had in-hospital rate control drugs, and 1.03 times higher for participants who reported having AF related symptoms. Gender and (Hispanic/non-Hispanic) ethnicity did not have a unique contribution to receiving in-hospital antiarrhythmic drugs (see Table 3).

Table 3

Summary of Logistic Regression Analysis Predicting Patient ***In-Hospital Antiarrhythmic Drugs*** *(N = 750)*

				99% CI			
Variable	***B***	***SE***	***OR***	**Lower**	**Upper**	***Wald statistic***	***p***
Gender: Male	-0.43	0.30	0.65	0.36	1.17	2.09	.148
Ethnicity: Hispanic, Latino	0.00	0.30	1.00	0.55	1.80	< 0.01	.992
AF related symptoms: Yes	0.46	0.22	1.59	1.03	2.46	4.32	**.038**
In-hospital rate control drugs: Yes	1.06	0.24	2.89	1.81	4.61	19.78	**< .001**
Cardioversion performed: Yes	1.23	0.52	3.43	1.24	9.48	5.68	**.017**

$\chi^2(5) = 41.061, p < .001$

-2 Log likelihood = 692.88. Nagelkerke $R^2 = 8.6\%$

Note. CI = Confidence interval for odds ratio (OR). *Reference categories:* Gender, Female; Ethnicity, Non-Hispanic/Latino; AF related symptoms, No; In-hospital rate control drugs, No; Cardioversion performed, No.

In-hospital Rate Control Drugs

Bivariate analysis (*Chi*-square and *t*-tests) revealed the type of community in which participants lived ($p < .001$), a diagnosis of hypertension ($p < .001$), the AF classification ($p = .049$), AF related symptoms ($p = .004$), and travel distance ($p = .037$) were significantly associated with receiving in-hospital rate control drugs (see Table 4).

Among participants living in an urban areas, 67.5% ($n = 485$) received in-hospital rate control drugs; among those living in a suburban areas, 25% ($n = 4$) received rate control drugs (see Table 4). Among those with hypertension, 70.6% ($n = 457$) received in-hospital rate control drugs, and 29.4% ($n = 190$) did not. Among participants with permanent AF, 66.2% ($n = 188$) received in-hospital rate control drugs and 33.8% ($n = 96$) did not. Among participants with AF related symptoms, 76.8% ($n = 109$) received in-hospital rate control drugs and 23.2% ($n = 33$) did not. Participants receiving in-hospital rate control drugs for AF traveled less distance to the hospital ($M = 11.40$, $SD = 20.71$) than those not receiving rate control treatment ($M = 17.11$, $SD = 36.84$), a significant mean difference of 5.57 miles (95% CI 0.35 to 10.79), $t(397) = 2.10$, $p = .037$, Cohen's d =.186, small effect size (see Table 4).

Table 4

Sociodemographic and Clinical Characteristics, Social Determinants of Health, and Symptom Burden of Study Population by ***In-hospital Rate Control Drugs*** *(N = 750)*

	Yes		No			
Characteristic	***n***	***%***	***n***	***%***	χ^2	***p***
Gender					0.26	.611[e]
Male	248	67.0	122	33.0		
Female	247	65.0	133	35.0		
Race					1.12	.935
White	292	66.2	149	33.8		
Black, African American	4	57.1	3	42.9		
Asian	27	67.5	13	32.5		
American Indian	2	100.0	0	0.0		
Other race	170	65.4	90	34.6		
Insurance					3.21	.355
Medicare	291	64.7	159	35.3		
MediCal	21	77.8	6	22.2		
Private	176	67.7	84	32.3		
Other insurance[a]	7	53.8	6	46.2		
Employment Status[b]					0.24	.622[e]
Employed	24	70.6	10	29.4		
Unemployed	154	76.2	48	23.8		
Type of Community[c]					20.04	**< .001**
Urban area	485	67.5	234	32.5		
Suburban area	4	25.0	12	75.0		
Large town	2	22.2	7	77.8		
Rural area	2	66.7	1	33.3		
International area	1	100.0	0	0.0		
Homeless	1	50.0	1	50.0		
Admitting Diagnosis[d]					43.04	**< .001**[f]
Infectious, parasitic diseases	8	72.7	3	27.3		
Neoplasms	5	45.5	6	54.5		
Blood, blood-forming organ, immune diseases	4	44.4	5	55.6		
Endocrine, nutritional, metabolic diseases	27	79.4	7	20.6		

Characteristic	Yes		No		χ^2	*p*
	n	***%***	***n***	***%***		
Admitting Diagnosis (*Cont.*)						
Eye diseases, adnexa	1	20.0	4	80.0		
Circulatory system diseases	104	65.8	54	34.2		
Respiratory system diseases	20	76.9	6	23.1		
Digestive system diseases	28	54.9	23	45.1		
Skin, subcutaneous tissue diseases	8	80.0	2	20.0		
Musculoskeletal, connective tissue diseases	28	65.1	15	34.9		
Genitourinary system diseases	16	80.0	4	20.0		
Congenital malformations, deformations, chromosomal abnormalities	1	100.0	0	0.0		
Symptoms, signs, abnormal clinical/lab findings	220	71.2	89	28.8		
Injury, poisoning, other consequences of external causes	9	37.5	15	62.5		
Special purpose codes (Covid-19)	3	60.0	2	40.0		
Factors influencing health status, contact with health services	8	32.0	17	68.0		
Primary Diagnosis[d]					47.25	**<.001**[f]
Infectious, parasitic diseases	57	67.9	27	32.1		
Neoplasms	16	55.2	13	44.8		
Blood, blood-forming organ, immune diseases	4	57.1	3	42.9		
Endocrine, nutritional, metabolic diseases	13	68.4	6	31.6		
Mental, behavioral, neurodevelopmental diseases	4	80.0	1	20.0		
Nervous system diseases	8	66.7	4	33.3		
Eye diseases, adnexa	1	33.3	2	66.7		
Ear, mastoid process diseases	1	100.0	0	0.0		
Circulatory system diseases	193	73.7	69	26.3		
Respiratory system diseases	23	74.2	8	25.8		
Digestive system diseases	42	64.6	23	35.4		
Skin, subcutaneous tissue diseases	7	77.8	2	22.2		
Musculoskeletal, connective tissue diseases	19	67.9	9	32.1		

Characteristic	Yes		No		χ^2	*p*
	n	%	*n*	%		
Primary Diagnosis (*Cont.*)						
Genitourinary system diseases	24	82.8	5	17.2		
Congenital malformations, deformations, chromosomal abnormalities	1	50.0	1	50.0		
Symptoms, signs, abnormal clinical/lab findings	31	52.5	28	47.5		
Injury, poisoning, other consequences of external causes	29	48.3	31	51.7		
Special purpose codes (Covid-19)	16	76.2	5	23.8		
Factors influencing health status, contact with health services	6	25.0	18	75.0		
Secondary Diagnosis[d]					4.80	.425
Neoplasms	2	100.0	0	0.0		
Blood, blood-forming organ, immune diseases	6	75.0	2	25.0		
Endocrine, nutritional, metabolic diseases	32	66.7	16	33.3		
Mental, behavioral, neurodevelopmental diseases	5	100.0	0	0.0		
Nervous system diseases	3	42.9	4	57.1		
Circulatory system diseases	447	65.7	233	34.3		
Hypertension Diagnosis					43.59	**< .001**[e]
Yes	457	70.6	190	29.4		
No	38	36.9	65	63.1		
Smoking Status					1.72	.443
Never smoked	264	79.5	68	20.5		
Former smoker	153	78.5	42	21.5		
Current smoker	15	68.2	7	31.8		
Alcohol Use Status					0.55	.768
Never	24	80.0	6	20.0		
Former	23	79.3	6	20.7		
Current	142	74.3	49	25.7		

	Yes		No			
Characteristic	***n***	***%***	***n***	***%***	χ^2	***p***
Body Mass Index, kg/m^2					2.14	.719
Underweight (< 18.5)	10	83.3	2	16.7		
Healthy weight (18.5-24.9)	79	69.3	35	30.7		
Overweight (25.0-29.9)	71	76.3	22	23.7		
Obese (30.0-39.9)	91	75.8	29	24.2		
Morbid obese (≥ 40)	24	75.0	8	25.0		
AF Classification					9.35	**.049**
Chronic unspecified AF	50	66.7	25	33.3		
Long-standing persistent AF	7	77.8	2	22.2		
Other persistent AF	57	80.3	14	19.7		
Permanent AF	188	66.2	96	33.8		
In-hospital Antiarrhythmic Drugs					33.81	**< .001**
None	375	62.1	229	37.9		
Amiodarone	95	80.5	23	19.5		
Flecainide	18	100.0	0	0.0		
Propafenone	6	100.0	0	0.0		
Sotalol	1	33.3	2	66.7		
Unknown type of drug	0	0.0	1	100.0		
Prior AF Catheter Ablation					1.17	.279[e]
Yes	29	58.0	21	42.0		
No	466	66.6	234	33.4		
Prior AF Surgical Ablation					< .001	> .999[e]
Yes	1	50.0	1	50.0		
No	494	66.0	254	34.0		
Cardioversion					0.44	.507[e]
Yes	13	76.5	4	23.5		
No	482	65.8	251	34.2		
AF Related Symptoms					8.46	**.004**[e]
Yes	109	76.8	33	23.2		
No	386	63.5	222	36.5		
Activity Limitation					0.01	.934[e]
Yes	49	67.1	24	32.9		
No	446	65.9	231	34.1		

Characteristic	Yes		No			
	n	***%***	***n***	***%***	χ^2	***p***
Treatment Concerns					0.15	.694[e]
Yes	24	70.6	10	29.4		
No	471	65.8	245	34.2		
AFEQT Patient Questionnaire					0.01	.906[e]
Yes	19	63.3	11	36.7		
No	476	66.1	244	33.9		
	M	***SD***	***M***	***SD***	***t***	***p***
Age, years	78.03	12.41	78.23	13.42	0.20	.841
Travel distance to hospital, miles	11.40	20.71	17.11	36.84	2.10	**.037**[g]
Body mass index, kg/m^2	28.98	7.84	28.50	7.66	0.95	.603

Note. [a]Other insurance = Uninsured, self-pay, workers compensation, international insurance. [b]Unemployed = Retired, disabled, student, other not seeking work. Employed = Full-time, part-time, self-employed. [c]Residence type based on the 2020 definition of the US Department of Agriculture (https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes/). [d]**ICD-10 Codes:** Infectious, parasitic diseases (A00-B99), Neoplasms (C00-D49), Blood, blood-forming organ, immune diseases (D50-D49), Endocrine, nutritional, metabolic diseases (E00-E89), Mental, behavioral, neurodevelopmental diseases (F01-F99), Nervous system diseases (G00-G99), Eye diseases, adnexa (H00-H59), Ear, mastoid process diseases (H60-H95), Circulatory system diseases (I00-I99), Respiratory system diseases (J00-J99), Digestive system diseases (K00-K95), Skin, subcutaneous tissue diseases (L00-L99), Musculoskeletal, connective tissue diseases (M00-M99), Genitourinary system diseases (N00-N99), Congenital malformations, deformations, chromosomal abnormalities (Q00-Q99), Symptoms, signs, abnormal clinical/lab findings (R00-R99), Injury, poisoning, other consequences of external causes (S00-T88), Special purpose codes (i.e., Covid-19, U00-U85), Factors influencing health status, contact with health services (Z00-Z99). *p*-value is Fisher's Exact tests, unless otherwise specified [e] Yate's Continuity Correction Sig. (2-sided). [f] Monte Carlo Sig. (2-sided). [g] Unequal sample sizes and variances; t-test performed with a random sample of largest group, equal to smallest group ($N = 510$).

A binomial logistic regression was conducted to ascertain the effects of ethnicity, type of community, hypertension diagnosis, AF classification, AF related symptoms, and travel distance to hospital on the likelihood that patients received in-hospital rate control drugs. Ethnicity, although not significant in the bivariate analysis, was included in the regression due to its relevance in the literature. There were five standardized residual with values greater than 2.5 standard deviations (potential outliers), which were kept in the analysis as they were less than 5 standard deviations and represented less than one

percent of the total sample size. The effect of these outliers in the results is deemed minimal. A test of the overall model against a constant only model was statistically significant, $\chi^2(11) = 76.66$, $p < .001$. The model explained 13.6% (Nagelkerke's R^2) of the variance in receiving (or not) in-hospital rate control drugs, and correctly classified 71.2% of the cases; sensitivity was 92.8% and sensitivity 29.4%. The area under the ROC curve was .669 (95% CI .628 to .711), which is a poor (close to acceptable) level of discrimination according to Hosmer et al. (2013).

Of the six predictor variables, three were statistically significant: type of community, hypertension diagnosis, and AF related symptoms (see Table 5). When compared to patients living in urban areas, those who lived in a suburban area ($p = .007$), or a large town ($p = .046$) were less likely to receive in-hospital rate control drugs. The odds of receiving in-hospital rate control drugs was 5.78 times less likely for participants in a suburban area and 5.71 less likely for participants in a small time, when compared to those living in an urban area. In addition, those with a hypertension diagnosis were 4.19 times more likely to receive in-hospital rate control drugs than those without a hypertension diagnosis ($p < .001$). Finally, those with AF related symptoms were 1.96 times more likely to receive in-hospital rate control drugs than those without AF related symptoms ($p = .004$). Hispanic/non-Hispanic ethnicity, AF classification and travel distance to the hospital did not have a unique contribution to receiving in-hospital rate control drugs (see Table 5).

Table 5

Summary of Logistic Regression Analysis Predicting Patient ***In-Hospital Rate Control Drugs*** *(N = 750)*

				99% CI			
Variable	***B***	***SE***	***OR***	**Lower**	**Upper**	***Wald statistic***	***p***
Ethnicity: Hispanic, Latino	0.17	0.17	1.19	0.85	1.67	0.99	.319
Community: Suburban	-1.75	0.65	0.17	0.05	0.62	7.28	**.007**
Community: Large town	-1.75	0.88	0.17	0.03	0.97	3.97	**.046**
Community: Rural area	0.27	1.47	1.31	0.07	23.53	0.03	.855
Hypertension diagnosis: Yes	1.43	0.23	4.19	2.66	6.60	38.16	**< .001**
AF classification: Long-standing persistent	0.41	0.88	1.50	0.27	8.38	0.21	.644
AF classification: Other persistent	0.61	0.41	1.83	0.83	4.06	2.22	.136
AF classification: Permanent	0.01	0.29	1.01	0.57	1.79	0.00	.971
AF classification: Unspecified	-0.17	0.28	0.84	0.48	1.47	0.37	.542
AF related symptoms: Yes	0.67	0.23	1.96	1.25	3.09	8.46	**.004**
Travel distance to hospital, miles	0.00	0.00	1.00	0.99	1.01	0.30	.587
$\chi^2(11) = 76.656, p < .001$							
-2 Log likelihood = 871.77. Nagelkerke $R^2 = 13.6\%$							

Note. CI = Confidence interval for odds ratio (OR). *Reference categories:* Ethnicity, Non-Hispanic/Latino; Community, Urban; Hypertension diagnosis, No; AF classification, Chronic AF unspecified; AF related symptoms, No; In-hospital rate control drugs, No; Cardioversion performed, No.

Prior Catheter Ablation

Bivariate analysis (*Chi*-square and *t*-tests) revealed healthcare insurance (p = .026), employment status (p = .002), admitting diagnosis (p < .001), secondary diagnosis (p < .001), hypertension diagnosis (p = .017), AF classification (p = .026), in-hospital antiarrhythmic drugs (p < .001), cardioversion (p < .001), AF related symptoms (p < .001), activity limitations (p < .001), treatment concerns, (p < .001), AFEQT Patient Questionnaire (p < .001), age (p < .001), and body mass index (p = .035) were significantly associated with prior catheter ablation (see Table 6).

None of participants with MediCal had a prior catheter ablation; among those with Medicare, 5.1% (n = 23) had a catheter ablation and 94.9% (n = 427) did not. Similarly, among those with private insurance 9.6% (n = 25) had a catheter ablation and 90.4% (n = 235) did not. Among participants with a hypertension diagnosis 5.7% (n = 37) had a prior catheter ablation and 94.3% did not; for those without a hypertension diagnosis 12.6% (n = 13) had a prior catheter ablation and 87.4% (n = 90) did not. About 18% (n = 26) participants with AF related symptoms had a prior catheter ablation; only 3.9% (n = 24) of those with no AF related symptoms had a prior catheter ablation. Of note, among participants with AF treatment concerns, 73.5% (n = 25) had a prior catheter ablation and 26.5% (n = 9) did not; however, for those with no AF treatment concerns, only 3.5% (n = 25) had a prior catheter ablation and 96.5% (n = 691) did not. Finally, those with a prior catheter ablation were younger (M = 69.02, SD = 9.04) than those with no prior catheter ablation (M = 81.64, SD = 11.45; see Table 6).

Table 6

Sociodemographic and Clinical Characteristics, Social Determinants of Health, and Symptom Burden of Study Population by ***Prior Catheter Ablation*** *(N = 750)*

	Yes		No			
Characteristic	***n***	***%***	***n***	***%***	χ^2	***p***
Gender					0.40	.526[e]
Male	22	5.9	348	94.1		
Female	28	7.4	352	92.6		
Race					3.79	.396
White	36	8.2	405	91.8		
Black, African American	0	0.0	7	100.0		
Asian	2	5.0	38	95.0		
American Indian	0	0.0	2	100.0		
Other race	12	4.6	248	95.4		
Insurance					8.59	**.026**
Medicare	23	5.1	427	94.9		
MediCal	0	0.0	27	100.0		
Private	25	9.6	235	90.4		
Other insurance[a]	2	15.4	11	84.6		
Employment Status[b]					9.89	**.002**[e]
Employed	12	35.3	22	64.7		
Unemployed	25	12.4	177	87.6		
Type of Community[c]					4.18	.753
Urban area	48	6.7	671	93.3		
Suburban area	1	6.3	15	93.8		
Large town	1	11.1	8	88.9		
Rural area	0	0.0	3	100.0		
International area	0	0.0	1	100.0		
Homeless	0	0.0	2	100.0		
Admitting Diagnosis[d]					42.98	**< .001**[f]
Infectious, parasitic diseases	0	0.0	11	100.0		
Neoplasms	0	0.0	11	100.0		
Blood, blood-forming organ, immune diseases	0	0.0	9	100.0		

Characteristic	Yes		No			
	n	%	*n*	%	χ^2	*p*
Admitting Diagnosis (*Cont.*)						
Endocrine, nutritional, metabolic diseases	0	0.0	34	100.0		
Mental, behavioral, neurodevelopmental diseases	0	0.0	1	100.0		
Nervous system diseases	0	0.0	7	100.0		
Eye diseases, adnexa	0	0.0	5	100.0		
Circulatory system diseases	30	19.0	128	81.0		
Respiratory system diseases	0	0.0	26	100.0		
Digestive system diseases	3	5.9	48	94.1		
Skin, subcutaneous tissue diseases	0	0.0	10	100.0		
Musculoskeletal, connective tissue diseases	2	4.7	41	95.3		
Genitourinary system diseases	2	10.0	18	90.0		
Congenital malformations, deformations, chromosomal abnormalities	0	0.0	1	100.0		
Symptoms, signs, abnormal clinical/lab findings	10	3.2	299	96.8		
Injury, poisoning, other consequences of external causes	0	0.0	24	100.0		
Special purpose codes (Covid-19)	0	0.0	5	100.0		
Factors influencing health status, contact with health services	3	12.0	22	88.0		
Primary Diagnosis[d]					21.83	.167[f]
Infectious, parasitic diseases	2	2.4	82	97.6		
Neoplasms	0	0.0	29	100.0		
Blood, blood-forming organ, immune diseases	0	0.0	7	100.0		
Endocrine, nutritional, metabolic diseases	0	0.0	19	100.0		
Mental, behavioral, neurodevelopmental diseases	0	0.0	5	100.0		
Nervous system diseases	0	0.0	12	100.0		
Eye diseases, adnexa	0	0.0	3	100.0		
Ear, mastoid process diseases	0	0.0	1	100.0		
Circulatory system diseases	32	12.2	230	87.8		

Characteristic	Yes		No			
	n	%	*n*	%	χ^2	*p*
Primary Diagnosis (*Cont.*)						
Respiratory system diseases	1	3.2	30	96.8		
Digestive system diseases	3	4.6	62	60.7		
Skin, subcutaneous tissue diseases	0	0.0	9	100.0		
Musculoskeletal, connective tissue diseases	3	10.7	25	89.3		
Genitourinary system diseases	1	3.4	28	96.6		
Congenital malformations, deformations, chromosomal abnormalities	0	0.0	2	100.0		
Symptoms, signs, abnormal clinical/lab findings	4	6.8	55	93.2		
Injury, poisoning, other consequences of external causes	1	1.7	59	98.3		
Special purpose codes (Covid-19)	1	4.8	20	95.2		
Factors influencing health status, contact with health services	2	8.3	22	91.7		
Secondary Diagnosis[d]					57.36	**< .001**
Neoplasms	0	0.0	2	100.0		
Blood, blood-forming organ, immune diseases	4	50.0	4	50.0		
Endocrine, nutritional, metabolic diseases	10	20.8	38	79.2		
Mental, behavioral, neurodevelopmental diseases	2	40.0	3	60.0		
Nervous system diseases	5	71.4	2	28.6		
Circulatory system diseases	29	4.3	651	95.7		
Hypertension Diagnosis					5.74	**.017**[e]
Yes	37	5.7	610	94.3		
No	13	12.6	90	87.4		
Smoking Status					0.34	.929
Never smoked	13	3.9	319	96.1		
Former smoker	8	4.1	187	95.9		
Current smoker	1	4.5	21	95.5		
Alcohol Use Status					0.85	.732
Never	2	6.7	28	93.3		
Former	1	3.4	28	96.6		
Current	18	9.4	173	90.6		

Characteristic	Yes		No			
	n	*%*	*n*	*%*	χ^2	*p*
Body Mass Index, kg/m^2					6.35	.153
Underweight (< 18.5)	0	0.0	12	100.0		
Healthy weight (18.5-24.9)	7	6.1	107	93.9		
Overweight (25.0-29.9)	14	15.1	79	84.9		
Obese (30.0-39.9)	14	11.7	106	88.3		
Morbid obese (≥ 40)	5	15.6	27	84.4		
AF Classification					10.54	**.026**
Chronic unspecified AF	1	1.3	74	98.7		
Long-standing persistent AF	0	0.0	9	100.0		
Other persistent AF	8	11.3	63	88.7		
Permanent AF	26	9.2	258	90.8		
In-hospital Antiarrhythmic Drugs					1.05	.306[e]
Yes	13	8.9	133	91.1		
No	37	6.1	567	93.9		
In-hospital Antiarrhythmic Drugs					31.34	**< .001**
None	37	6.1	567	93.9		
Amiodarone	3	2.5	115	97.5		
Flecainide	8	44.4	10	55.6		
Propafenone	2	33.3	4	66.7		
Sotalol	0	0.0	3	100.0		
Unknown type of drug	0	0.0	1	100.0		
In-hospital Rate Control Drugs					1.17	.279
Yes	29	5.9	466	94.1		
No	21	8.2	234	91.8		
In-hospital Rate Control Drugs					12.38	.096[f]
None	21	8.2	234	91.8		
Metoprolol	6	4.3	133	95.7		
Diltiazem	7	14.6	41	85.4		
Diltiazem, Metoprolol	3	6.8	41	93.2		
Digoxin, Metoprolol	3	7.5	37	92.5		
Digoxin, Diltiazem, Metoprolol	4	12.5	28	87.5		
Carvedilol	1	3.4	28	96.6		
Digoxin, Diltiazem	1	4.5	21	95.5		
All other combinations	4	9.4	137	97.2		

	Yes		No			
Characteristic	***n***	***%***	***n***	***%***	χ^2	***p***
Prior AF Surgical Ablation					1.08	.298[e]
Yes	1	50.0	1	50.0		
No	49	6.6	699	93.4		
Cardioversion					18.44	**< .001**[e]
Yes	6	35.3	11	64.7		
No	44	6.0	689	94.0		
AF Related Symptoms					35.89	**< .001**[e]
Yes	26	18.3	116	81.7		
No	24	3.9	584	96.1		
Activity Limitation					67.48	**< .001**[e]
Yes	22	30.1	51	69.9		
No	28	4.1	649	95.9		
Treatment Concerns					244.76	**< .001**[e]
Yes	25	73.5	9	26.5		
No	25	3.5	691	96.5		
AFEQT Patient Questionnaire					362.86	**< .001**[e]
Yes	28	93.3	2	6.7		
No	22	3.1	698	96.9		
	M	***SD***	***M***	***SD***	***t***	***p***
Age, years	69.02	9.04	81.64	11.45	6.12	**< .001**[g]
Travel distance to hospital, miles	18.53	24.43	13.26	29.35	-1.23	.220
Body mass index, kg/m^2	31.31	7.71	28.56	7.75	-2.12	**.035**

Note. [a]Other insurance = Uninsured, self-pay, workers compensation, international insurance. [b]Unemployed = Retired, disabled, student, other not seeking work. Employed = Full-time, part-time, self-employed. [c]Residence type based on the 2020 definition of the US Department of Agriculture (https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes/). [d]**ICD-10 Codes:** Infectious, parasitic diseases (A00-B99), Neoplasms (C00-D49), Blood, blood-forming organ, immune diseases (D50-D49), Endocrine, nutritional, metabolic diseases (E00-E89), Mental, behavioral, neurodevelopmental diseases (F01-F99), Nervous system diseases (G00-G99), Eye diseases, adnexa (H00-H59), Ear, mastoid process diseases (H60-H95), Circulatory system diseases (I00-I99), Respiratory system diseases (J00-J99), Digestive system diseases (K00-K95), Skin, subcutaneous tissue diseases (L00-L99), Musculoskeletal, connective tissue diseases (M00-M99), Genitourinary system diseases (N00-N99), Congenital malformations, deformations, chromosomal abnormalities (Q00-Q99), Symptoms, signs, abnormal clinical/lab findings (R00-R99), Injury, poisoning, other consequences of external causes (S00-T88), Special purpose codes (i.e., Covid-19, U00-U85), Factors influencing health status, contact with health services (Z00-Z99). *p*-value is Fisher's Exact tests, unless otherwise specified [e]Yate's Continuity Correction Sig. (2-sided). [f]Monte Carlo Sig. (2-sided). [g]Unequal sample sizes and variances; t-test performed with a random sample of largest group, equal to smallest group ($N = 100$).

A binomial logistic regression was conducted to ascertain the effects of ethnicity, hypertension diagnosis, AF symptoms, AF treatment concerns, and age on the likelihood that participants had a prior catheter ablation. There were twenty-five standardized residuals with values greater than 2.5 standard deviations (outliers), which were kept in the analysis as they were about 3% of the total sample size and impact on results was deemed minimal. A test of the overall model against a constant only model was statistically significant, $\chi^2(5) = 133.55$, $p < .001$. The model explained 42.2% (Nagelkerke's R^2) of the variance in having a prior catheter ablation, and correctly classified 95.8% of the cases; sensitivity was 48% and specificity 99.3%. The area under the ROC curve was .858 (95% CI .795 to .921), which is excellent discrimination according to Hosmer and Lemeshow (2000). Of the five predictor variables, three were statistically significant: Hispanic ethnicity, AF treatment concerns, and age (see Table 7).

Hispanic participants were 3.62 times more likely to have a prior Catheter ablation ($p = .006$) when compared to non-Hispanic participants. When compared to participants with no AF treatment concerns, those with treatment concerns are 68.07 times more likely to have a prior catheter ablation ($p < .001$). Increasing age was associated with a decrease in prior catheter ablation ($p < .001$); with each increasing year, there is a decrease in likelihood of prior catheter ablation by 1.06 times (see Table 7).

Table 7

Summary of Logistic Regression Analysis Predicting Patient ***Prior Catheter Ablation*** *(N = 750)*

				99% CI			
Variable	***B***	***SE***	***OR***	**Lower**	**Upper**	***Wald statistic***	***p***
Ethnicity: Hispanic, Latino	1.29	0.47	3.62	1.44	9.13	7.45	**.006**
Hypertension diagnosis: Yes	-0.72	0.44	0.49	0.20	1.16	2.61	.106
AF related symptoms: Yes	0.27	0.50	1.31	0.50	3.48	0.30	.583
Age	-0.06	0.02	0.94	0.92	0.97	14.64	**< .001**
Treatment concerns: Yes	4.22	0.59	68.07	21.46	215.94	51.34	**< .001**
$\chi^2(5) = 133.545$, $p < .001$							
-2 Log likelihood = 233.02. Nagelkerke $R^2 = 42.2\%$							

Note. CI = Confidence interval for odds ratio (OR). *Reference categories:* Ethnicity, Non-Hispanic/Latino; Hypertension diagnosis, No; AF related symptoms, No; Treatment concerns, No.

Prior Surgical Ablation

Bivariate analysis (*Chi*-square and *t*-tests) revealed only secondary diagnosis ($p < .001$), and AF classification ($p = .026$) were significantly associated with prior catheter ablation (see Table 8). Only two participants had a prior surgical ablation and 748 did not. Both these participants had an endocrine, nutritional, or metabolic disease. Among participants who had a prior surgical ablation, one had long-standing persistent AF and the other one permanent AF. Participants with chronic unspecified AF, other persistent AF, or unspecified AF did not have a prior catheter ablation.

Using the most lenient approach (Peduzzi et al., 1996; Schwab, 2002; Starkweather & Moske, 2011) 10 events per independent variable are needed for binomial logistic regression. Since only two participants had a prior catheter ablation, there were not enough cases to run binomial logistic regression with prior catheter ablation.

Table 8

Sociodemographic and Clinical Characteristics, Social Determinants of Health, and Symptom Burden of Study Population by ***Prior Surgical Ablation*** *(N = 750)*

	Yes		**No**			
Characteristic	***n***	***%***	***n***	***%***	χ^2	***p***
Gender					< .001	> .999[e]
Male	1	0.3	369	99.7		
Female	1	0.3	379	99.7		
Race					6.80	> .999
White	1	0.0	440	99.8		
Black, African American	0	0.0	7	100.0		
Asian	40	100.0	0	0.0		
American Indian	0	0.0	2	100.0		
Other race	1	0.4	259	99.6		

	Yes		No			
Characteristic	***n***	***%***	***n***	***%***	χ^2	***p***
Insurance					3.41	.583
Medicare	2	0.4	448	99.6		
MediCal	0	0.0	27	100.0		
Private	0	0.0	260	100.0		
Other insurance[a]	0	0.0	13	100.0		
Employment Status[b]					< .001	> .999[e]
Employed	0	0.0	34	100.0		
Unemployed	2	1.0	200	99.0		
Type of Community[c]					13.91	> .999
Urban area	2	0.3	717	99.7		
Suburban area	0	0.0	16	100.0		
Large town	0	0.0	9	100.0		
Rural area	0	0.0	3	100.0		
International area	0	0.0	1	100.0		
Homeless	0	0.0	2	100.0		
Admitting Diagnosis[d]					33.29	.553
Infectious, parasitic diseases	0	0.0	11	100.0		
Neoplasms	0	0.0	2	100.0		
Blood, blood-forming organ, immune diseases	0	0.0	9	100.0		
Endocrine, nutritional, metabolic diseases	0	0.0	34	100.0		
Mental, behavioral, neurodevelopmental diseases	0	0.0	1	100.0		
Nervous system diseases	0	0.0	7	100.0		
Eye diseases, adnexa	0	0.0	5	100.0		
Circulatory system diseases	2	1.3	156	98.7		
Respiratory system diseases	0	0.0	26	100.0		
Digestive system diseases	0	0.0	51	100.0		
Skin, subcutaneous tissue diseases	0	0.0	10	100.0		
Musculoskeletal, connective tissue diseases	0	0.0	43	100.0		
Genitourinary system diseases	0	0.0	20	100.0		
Congenital malformations, deformations, chromosomal abnormalities	0	0.0	1	100.0		

Characteristic	Yes		No			
	n	%	*n*	%	χ^2	*p*
Admitting Diagnosis (*Cont.*)						
Symptoms, signs, abnormal clinical/lab findings	0	0.0	309	100.0		
Injury, poisoning, other consequences of external causes	0	0.0	24	100.0		
Special purpose codes (Covid-19)	0	0.0	5	100.0		
Factors influencing health status, contact with health services	0	0.0	25	100.0		
Primary Diagnosis[d]					29.44	> .999
Infectious, parasitic diseases	0	0.0	84	100.0		
Neoplasms	0	0.0	29	100.0		
Blood, blood-forming organ, immune diseases	0	0.0	7	100.0		
Endocrine, nutritional, metabolic diseases	0	0.0	19	100.0		
Mental, behavioral, neurodevelopmental diseases	0	0.0	5	100.0		
Nervous system diseases	0	0.0	12	100.0		
Eye diseases, adnexa	0	0.0	3	100.0		
Ear, mastoid process diseases	0	0.0	1	100.0		
Circulatory system diseases	2	0.8	260	99.2		
Respiratory system diseases	0	0.0	31	100.0		
Digestive system diseases	0	0.0	65	100.0		
Skin, subcutaneous tissue diseases	0	0.0	9	100.0		
Musculoskeletal, connective tissue diseases	0	0.0	28	100.0		
Genitourinary system diseases	0	0.0	29	100.0		
Congenital malformations, deformations, chromosomal abnormalities	0	0.0	2	100.0		
Symptoms, signs, abnormal clinical/lab findings	0	0.0	59	100.0		
Injury, poisoning, other consequences of external causes	0	0.0	60	100.0		
Special purpose codes (Covid-19)	0	0.0	21	100.0		
Factors influencing health status, contact with health services	0	0.0	24	100.0		

Characteristic	Yes		No			
	n	***%***	***n***	***%***	χ^2	***p***
Secondary Diagnosis[d]					21.39	**.009**
Neoplasms	0	0.0	2	100.0		
Blood, blood-forming organ, immune diseases	0	0.0	8	100.0		
Endocrine, nutritional, metabolic diseases	2	4.2	46	95.8		
Mental, behavioral, neurodevelopmental diseases	0	0.0	5	100.0		
Nervous system diseases	0	0.0	7	100.0		
Circulatory system diseases	0	0.0	680	100.0		
Hypertension Diagnosis					< .001	> .999[e]
Yes	2	0.3	645	99.7		
No	0	0.0	103	100.0		
Smoking Status					2.07	.395[e]
Never smoked	0	0.0	332	100.0		
Former smoker	1	0.5	194	99.5		
Current smoker	0	0.0	22	100.0		
Alcohol Use Status						
Never	0	0.0	30	100.0		
Former	0	0.0	29	100.0		
Current	0	0.0	191	100.0		
Body Mass Index, kg/m^2					3.11	.801
Underweight (< 18.5)	0	0.0	12	100.0		
Healthy weight (18.5-24.9)	0	0.0	114	100.0		
Overweight (25.0-29.9)	1	1.1	92	98.9		
Obese (30.0-39.9)	1	0.8	119	99.2		
Morbid obese (≥ 40)	0	0.0	32	100.0		
AF Classification					10.22	**.023**
Chronic unspecified AF	0	0.0	75	100.0		
Long-standing persistent AF	1	11.1	8	88.9		
Other persistent AF	0	0.0	71	100.0		
Permanent AF	1	0.4	283	99.6		
Unspecified AF	0	0.0	311	100.0		
In-hospital Antiarrhythmic Drugs					< .001	> .999[e]
Yes	0	0.0	146	100.0		
No	2	0.3	602	99.7		

	Yes		No			
Characteristic	***n***	***%***	***n***	***%***	χ^2	***p***
In-hospital Antiarrhythmic Drugs					0.87	> .999[e]
None	2	0.3	602	99.7		
Amiodarone	0	0.0	118	100.0		
Flecainide	0	0.0	18	100.0		
Propafenone	0	0.0	6	100.0		
Sotalol	0	0.0	3	100.0		
Unknown type of drug	0	0.0	1	100.0		
In-hospital Rate Control Drugs					< .001	> .999[e]
Yes	1	0.2	494	99.8		
No	1	0.4	254	99.6		
In-hospital Rate Control Drugs					6.77	> .999
None	1	0.4	254	99.6		
Metoprolol	0	0.0	139	100.0		
Diltiazem	0	0.0	48	100.0		
Diltiazem, Metoprolol	0	0.0	44	100.0		
Digoxin, Metoprolol	0	0.0	40	100.0		
Digoxin, Diltiazem, Metoprolol	0	0.0	32	100.0		
Carvedilol	0	0.0	29	100.0		
Digoxin, Diltiazem	0	0.0	22	100.0		
All other combinations	1	0.7	140	99.3		
Prior AF Catheter Ablation					1.05	.298
Yes	1	2.0	49	98.0		
No	1	0.1	699	99.9		
Cardioversion					< .001	> .999[e]
Yes	0	0.0	17	100.0		
No	2	0.3	731	99.7		
AF Related Symptoms					0.48	.826[e]
Yes	1	0.7	141	99.3		
No	1	0.2	607	99.8		
Activity Limitation					< .001	> .999[e]
Yes	0	0.0	73	100.0		
No	2	0.3	675	99.7		

	Yes		No			
Characteristic	***n***	***%***	***n***	***%***	χ^2	***p***
Treatment Concerns					1.94	.164[e]
Yes	1	2.9	33	97.1		
No	1	0.1	715	99.9		
AFEQT Patient Questionnaire					2.30	.129[e]
Yes	1	3.3	29	96.7		
No	1	0.1	719	99.9		
	M	***SD***	***M***	***SD***	***t***	***p***
Age, years	72.00	7.07	78.11	12.77	0.68	.499
Travel distance to hospital, miles	9.55	12.09	13.62	29.10	0.20	.844
Body mass index, kg/m^2	29.84	0.57	28	7.81	-0.18	.858

Note. [a]Other insurance = Uninsured, self-pay, workers compensation, international insurance. [b]Unemployed = Retired, disabled, student, other not seeking work. Employed = Full-time, part-time, self-employed. [c]Residence type based on the 2020 definition of the US Department of Agriculture (https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes/). [d]**ICD-10 Codes:** Infectious, parasitic diseases (A00-B99), Neoplasms (C00-D49), Blood, blood-forming organ, immune diseases (D50-D49), Endocrine, nutritional, metabolic diseases (E00-E89), Mental, behavioral, neurodevelopmental diseases (F01-F99), Nervous system diseases (G00-G99), Eye diseases, adnexa (H00-H59), Ear, mastoid process diseases (H60-H95), Circulatory system diseases (I00-I99), Respiratory system diseases (J00-J99), Digestive system diseases (K00-K95), Skin, subcutaneous tissue diseases (L00-L99), Musculoskeletal, connective tissue diseases (M00-M99), Genitourinary system diseases (N00-N99), Congenital malformations, deformations, chromosomal abnormalities (Q00-Q99), Symptoms, signs, abnormal clinical/lab findings (R00-R99), Injury, poisoning, other consequences of external causes (S00-T88), Special purpose codes (i.e., Covid-19, U00-U85), Factors influencing health status, contact with health services (Z00-Z99). *p*-value is Fisher's Exact tests, unless otherwise specified [e]Yate's Continuity Correction Sig. (2-sided).

Cardioversion

Bivariate analysis (*Chi*-square and *t*-tests) revealed secondary diagnosis (p = .002), AF classification ($p < .001$), in-hospital antiarrhythmic drugs (p = .009), prior catheter ablation ($p < .001$), treatment concerns, (p = .041), AFEQT Patient Questionnaire ($p < .001$) were significantly associated with cardioversion (see Table 9).

Among participants with blood, blood-forming organ or immune diseases, 25% (n = 2) received cardioversion and 75% (n = 6) did not. Among participants with long-standing persistent AF, 22.2% (n = 2) received cardioversion 77.8% (n = 7) did not. About 5.5% (n = 8) of participants who received in-hospital antiarrhythmic drugs, also received cardioversion and 94.5% (n = 138) did not. Among those who had a prior catheter ablation, 12% (n = 6) received cardioversion and 88% (n = 44) did not. About 9% (n = 3) of participants with AF treatment concerns received cardioversion and 91.2% (n = 31) did not; among those with no AF treatment concerns, only 2% (n = 14) received cardioversion. Finally, among participants with an AFQOL questionnaire (AF symptoms), 13.3% (n = 4) received cardioversion and 96.7% (n = 26) did not; among those with no AF symptoms only 1.8% (n = 13) received cardioversion (see Table 9).

Table 9

Sociodemographic and Clinical Characteristics, Social Determinants of Health, and Symptom Burden of Study Population by ***Cardioversion*** *(N = 750)*

	Yes		No			
Characteristic	***n***	***%***	***n***	***%***	χ^2	***p***
Gender					< .001	> .999[e]
Male	8	2.2	362	97.8		
Female	9	2.4	371	97.6		
Race					6.32	.198
White	14	3.2	427	58.3		
Black, African American	0	0.0	7	100.0		
Asian	1	2.5	39	97.5		
American Indian	0	0.0	2	100.0		
Other race	2	0.8	258	99.2		
Insurance					0.30	.922
Medicare	10	2.2	440	97.8		
MediCal	0	0.0	27	100.0		
Private	7	2.7	253	97.3		
Other insurance[a]	0	0.0	13	100.0		
Employment Status[b]					2.16	.141
Employed	5	14.7	29	85.3		
Unemployed	12	5.9	190	94.1		
Type of Community[c]					4.59	> .999
Urban area	17	2.4	702	97.6		
Suburban area	0	0.0	16	100.0		
Large town	0	0.0	9	100.0		
Rural area	0	0.0	3	100.0		
International area	0	0.0	1	100.0		
Homeless	0	0.0	2	100.0		
Admitting Diagnosis[d]					11.64	.901
Infectious, parasitic diseases	0	0.0	11	100.0		
Neoplasms	0	0.0	11	100.0		
Blood, blood-forming organ, immune diseases	0	0.0	9	100.0		
Endocrine, nutritional, metabolic diseases	1	2.9	33	97.1		

Characteristic	Yes		No			
	n	*%*	*n*	*%*	χ^2	*p*
Eye diseases, adnexa	0	0.0	5	100.0		
Circulatory system diseases	8	5.1	150	94.9		
Respiratory system diseases	0	0.0	26	100.0		
Digestive system diseases	0	0.0	51	100.0		
Skin, subcutaneous tissue diseases	0	0.0	10	100.0		
Musculoskeletal, connective tissue diseases	1	2.3	42	97.7		
Genitourinary system diseases	0	0.0	20	100.0		
Congenital malformations, deformations, chromosomal abnormalities	0	0.0	1	100.0		
Symptoms, signs, abnormal clinical/lab findings	7	2.3	302	97.7		
Injury, poisoning, other consequences of external causes	0	0.0	24	100.0		
Special purpose codes (Covid-19)	0	0.0	5	100.0		
Factors influencing health status, contact with health services	0	0.0	25	100.0		
Primary Diagnosis[d]					15.24	.670
Infectious, parasitic diseases	0	0.0	84	100.0		
Neoplasms	1	3.4	28	96.6		
Blood, blood-forming organ, immune diseases	0	0.0	7	100.0		
Endocrine, nutritional, metabolic diseases	0	0.0	19	100.0		
Mental, behavioral, neurodevelopmental diseases	0	0.0	5	100.0		
Nervous system diseases	0	0.0	12	100.0		
Eye diseases, adnexa	0	0.0	3	100.0		
Ear, mastoid process diseases	0	0.0	1	100.0		
Circulatory system diseases	11	4.2	251	95.8		
Respiratory system diseases	0	0.0	31	100.0		
Digestive system diseases	0	0.0	65	100.0		
Skin, subcutaneous tissue diseases	0	0.0	9	100.0		
Musculoskeletal, connective tissue diseases	0	0.0	28	100.0		
Genitourinary system diseases	0	0.0	29	100.0		

Characteristic	Yes		No			
	n	*%*	*n*	*%*	χ^2	*p*
Primary Diagnosis (*Cont.*)						
Congenital malformations, deformations, chromosomal abnormalities	0	0.0	2	100.0		
Symptoms, signs, abnormal clinical/lab findings	3	5.1	56	94.9		
Injury, poisoning, other consequences of external causes	2	3.3	58	96.7		
Special purpose codes (Covid-19)	0	0.0	21	100.0		
Factors influencing health status, contact with health services	0	0.0	24	100.0		
Secondary Diagnosis[d]					19.07	**.002**
Neoplasms	0	0.0	2	100.0		
Blood, blood-forming organ, immune diseases	2	25.0	6	75.0		
Endocrine, nutritional, metabolic diseases	3	6.3	45	93.8		
Mental, behavioral, neurodevelopmental diseases	0	0.0	5	100.0		
Nervous system diseases	1	14.3	6	85.7		
Circulatory system diseases	11	1.6	669	98.4		
Hypertension Diagnosis					0.69	.406[e]
Yes	13	2.0	634	98.0		
No	4	3.9	99	96.1		
Smoking Status					0.06	> .999
Never smoked	8	2.4	324	97.6		
Former smoker	4	2.1	191	97.9		
Current smoker	0	0.0	22	100.0		
Alcohol Use Status					1.15	.552
Never	0	0.0	30	100.0		
Former	0	0.0	29	100.0		
Current	8	4.2	183	95.8		
Body Mass Index, kg/m^2					5.54	.177
Underweight (< 18.5)	2	16.7	10	83.3		
Healthy weight (18.5-24.9)	7	6.1	107	93.9		
Overweight (25.0-29.9)	3	3.2	90	96.8		
Obese (30.0-39.9)	5	4.2	115	95.8		
Morbid obese (≥ 40)	0	0.0	32	100.0		

Characteristic	Yes		No			
	n	*%*	*n*	*%*	χ^2	*p*
AF Classification					19.96	**< .001**
Chronic unspecified AF	0	0.0	75	100.0		
Long-standing persistent AF	2	22.2	7	77.8		
Other persistent AF	6	8.5	65	91.5		
Permanent AF	6	2.1	278	97.9		
Unspecified AF	3	1.0	308	99.0		
In-hospital Antiarrhythmic Drugs					6.74	**.009**[e]
Yes	8	5.5	138	94.5		
No	9	1.5	595	98.5		
In-hospital Antiarrhythmic Drugs					16.09	**.011**
None	9	1.5	595	98.5		
Amiodarone	5	4.2	113	95.8		
Flecainide	2	11.1	16	88.9		
Propafenone	1	16.7	5	83.3		
Sotalol	0	0.0	3	100.0		
Unknown type of drug	0	0.0	1	100.0		
In-hospital Rate Control Drugs					0.44	.507[e]
Yes	13	2.6	482	97.4		
No	4	1.6	251	98.4		
In-hospital Rate Control Drugs					12.59	.053
None	4	1.6	251	98.4		
Metoprolol	1	0.7	138	99.3		
Diltiazem	0	0.0	48	100.0		
Diltiazem, Metoprolol	2	4.5	42	95.5		
Digoxin, Metoprolol	2	5.0	38	95.0		
Digoxin, Diltiazem, Metoprolol	3	9.4	29	90.6		
Carvedilol	1	3.4	28	96.6		
Digoxin, Diltiazem	1	4.5	21	95.5		
All other combinations	3	2.1	138	97.9		
Prior AF Catheter Ablation					18.44	**< .001**[e]
Yes	6	12.0	44	88.0		
No	11	1.6	689	98.4		

Characteristic	Yes		No			
	n	***%***	***n***	***%***	χ^2	***p***
Prior AF Surgical Ablation					< .001	> .999[e]
Yes	0	0.0	2	100.0		
No	17	2.3	731	97.7		
AF Related Symptoms					2.04	.153[e]
Yes	6	4.2	136	95.8		
No	11	1.8	597	98.2		
Activity Limitation					2.33	.127[e]
Yes	4	5.5	69	94.5		
No	13	1.9	664	98.1		
Treatment Concerns					4.16	**.041**[e]
Yes	3	8.8	31	91.2		
No	14	2.0	702	98.0		
AFEQT Patient Questionnaire					12.47	**< .001**[e]
Yes	4	13.3	26	86.7		
No	13	1.8	707	98.2		
	M	***SD***	***M***	***SD***	***t***	***p***
Age, years	72.41	9.12	78.23	12.80	1.86	.063
Travel distance to hospital, miles	12.12	14.42	13.64	29.33	0.21	.831
Body mass index, kg/m^2	25.90	6.33	29.00	7.83	1.61	.109

Note. [a]Other insurance = Uninsured, self-pay, workers compensation, international insurance. [b]Unemployed = Retired, disabled, student, other not seeking work. Employed = Full-time, part-time, self-employed. [c]Residence type based on the 2020 definition of the US Department of Agriculture (https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes/). [d]**ICD-10 Codes:** Infectious, parasitic diseases (A00-B99), Neoplasms (C00-D49), Blood, blood-forming organ, immune diseases (D50-D49), Endocrine, nutritional, metabolic diseases (E00-E89), Mental, behavioral, neurodevelopmental diseases (F01-F99), Nervous system diseases (G00-G99), Eye diseases, adnexa (H00-H59), Ear, mastoid process diseases (H60-H95), Circulatory system diseases (I00-I99), Respiratory system diseases (J00-J99), Digestive system diseases (K00-K95), Skin, subcutaneous tissue diseases (L00-L99), Musculoskeletal, connective tissue diseases (M00-M99), Genitourinary system diseases (N00-N99), Congenital malformations, deformations, chromosomal abnormalities (Q00-Q99), Symptoms, signs, abnormal clinical/lab findings (R00-R99), Injury, poisoning, other consequences of external causes (S00-T88), Special purpose codes (i.e., Covid-19, U00-U85), Factors influencing health status, contact with health services (Z00-Z99). *p*-value is Fisher's Exact tests, unless otherwise specified [e] Yate's Continuity Correction Sig. (2-sided).

Using the most lenient approach (Peduzzi et al., 1996; Schwab, 2002; Starkweather & Moske, 2011) 10 events per independent variable are needed for binomial logistic regression. Since only 17 participants received cardioversion and 733 did not, only two factors were evaluated in the binomial logistic regression.

A binomial logistic regression was conducted to ascertain the effects of ethnicity, and AF treatment concerns on the likelihood that participants had a cardioversion procedure. There were seventeen standardized residuals with values greater than 2.5 standard deviations (outliers), which were kept in the analysis as they were about 2.3% of the total sample size and impact on results was deemed minimal. A test of the overall model against a constant only model was statistically significant, $\chi^2(2) = 8.38$, p = .015. The model explained 5.7% (Nagelkerke's R^2) of the variance in having a cardioversion procedure, and correctly classified 97.7% of the cases; sensitivity was 0% and specificity 100%. The area under the ROC curve was .664 (95% CI .540 to .788), which is poor discrimination according to Hosmer and Lemeshow (2000). Of the two predictor variables, one was statistically significant: AF treatment concerns (see Table 10). When compared to participants with no AF treatment concerns, those with AF treatment concerns were 5.53 times more likely to have a cardioversion procedure (p = .011; see Table 10).

Table 10

Summary of Logistic Regression Analysis Predicting Patient ***Cardioversion*** *(N = 750)*

				99% CI			
Variable	***B***	***SE***	***OR***	**Lower**	**Upper**	***Wald statistic***	***p***
Ethnicity: Hispanic, Latino	1.20	0.65	3.31	0.93	11.74	3.42	.065
AF treatment concerns: Yes	1.71	0.67	5.53	1.48	20.68	6.47	**.011**
$\chi^2(2) = 8.381$, $p = .015$							
-2 Log likelihood = 153.71. Nagelkerke $R^2 = 5.7\%$							

Note. CI = Confidence interval for odds ratio (OR). *Reference categories:* Ethnicity, Non-Hispanic/Latino; AF treatment concerns, No.

Chapter 5

Discussion

For more than two decades, multiple studies have found rising mortality from AF is the primary or a contributing cause of death, with AF mentioned on 183,321 death certificates and found as the underlying cause of death in 26,535 Americans (CDC, 2022). In the United States, the increased financial burden from AF stems from more than 454,000 hospitalizations, with AF as the primary diagnosis (Benjamin et al., 2019). AF causes about 1 in 7 strokes and contributes to about 158,000 deaths each year (CDC, 2022). In terms of race and ethnicity, research indicates White people receive an AF diagnosis in greater numbers than ethnic minorities (Tamirisa et al., 2021; Wyse et al., 2002); a paradox that needs investigation. The identification and management of AF among minority populations-focused on interventions to promote quality of life for people diagnosed with AF, is needed. Research is necessary to facilitate the acceptance and continuity of AF screening programs, as well as AF prevention and management programs, in minority populations in the United States; particularly in Santa Clara County, Northern California, where the current study was conducted. Previous research has not described ethnic minorities' choice of AF treatment, or self-rating symptom burden affecting their quality of life. At the present time, the extant research does not support the clinical use of any specific AF screening and management strategy over another for ethnic minorities. The purpose of this study was to explore the SDOH, sociodemographic characteristics, and symptom burden in Hispanic/Latino adults compared to non-Hispanic/Latino adults with AF, and determine what AF treatments (rhythm control and rate control) these two groups receive.

Data was collected retrospectively via extraction from the HER of 750 patients who received care at an acute care hospital in Santa Clara County, California, from June 1, 2020 to June 1, 2022. Data included select sociodemographic and clinical characteristics (age, race, ethnicity, gender, health plan, body mass index, hypertension diagnosis, smoking status, alcohol use, and admitting, primary and secondary diagnoses), AF diagnosis, SDOH (employment status, insurance, access to healthcare, and type of community participants reside in), AF symtpoms, and AF treatments received (drugs, and interventions).

Specific Aims

Specific aims were to (1) describe select sociodemographic and clinical characteristics, AF symptoms, SDOH, and AF management in adult Hispanic/Latino participants with AF receiving care at an urban hospital in Northern California; (2) examine associations among select sociodemographic and clinical characteristics AF symptoms, SDOH, and AF management in adult Hispanic/Latino participants with AF receiving care at an urban hospital in Northern California; and (3) analyze the type of treatment received (rate or rhythm control) among Hispanics/Latinos and non-Hispanics.

Race/Ethnicity

The final sample size included 750 adult patients receiving care for AF at an urban hospital in Santa Clara County in Northern California. Research has reported AF as a predominately White people issue, based on studies with mostly White participants (Koch et al., 2010; Shulman et al., 2017). In the current study, all 750 participants received care for AF, with 58.8% self-identified as White, 39% as Hispanic or Latino, 34.7% Other race, 5.3% Asian, and 0.9% Black or African American. Thirty-nine percent

(n = 289) self-identified as Hispanic or Latino, which is higher than the value reported by the 2021 U.S. Census for Santa Clara County, which may be due to the census category of White including people of Hispanic origin. By separating race and ethnicity, White Hispanic participants must identify themselves as Hispanic ethnicity, in addition to White race. In this study all participants had AF, but a larger number were White non-Hispanic when compared to Hispanics. Despite separating race and ethnicity in the current study, it is still not clear whether the prevalence of AF differs by race and ethnicity (White non-Hispanic vs. Hispanic regardless of race); yet multiple studies suggest AF is primarily a White people disease. Lack of screening and enrollment in longitudinal studies for Hispanics and other ethnic minorities—coupled with lack of mutually exclusive categories for race and ethnicity in EHRs—may obscure the results. AF risk factors include diabetes, previous cardiothoracic surgery, smoking, stroke, heart disease, sleep apnea, obesity, alcohol use, drug use, elevated blood pressure, hyperlipidemia, hyperthyroidism, ECG features left ventricular hypertrophy, or left atrial enlargement (Fitzmaurice et al., 2007).

Age

Prior studies indicate the prevalence of AF increases with age (Schnabel et al., 2015). For example, in the SPORTIF trials, females with a diagnosis of AF were 75 and older, had more risk factors for stroke than males, were prone to more anticoagulant related bleeding, had a higher thromboembolism rate due to more frequent interruption of anticoagulant therapy, and were also less likely to receive cardiovascular medications (Gomberg-Maitland et al., 2006). In the current study the average participant age was 78 with ages ranging between 26 and 104 years; mean age was about 9 years younger for

Hispanic versus non-Hispanic participants (72 vs. 81 years respectively). In the Framingham community 50-year surveillance study, there was an observed increased AF prevalence of 25.7% per 1000 person-years in men, and 11.8% per 1000 person-years in women, with a statistically significant trend across time periods *p*-trend < .0001 (Schnabel et al., 2015). In the current study, participants with AF were older, supporting prior research noting AF risk increases with age. However, Hispanics seeking care for AF may do so at a younger age compared to non-Hispanic Whites. Further research should elucidate whether Hispanics with AF may experience or pursue care at a younger age.

Gender

In this study, there were slightly more women (50.7%, *n* = 380) than men (49.3%, *n* = 370). Interestingly, none of the males self-identified as Hispanic or Latino, while 76.3% (*n* = 289) of females identified as Hispanic or Latina seeking care at a community hospital. It is unclear why there were not self-identified Hispanic males in this sample. This contrasts with the Framingham enhanced surveillance study that over a period of 50 years observed an increased AF prevalence 25.7% per 1000 person-years in males and 11.8% per 1000 person-years in females (*p*-trend < .0001; Schnabel et al., 2015). Additionally, studies have reported females with an AF diagnosis were at higher risk for ischemic stroke and thromboembolism and had worst outcomes and higher rate of recurrences after cardioversion than males (Wyse et al., 2002). Clinical outcomes were not evaluated in this study and thus we are unable to make any conclusions on clinical outcomes by gender.

Hypertension

Over eighty percent (*n* = 647) of study participants had a hypertension diagnosis.

Notably, hypertension was a frequent comorbidity. Prior research, including the 50-year Framingham surveillance study, found females with AF although older, had a better risk profile than males; except for having worse blood pressure despite having a higher proportion of hypertension treatment (36.9% prevalence new onset AF, *p*-trend < .0001; Schnabel et al., 2015). In the current study, there were slightly more females than males with AF, with Hispanic females seeking care at an earlier age. Additionally, significant associations were found between prior catheter ablation and insurance, employment status, admitting diagnosis, secondary diagnosis, hypertension diagnosis, AF classification, in-hospital antiarrhythmic drugs, cardioversion, AF related symptoms, activity limitation, treatment concerns, AFEQT patient questionnaire, age, and body mass index.

Opportunistic screening for AF is recommended for people with hypertension and obstructive sleep apnea (January et al., 2019). In the current study there was a statistically significant association between AF treatment of in-hospital rate control drugs and hypertension diagnosis ($p < .001$). Among those with a hypertension diagnosis, 70.6% received in-hospital rate control drugs and 29.4% did not. Therefore, participants with AF and hypertension were more likely to receive treatment with rate control medications.

A prominent risk factor for AF is increasing age and burden from other comorbidities, such as, diabetes mellitus, coronary artery disease, chronic kidney disease, obesity, obstructive sleep apnea, and modifiable risk factors are contributors to AF development and progression (January et al., 2019). AF related hospitalizations (i.e., 10 to 40% annually) are related to HF, myocardial infarction or AF related symptoms and treatment associated complications (January et al., 2019).

Smoking and Alcohol Risk Factors

People with new onset AF had similar risk factors in both males and females, except smoking showed a decline in males but not in females with both sexes demonstrating 2.7% smoking prevalence (*p*-trend of .0002) having a decreasing trend direction over the 50 years of the Framingham study (Schnabel et al., 2015). Notably, cigarette smoking and exposure to secondhand smoke can increase stroke risk. Indeed, smoking cessation is crucial in the management of patients with an AF diagnosis. In the current population, few smoked and it was not a common comorbidity.

The greater proportion of current alcohol users in this population self-identified as non-Hispanic/non-Latino (74.6%, $n = 141$) when compared to Hispanics. By contrast, Schnabel et al. (2015) found people with new onset AF had a 5.4% prevalence of heavy alcohol (*p*-trend of .005), with a decreasing trend direction of alcohol use over the 50 years of the Framingham study. In the current study, 60.5% of participants did not smoke; yet, three quarters (76.4%) consumed alcohol, although the exact amount of alcohol use was not measured. In the current study, the clinical factors smoking status and alcohol us were not significantly associated with ethnicity. For instance, Hispanics with AF neither smoked, nor drank alcohol more than non-Hispanics with AF.

Obesity

Among study participants with healthy weight, 69.9% self-identified as non-Hispanic. Most Hispanic participants had an above normal weight; less than one third of Hispanics (30.1%) had a healthy weight, when compared to 75% of non-Hispanic who had a healthy weight. Among Hispanic participants (column percentages), 2% were underweight, 22.5% had heathy weight, 31.1% were overweight, and 33.1% obese and

11.3% morbidly obese. The average body mass index for Hispanic participants was 29 kg/m^2 and 7.58 kg/m^2 for non-Hispanic participants. The Framingham study (Schnabel et al., 2015) has found a 35.4% prevalence of obesity (BMI > 30, *p*-trend .0001) in AF patients, both male and female (Schnabel et al., 2015). Atrial remodeling during obesity was associated with AF from progressive obesity, changes in atrial size, conduction, histology, and expression of profibrotic mediators (Heart Rhythm Society, 2019). Hispanic/Latino adults with stroke/transient ischemic attack have suboptimal control of modifiable vascular risk factors with only 30% participants having a healthy diet (Bai et al., 2021). Based on the current findings, it is important to advise Hispanic patients to consume a diet rich in fruit and vegetables and low-fat dairy, and a reduction in saturated fat. Also, it is important to encourage five times weekly moderate physical activity for 30 minutes. Sleep apnea, decreased exercise tolerance, coupled with the maintenance of activity levels and healthy weights, were among the most problematic AF challenges for rural patients (O'Neal et al., 2018).

Employment and Education

Among unemployed participants (retired, disabled, student, other not seeking work), most were non-Hispanic (68.5%, *n* = 137); 31.5% (*n* = 63) were Hispanic (*p* = .041). Most participants were of retirement age; however, since Hispanic participants were younger, they were most likely still employed. Previous studies that evaluated socioeconomic status (SES, i.e., neighborhood level median household income, education level, employment status and receipt of social services) and AF incidence did not observe significant associations between SES and AF due to small sample of underserved population enrolled and limitations in ascertaining AF (Essien et al., 2021; Shulman et

al., 2017). Shulman et al. (2017) findings suggest non-Hispanic White people at higher risk for AF independent of SES from a population of 9504 non-Hispanic Whites (mostly older, male, and higher SES; hazard ratio of 0.99, $p = .061$) and 20,960 Hispanics.

Education attainment can affect coping and problem-solving, which, in turn, can influence diet, exercise, smoking habits, health, and disease; all of which impact health outcomes. Furthermore, education attainment can shape work opportunities, work conditions, work-related resources, and income, leading to stress, affecting access to health insurance, availability of sick leave, housing quality, neighborhood environment, dietary choices, and exercise options. Educational and social status also play a role in shaping self-agency and social networks, and, in turn, affect coping mechanisms, responses to stress, health-related behaviors, access to social and economic resources, availability of social support, and adherence to norms of healthy behavior (Egerter et al., 2011). Unfortunately, capturing education level and employment type was not feasible due to limitations in EHR data.

Insurance Coverage

The most common insurance carriers for the study population were Medicare (60%) and private (34.7%); only 3.6% participants had MediCal. Among participants with Medicare, 70.8% self-identified as non-Hispanic or non-Latino and 29.2% as Hispanic or Latino. By contrast, among those with MediCal, 85.2% self-identified as Hispanic and 14.8% as non-Hispanic. About half of participants with private insurance self-identified as Hispanic (49%) and half as non-Hispanic (51%). A limitation in this study was that there where categories of Hispanic whites which made it hard to differentiate treatment between whites and Hispanics. In the current study, Hispanics

seemed to utilize more MediCal and private insurance, meanwhile non-Hispanic Whites were more dependent on Medicare.

In the current study both Hispanics and Non-Hispanics depend in insurance coverage for treatment and reimbursement would affect the access to treatment. The Protecting Medicare and American Farmers from Sequester Cuts Act (S.610) became Public Law No.: 117-71 on December 10, 2021. This law made several budgetary, technical, and procedural changes to Medicare and increased the debt limit. PAYGO subjects Medicare and some community health funding to sequestration (across the board spending reductions), but caps any reduction at 4%, which amounts to about $38 billion in FY2023. Making AF care available through insurance coverage is important to allow people to receive treatment. Naturally, healthcare providers oppose spending reductions because it is unsustainable since these cuts decrease hospital profitability while dealing with significantly higher labor costs.

The American Medical Association relative value scale was flagged for electrophysiology ablation services due to growth in volume in Medicare reassessment (ACC, 2022). Growing services reflect evolving patterns of care and reflect performance of services. 3D mapping, left atrial pacing and ICE are nearly universally performed for AF ablation and starting 2022 they are not reported separately, but instead it is bundled services (ACC, 2022). Therefore, AF ablation services bundles in CPT code 93656 (including catheter ablation, 3D mapping, and ICE), and the relative value units decreased from 26.44 in 2021 to 19.77 in 2022. Medicare paid $32.4085 per relative value unit in 2021 and in 2022 conversion factor is $34.6062 (ACC, 2021). Cuts in ablation payments included 35.7% in AF ablations. At the same time, between 2021 and

2023, the Centers for Medicare and Medicaid Services increased payments for these same procedures to hospitals by 9.4% (ACC, 2022). Reducing reimbursement has the potential to discourage clinicians from providing such services to the already undertreated Hispanic minority.

Even more, in research, following participants for a few years only, misses the long-time lag among variables, and represents both a scientific and political challenge. Funders and politicians want results within timeframes. The Office of Management and Budget generally requires a five-year-or-less time window for assessing policy impact (Broyles et al., 2012). The Federal Reserve Bank has recently collaborated with Robert Wood Johnson Foundation to convene a series of national and regional forums to discuss intersections between community development and health improvement.

Zip Code

Associations between ethnicity and type of community where participants lived (urban, suburban, large town, rural, international, homeless) were statistically significant in the current study; 95.9% participants lived in an urban area and only 0.4% in a rural area. Studies found segregated residential neighborhoods by race and ethnicity lacked specialized healthcare and access to pharmacies (O'Neal et al, 2018; Rush et al., 2019). Pharmacy desserts were more commonly seen in Black or Hispanic communities in the years 2000-2012 (Qato et al., 2014). In this study, among participants living in an urban area, 67.5% received in-hospital rate control drugs and 32.5% did not. For those living in a suburban area, 25% received in-hospital rate control drugs and 75% did not. Therefore, proximity to the hospital may have influenced the type of treatment received in this population.

Similarly, a study by O'Neal et al. (2018) found urban hospitals were more likely to report direct external electrical cardioversion and catheter ablation procedures than rural hospitals independent of sex, race, or region. A higher percentage of patients admitted for AF died in rural 1.3% versus urban hospitals 1.0% ($p < .001$) independent of treatment (O'Neal et al., 2018). Public policy to improve access to prescription medications and AF treatment must address factors beyond insurance coverage and affordability.

Atrial Fibrillation Symptoms

There was small association between AF in-hospital antiarrhythmic drugs and presence of AF related symptoms (absence vs. presence of AF related symptoms; $p = .005$). About 19% ($n = 142$) participants had AF related symptoms, and about 20% received in-hospital antiarrhythmic drugs, with Amiodarone being the most common drug administered (15.7%, $n = 118$). Approximately two-thirds were admitted with symptoms, signs, or abnormal clinical/lab findings (41.2%, $n = 309$) or a circulatory system disease (21.1%, $n = 158$). The most common primary diagnoses (after admission) were circulatory system diseases (34.9%, $n = 262$), followed by infectious or parasitic diseases (11.2%, $n = 84$). The most common secondary diagnoses were circulatory system diseases (90.7%, $n = 680$) and endocrine, nutritional, and metabolic diseases (6.4%, $n = 48$). These AF symptoms and diagnoses support the need to follow the guideline recommendations to offer antiarrhythmic drugs to symptomatic patients with AF. Studies have found association between actual AF symptoms and actual cardiac rhythm is weak (Quirino et al., 2009). The side effects of the antiarrhythmic may be severe in some patients requiring polytherapy (Quirino et al., 2009). AF therapies are

related to improvement in symptoms, quality of life, functional status, and emotional status (Atwood et al., 2007; Mohanty et al., 2014).

Atrial Fibrillation Classification

Ethnicity was not significantly associated with any of the AF pharmacological and non-pharmacological treatments evaluated (i.e., in-hospital antiarrhythmic drugs, in-hospital rate control drugs, prior catheter ablation, prior surgical ablation, and cardioversion). In terms of AF classification, 41.5% had unspecified AF (n = 331) and 37.9% permanent AF (n = 284). Twenty percent received in-hospital antiarrhythmic drugs, with Amiodarone being the most common drug administered (n = 118) and 66% received in-hospital rate control drugs, with Metoprolol being the most common drug administered (n = 139). Only 6.7% (n = 50) had a prior AF catheter ablation; 99.7% (n = 748) did not have a prior AF surgical ablation. Clinically relevant antiarrhythmic procedures are most beneficial in younger patients, and in the current study, Hispanic participants were significantly younger by about 9 years than non-Hispanic participants (American Indian, Asian, Black, African American, Other race, White); yet, Hispanic participants were not more likely to received antiarrhythmic procedures than non-Hispanic.

The main goal of AF management is preventing stroke and managing symptoms, often achieved by controlling the heart rate and restoring normal heart rhythm. This study did not evaluate stroke events.

Study Limitations

The quality of the data collected is dependent on the person gathering and imputing data into EPIC. The cross-sectional study design strategy suffers from internal

validity concerns; it is not known if any observed changes persisted over time, and cannot confidently attibute the AF observed to a specific type of screening. Yet, there is strength in this retrospective observational design, with a 24-month data collection timeframe. Another limitation is the constrained number of individuals with AF found in EPIC; those with AF, not in the EPIC healthcare system were not evaluated. Also, the health plan membership is fluid, with the potential to change annually for individuals, therefore the long-term claims-based follow-up visits are not guaranteed. It is possible those who did receive treatment could have been prompted more aggressively to seek clinical evaluation than those not receiving treatment. Finally, the current study does not account for left ventricular systolic function, left atrial function, and blood pressure control among gender and race; factors known to affect stoke risk. Some studies suggest decreased left atrial appendage velocity less than 20 cm/s indicates a high risk of subsequent cerebral ischemia in these patients, which was not assessed in this study.

Notably, race and ethnicity in this study were collected separately and were self-report. Race did not have mutually exclusive categories; thus, the White group included White non-Hispanic, White Hispanic, and White unknow ethnicity groups. Similarly, the Asian group included Asian non-Hispanic and Asian Hispanic participants; the Other race category included Other race non-Hispanic, Other race Hispanic, and Other race unknown ethnicity. In addition, ethnicity (Hispanic vs. non-Hispanic) included participants of multiple races. For example, the Hispanic group includes individuals who self-identify as White, Asian, American Indian, Other race, and Hispanic. The non-Hispanic group includes individuals who self-identify as White, Black, Asian, Other race, and non-Hispanic. Unfortunately, the EHR did not allow to clarify questionable

categories (e.g., Asian Hispanic, or American Indian Hispanic). Consequently, the dependent variable (Hispanic vs. non-Hispanic ethnicity) was based on participants' self-report of ethnicity regardless of race; caution should be utilized when interpreting the study findings, as well as when making comparisons to previous research.

Additional limitations include the lack of understanding of the allostatic load, cumulative burden of chronic stress and life events, and limited data on the relevance of education. Health inequities exist for racial and ethnic minorities and persons with lower educational attainment, due to differential exposure to economic, social networks, structural access to healthcare, and environmental health risks, face barriers to treatment.

Future Research

Future research should include ethnicity, education, and income to further elucidate health inequities with a focus on health outcomes for patients who must travel longer distances to receive healthcare. Careful consideration should be given to define and collect these variables using mutually exclusive categories for conclusions to be drawn.

Health Policy

Rhythm monitoring resulted in higher rates of cardiology visits and a small increase in pacemaker placements and antiarrhythmic medication initiation (Steinhubl et al., 2018). Early recognition could encourage the implementation of strategies to prevent progression, such a treatment of sleep apnea or obesity (Steinhubl et al., 2018).

Hispanic elderly patients experiencing AF are at risk for health inequities related to sociodemographics. The poverty rate in 2008 for Hispanic elders in the United States was nearly twice that of the total older population; 19.3% in Hispanic elders compared to

7.6% elders in the general population (Administration on Aging, 2010). Family members frequently act as their unpaid caregivers, and multigenerational families under one roof are common. Hispanic elders are more likely to be married and to rely on family for help in managing their health. According to the 2010 census, most immigrants (about 24%) came from Latin American countries, and fewer than half of older Hispanics (47%) had completed high school (Administration on Aging, 2010).

Hispanics have a higher prevalence of AF risk factors but decreased observed AF prevalence compared to Whites. Perhaps this contradiction is related to structural racism and decreased access to general and specialty healthcare in Hispanics. Hispanics have lower socioeconomic status than other groups and depend on Medicaid or MediCal for care; consequently, they must often travel far to receive access to specialty care.

AF is a health problem affecting Hispanics ages 65 and older, a vulnerable population in the United States. Each year, about 795,000 people in the United States had a new or recurrent stroke (CDC, 2023). Stroke is the fifth leading cause of death in the United States, and the leading cause of serious long-term disability, affecting the mobility of more than half stroke survivors older than 65 years of age (CDC, 2023). The Hispanic elderly population belong to a minority group, especially vulnerable to health inequities in access to care, screening, and treatment options; this may potentially result in poor AF outcomes. The relationship between Hispanic access to AF treatment and screening has been understudied in U.S. Hispanics—a group at high risk for cardiovascular disease.

Policy Recommendations

- Atrial fibrillation (AF) must be identified and controlled to prevent poor outcomes, and AF screening funding is crucial to reduce health inequities in

Hispanic adults.

- Catheter ablations are most effective in AF patients, and reducing reimbursement will discourage its use in Hispanics.
- Hispanics are a particularly vulnerable population, less likely to get AF treatment due to barriers to access AF treatment and specialty care.
- Decreased healthcare reimbursement discourages providers from offering ablations as a treatment option.
- More research funding is needed to fully understand the effects of AF in Hispanic adults because of their increased cardiovascular risk.

Contribution to Nursing

American Association of Colleges of Nursing goals for nurses include addressing pervasive inequities in healthcare to meet the needs of all individuals (AACN, 2021). Studies have found great variability in AF symptomology, with current treatment guidelines recommending clinical treatment decisions based on a patients' symptoms. Findings from this study provide evidence to inform treatment for Hispanics with AF. This study identified disparities in healthcare; notably, Hispanic participants had to travel longer distances to receive care although this difference was small (i.e., in-hospital rate control drugs), sought care at an earlier age (i.e., catheter ablation), benefitted from catheter ablations (i.e., Hispanics more catheter ablations and less AF related symptoms than non-Hispanics), and had greater prevalence of obesity. Hispanic women would benefit from early screening and treatment due to the higher prevalence of AF in this study group, when compared to non-Hispanic women and Hispanic men. Race and ethnicity should be clearly defined and measured utilizing mutually exclusive categories

for conclusions to be drawn. Nursing research would benefit from further understanding of population care to reduce health disparities. The Hispanic population in this study had to travel longer distances to receive care, which may have resulted in decreased healthcare utilization (screening, prevention, treatment, management). It is important to create nursing interventions to address challenges faced by patients to access care and improve health outcomes.

Conclusion

Studies have demonstrated early pharmacological and nonpharmacological strategies reduce arrhythmia recurrence and improve cardiovascular outcomes. In the current study, significantly fewer Hispanic participants with AF were current drinkers when compared to non-Hispanic participants; smoking status was not significant by ethnicity. The literature indicates antiarrhythmic procedures are most beneficial in younger patients. In this study, Hispanic participants were significantly younger than non-Hispanics; also, younger participants had a prior catheter ablation in greater frequencies than older participants (other AF treatments were not associated with age in this population). Yet, ethnicity was not significantly associated with any of the AF pharmacological and non-pharmacological care treatments evaluated in this study (i.e., in-hospital antiarrhythmic drugs, in-hospital rate control drugs, prior catheter ablation, prior surgical ablation, and cardioversion). The categories of race and ethnicity in the EHR where data was collected did not allow the required precision to draw conclusions.

Furthermore, the most common insurance carriers for the study population were Medicare (60%), primarily used by non-Hispanics, followed by private insurance (34.7%), equally used by Hispanics and non-Hispanics. MediCal is primarily used by

Hispanics. In this study, Hispanics travelled longer distances for AF treatment; thus, proximity to the hospital may have influenced the type of AF treatment received. Public policy to improve access to prescription medications must address factors beyond insurance coverage and affordability.

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Appendix A. Literature Search Flow Diagram

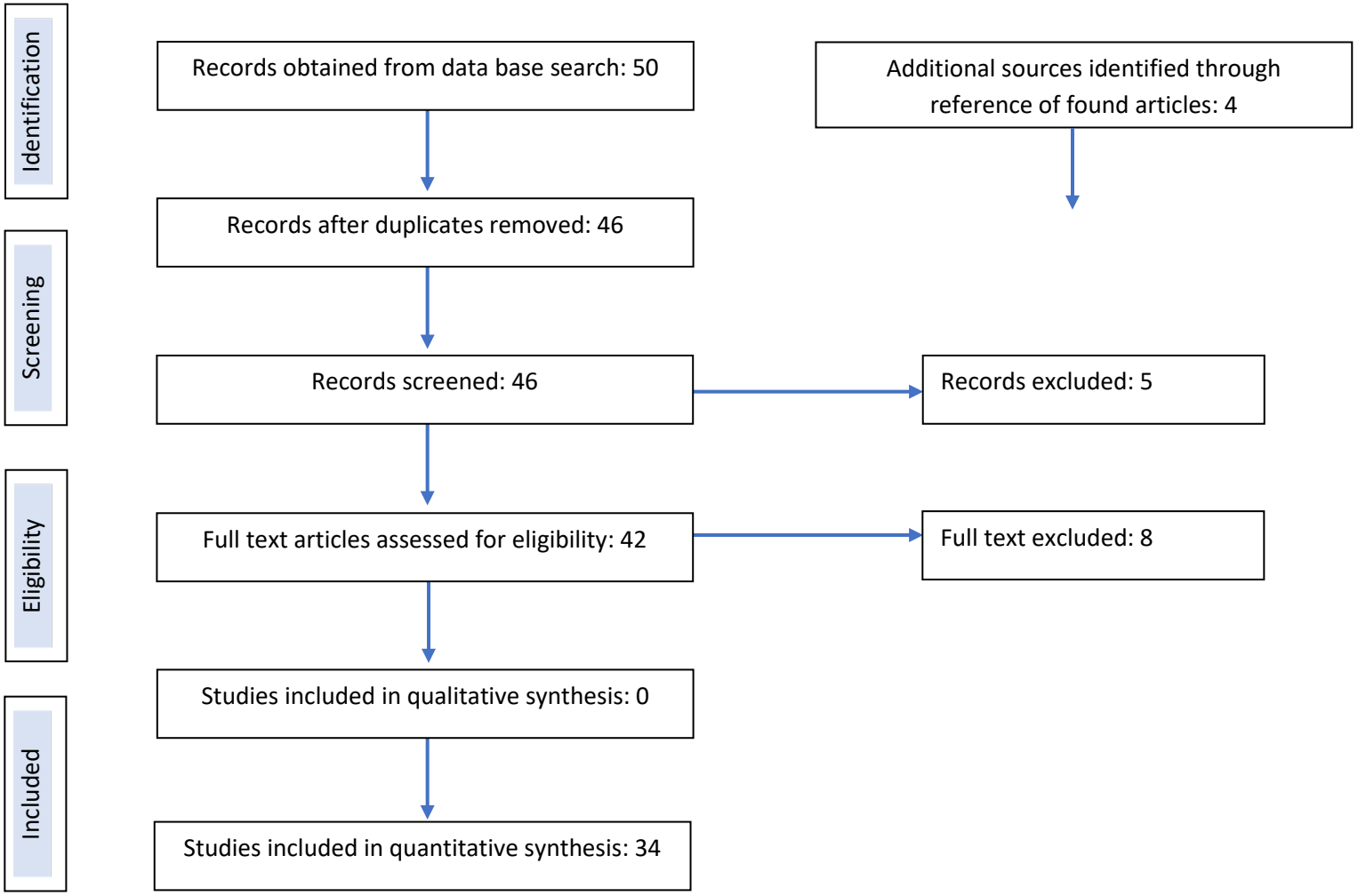

Figure1: Literature search flow diagram. Search terms: *Atrial fibrillation rhythm control in Hispanics, AF SDOH, AF rural areas.*

Appendix B. IRB Approval Letter

University of San Diego

Dec 7, 2022 2:27:24 PM PST

Tania Borja
Hahn School of Nursing & Health Science

Re: Initial - IRB-2023-134 Atrial Fibrillation Management in Hispanic Adults

Dear Tania Borja:

University of San Diego Human Subjects Review Board has rendered the decision below for Atrial Fibrillation Management in Hispanic Adults .

Decision: Rely on External IRB

Findings: This research study was approved by an external IRB, El Camino Hospital, on Oct 18, 2022, as an Expedited review category.

Research Notes:

Internal Notes:

The USD IRB requires annual renewal of all active studies reviewed and approved by the IRB. Please submit an application for renewal prior to the annual anniversary date of initial study approval.
If an application for renewal is not received, the study will be administratively closed.

Note: We send IRB correspondence regarding student research to the faculty advisor, who bears the ultimate responsibility for the conduct of the research. We request that the faculty advisor share this correspondence with the student researcher.

The next deadline for submitting project proposals to the Provost's Office for full review is N/A. You may submit a project proposal for expedited or exempt review at any time.

Sincerely,

Truc T. Ngo, PhD IRB
Administrator

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