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ORIGINAL RESEARCH

Race, Sex, and Neighborhood Socioeconomic Disparities in Ablation of Ventricular Tachycardia Within a National Medicare Cohort

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BACKGROUND: Ventricular tachycardia (VT) ablation significantly improves our ability to control VT, yet little is known about whether disparities exist in delivery of this technology.

METHODS AND RESULTS: Using a national 100% Medicare inpatient data set of beneficiaries admitted with VT from January 1, 2014, through November 30, 2014, multivariable logistic regression techniques were used to examine the sociodemographic and clinical characteristics associated with receiving ablation. Census block group-level neighborhood socioeconomic disadvantage was measured for each patient by the Area Deprivation Index, a composite measure of socioeconomic disadvantage consisting of education, income, housing, and employment factors. Among 131 645 patients admitted with VT, 2190 (1.66%) received ablation. After adjustment for comorbidities, hospital characteristics, and sociodemographics, female sex (odds ratio [OR], 0.75 [95% CI, 0.67–0.84]), identifying as Black race (OR, 0.75 [95% CI, 0.62–0.90] compared with identifying as White race), and living in a highly socioeconomically disadvantaged neighborhood (national Area Deprivation Index percentile of >85%) (OR, 0.81 [95% CI, 0.69–0.95] versus Area Deprivation Index ≤85%) were associated with significantly lower odds of receiving ablation.

CONCLUSIONS: Female patients, patients identifying as Black race, and patients living in the most disadvantaged neighborhoods are 19% to 25% less likely to receive ablation during hospitalization with VT. The cause of and solutions for these disparities require further investigation.

Key Words: ablation ■ disparities ■ ventricular tachycardia

Our understanding and management of ventricular tachycardia (VT) has evolved significantly over the past several decades. Numerous antiarrhythmic medications may suppress VT and reduce the risk of recurrence, but these medications may be poorly tolerated or ineffective and carry the risk of numerous adverse effects and toxicities.[1] Although implantable cardioverters-defibrillators (ICDs) can prevent sudden death from VT and ventricular fibrillation,[2,3] ICD discharges are painful and traumatic. Defibrillation, particularly when repeated, has been associated with prolonged anxiety, depression, and decreased quality of life.[4–6]

Recent advances in understanding the pathophysiology of VT and improvements in technology have facilitated the development of catheter ablation as a safe and reliable method for VT suppression.[7–9] Current guidelines recommend considering ablation for patients with ischemic and nonischemic cardiomyopathy with recurrent VT despite antiarrhythmic medications, or when antiarrhythmic medications are not desired.[10]

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CLINICAL PERSPECTIVE

What Is New?

- In a nationwide analysis of Medicare patients hospitalized with ventricular tachycardia, female patients, patients identifying as Black race, and patients living in the most socioeconomically disadvantaged neighborhoods were 19% to 25% less likely to receive ablation during hospitalization.
- Female patients who identify as Black race were 50% less likely to receive ablation than male patients who identify as White race.

What Are the Clinical Implications?

- The benefits of ventricular tachycardia ablation are differentially delivered, with female patients and patients who identify as Black race least likely to receive advanced care.
- Further studies are required to understand the cause of this disparity and the impact on outcomes, and to develop strategies to improve equitable access to ventricular tachycardia ablation.

Yet, little is known about whether and to what degree disparities exist in treatment of VT with ablation.

To address this knowledge gap, we conducted a retrospective observational study to assess whether race, sex, and neighborhood socioeconomic disadvantage are associated with catheter ablation during hospitalization with VT in the Medicare population.

METHODS

This study is a retrospective analysis of the 100% national Medicare fee-for-service inpatient claims data set from 2013 to 2014. Patients were included in the analysis if they were aged >18 years and admitted to an acute care hospital from January 1, 2014, through November 30, 2014, with VT, identified using *International Classification of Diseases, Ninth Revision, Clinical Modification* (*ICD-9-CM*) code 427.1x in any position,[11,12] had a valid ZIP+4 code to allow geolinking, and were continuously enrolled in Medicare Part A and B in the year before the index hospitalization. To ensure completeness of claims information, patients were excluded if they were beneficiaries of the Railroad Retirement program or if they were enrolled in a health maintenance organization (Medicare Advantage plan). Each beneficiary was included only once, at the time of index hospitalization for VT during the study period[13,14] (Figure 1). Because of data-use agreements, the data used in this analysis cannot be shared, but the detailed methods used for the analysis can be provided on request.

Beneficiaries with valid ZIP+4 codes were geolinked (97.3% of patients with VT during hospitalization) to neighborhood socioeconomic disadvantage nationwide rankings via the Area Deprivation Index obtained from the Neighborhood Atlas.[15,16] The Area Deprivation Index is calculated using 17 social determinants of health dimensions, including housing quality, employment, income, and education, as captured in the American Community Survey,[15,17] and ranked from 1 to 100, with higher numbers indicating greater levels of neighborhood disadvantage.[16]

Race was self-reported and determined using the Research Triangle Institute Race Code.[18] Race was combined into 3 groups, including "White," "Black," and "other" because of validity concerns in more specific categorizations in the Medicare race and ethnicity claims data codes.[19] "Other" was composed of the Research Triangle Institute race codes for Asian/Pacific Islander, Hispanic, American Indian/Alaskan Native, and other. Patients with an unknown race (which comprised 0.4% of the study population) were grouped with the largest of the 3 groups, "White/unknown." Patient comorbid conditions were determined from Elixhauser comorbidities,[20] Centers for Medicare & Medicaid Services hierarchical condition category community score,[21] Medicare Chronic Conditions Data Warehouse,[22] and *ICD-9-CM* codes for VT,[11] cardiac arrest,[11] presence of an ICD,[23] and endovascular ablation,[11] coded during the year before index hospitalization (Data S1). Rural-urban residential location was determined using the Rural-Urban Commuting Area Codes.[24]

Outcome

The outcome was endovascular ablation (*ICD-9-CM* procedure code 37.34) performed during the index hospitalization.[11,12]

Statistical Analysis

Descriptive statistics of baseline characteristics are reported by ablation status. We used logistic regression to isolate the effects of neighborhood socioeconomic disadvantage, race, and sex on receiving ablation during the index hospitalization, adjusting for patient and hospital characteristics. Covariate adjustments included patient characteristics (eg, age, disability status, Medicaid status, and rural-urban residence), comorbid conditions in the year prior (Elixhauser comorbidities[20]; Centers for Medicare & Medicaid Services hierarchical condition category community score[21]; Centers for Medicare & Medicaid Services Chronic Conditions Data Warehouse comorbidities, including atrial fibrillation,[22] myocardial infarction,[22] and ischemic heart disease[22]; and specific cardiovascular comorbidities identified in the year before the index hospitalization, including VT,[11]

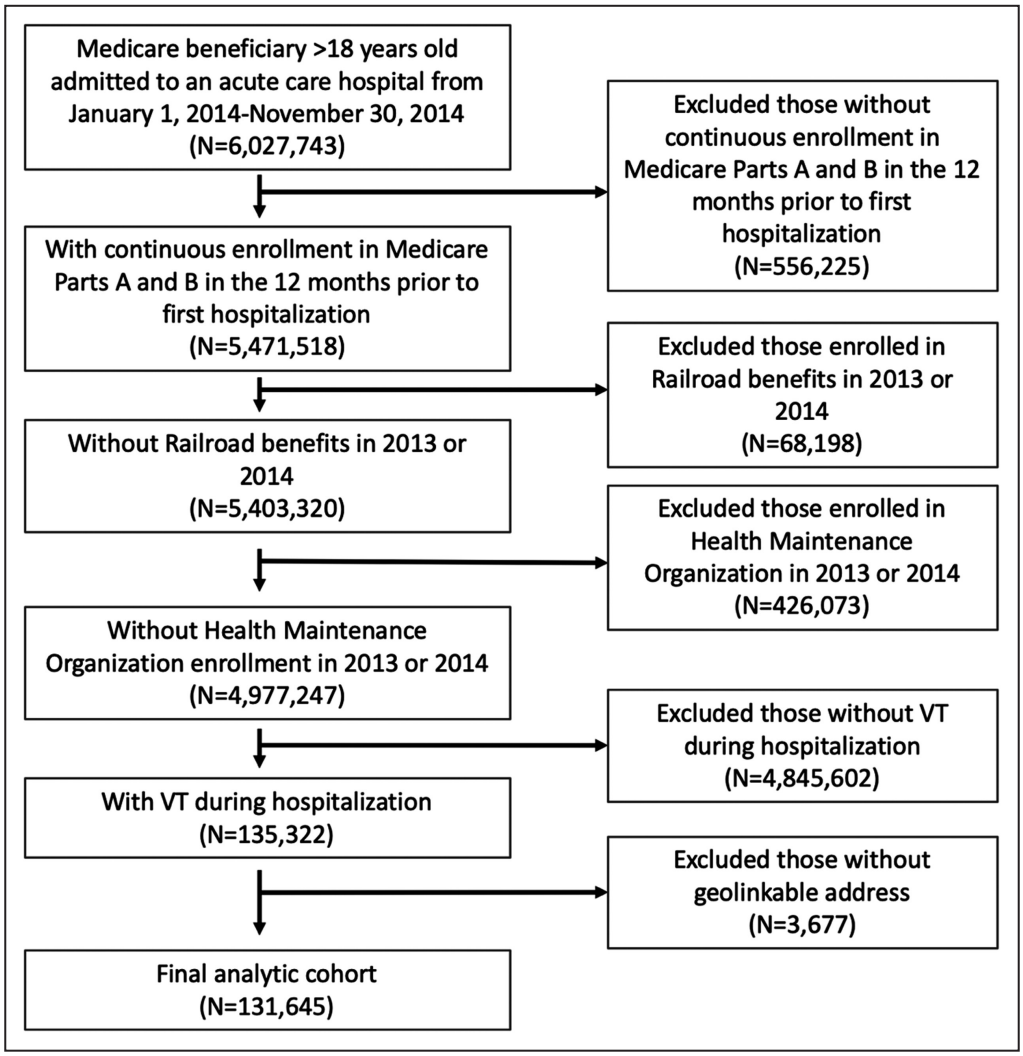

Figure 1. Cohort derivation diagram.
Inclusion and exclusion criteria for creation of analysis cohort. VT indicates ventricular tachycardia.

cardiac arrest,[11] presence of an ICD,[23] and previous endovascular ablation[11]), and hospital characteristics (medical school affiliation, nonprofit status, and hospital volume). Age was grouped as a categorical variable as 18–49, 50–59, 60–69, 70–79, and >80 years rather than continuous to more accurately allow interpretation of the results for health policy and because of the nonlinear relationship between age and receiving ablation. Neighborhood socioeconomic disadvantage (Area Deprivation Index) was analyzed comparing those living in the top 15% most disadvantaged neighborhoods with those living in the 85% least disadvantaged neighborhoods because of previously published thresholds in health disparity literature.[13] We used a generalized estimating equations approach, with SEs adjusted to account for hospital-level clustering.

We report adjusted odds ratios (ORs) with 95% CIs and the predicted ablation rate (predicted probabilities) for all categorical variables. To test for an additional interaction between race, sex, and neighborhood socioeconomic disadvantage categories, marginal standardization was used to estimate predicted ablation rates. Because of multiple comparisons made in the marginal standardization calculation, P=0.016 was considered statistically significant.[25]

Because patients with an ICD may be more likely to subsequently receive an ablation when hospitalized with VT, we performed secondary analyses investigating the rate of ablation in patients hospitalized with VT who had received an ICD before hospitalization,[23] and separately in patients who had received an ICD before hospitalization[23] with a history of myocardial infarction[22] or ischemic cardiomyopathy.[22] Logistic regression was used to isolate the effects of neighborhood socioeconomic status, race, and sex on the rate of ablation in each separate cohort. We performed covariate adjustments for all of the previously reported variables, with the exception of previously implanted ICD[23] (which was

excluded from both secondary analyses) and previous myocardial infarction[22] or ischemic cardiomyopathy[22] (which were excluded from the secondary analysis investigating rate of ablation in patients with previous ICD implantation and history of myocardial infarction or ischemic cardiomyopathy).

Given that a prior diagnosis of atrial fibrillation increases the probability of inpatient ablation for atrial fibrillation, we addressed this by performing a sensitivity analysis on the primary cohort by excluding any patients with a previous diagnosis of atrial fibrillation.[22] As ablation is more often chosen as a treatment strategy in patients with ischemic cardiomyopathy, another sensitivity analysis was performed by limiting the analysis to those with previous myocardial infarction[22] or ischemic cardiomyopathy[22] for comparability. An additional sensitivity analysis was also performed excluding patients with an unknown race. In each separate cohort, multivariable logistic regression analysis was used to isolate the effects of neighborhood socioeconomic status, race, and sex on the rate of ablation. We adjusted for all of the previously reported covariates, with the exception of atrial fibrillation[22] (which was excluded from the atrial fibrillation sensitivity analysis), myocardial infarction[22] (which was excluded from the previous myocardial infarction or ischemic cardiomyopathy sensitivity analysis), and ischemic cardiomyopathy[22] (which was excluded from the previous myocardial infarction or ischemic cardiomyopathy sensitivity analysis).

SAS 9.4 (Cary, NC) and Stata/MP 15.0 (StataCorp, College Station, TX) were used for statistical analysis.

The study was approved with waiver of informed consent by the University of Wisconsin School of Medicine and Public Health Institutional Review Board.

RESULTS

A total of 131 645 Medicare patients were admitted with VT during their acute hospitalization in the study period, of which 2190 (1.66%) received ablation. Table 1 describes the key characteristics by ablation status. Ablation occurred more often in patients who identified as White race (1.77% White race versus 1.11% Black race), male patients (2.01% male patients versus 1.09% female patients), and patients living in least disadvantaged neighborhoods (1.72% in the least disadvantaged neighborhood versus 1.22% in the most disadvantaged neighborhoods). When the number of ablations is investigated across Area Deprivation Index deciles, those living in the most disadvantaged neighborhood deciles received fewer ablations than those living in the more affluent neighborhoods (Figure 2).In the fully adjusted model, female patients were 25% less likely to receive an ablation compared with male patients (OR, 0.75 [95% CI, 0.67–0.84]), and patients identifying as Black race were 25% less likely to receive ablation compared with patients identifying as White race (OR, 0.75 [95% CI, 0.62–0.90]). Patients from the most socioeconomically disadvantaged neighborhoods were 19% less likely to receive an ablation (OR, 0.81 [95% CI, 0.69–0.95]). VT or atrial fibrillation in the year before admission, as well as presence of an ICD, was associated with greater odds of receiving ablation during hospitalization. Patients with ablation in the previous year were significantly more likely to receive a repeated ablation (OR, 38.41 [95% CI, 32.40–45.54]) (Table 2). The fully adjusted model with age categorized in 5-year increments is presented in Table S1.

Investigating the interaction between sex, race, and neighborhood disadvantage revealed that female patients identifying as Black race had the lowest predicted rate of ablation (0.94%), followed by female patients identifying as White race (1.42%), male patients identifying as Black race (1.53%), and male patients identifying as White race (1.82%) (Table 3). Although patients residing in the most disadvantaged neighborhoods were less likely to receive ablation, we did not find an additional difference in ablation rates between neighborhood disadvantage with race or sex stratifications.

In the secondary analysis including only patients with a previously implanted ICD, and in a separate secondary analysis including only those with a previously implanted ICD and history of myocardial infarction or ischemic cardiomyopathy, race, sex, and neighborhood socioeconomic disadvantage had a similar association with ablation as in the primary analysis (Table 4). Compared with the overall cohort, female patients were also less likely to have received an ICD before hospitalization with VT (Table S2).

In the 3 separate sensitivity analyses excluding patients with a history of atrial fibrillation, investigating the rate of ablation only in patients with a history of myocardial infarction or ischemic cardiomyopathy, and excluding patients with an unknown race, race, sex, and neighborhood socioeconomic disadvantage had similar effects on rates of ablation as in the overall analysis (Tables S3 and S4).

DISCUSSION

To our knowledge, this is the first investigation of VT treatment patterns across the entire Medicare population. We found that female patients, patients identifying as Black race, and patients living in the most socioeconomically disadvantaged neighborhoods were significantly less likely to receive ablation when hospitalized with VT, associations that were more strongly linked with receiving ablation than many comorbidities. This association persisted after adjustment for remaining

Table 1. Characteristics of Medicare Patients Admitted With VT

Key characteristic	Overall (n=131 645)	No ablation received (n=129 455)	Received ablation (n=2190)
Age, mean (SD), y	75.75 (11.20)	75.81 (11.22)	72.30 (9.48)
18–49	3542 (3)	3477 (3)	65 (3)
50–59	7789 (6)	7636 (6)	153 (7)
60–69	24 277 (18)	23 706 (18)	572 (26)
70–79	45 957 (35)	44 991 (35)	966 (44)
>80	50 080 (38)	49 645 (38)	435 (20)
Male sex	82 205 (62)	80 553 (62)	1652 (75)
Female sex	49 440 (38)	48 902 (38)	538 (25)
Residence in a neighborhood with low socioeconomic disadvantage (ADI ≤85)*	116 697 (89)	114 690 (89)	2007 (92)
Residence in a neighborhood with high socioeconomic disadvantage (ADI >85)*	14 948 (11)	14 765 (11)	183 (8)
Race			
White/unknown	105 517 (80)	103 650 (80)	1867 (85)
Black	17 694 (13)	17 498 (14)	196 (9)
Other†	8434 (6)	8307 (6)	127 (6)
Medicaid	28 149 (21)	27 821 (21)	328 (15)
HCC community score, mean (SD)	2.18 (1.74)	2.18 (1.74)	1.77 (1.26)
Comorbid conditions			
Alcohol abuse	4669 (4)	4603 (4)	66 (3)
Anemia, chronic blood loss	3428 (3)	3399 (3)	29 (1)
Anemia, deficiency	47 269 (36)	46 714 (36)	555 (25)
Atrial fibrillation‡	57 449 (44)	56 131 (43)	1318 (60)
History of cardiac arrest‡	1224 (1)	1212 (1)	12 (<1)
Chronic pulmonary disease	44 314 (34)	43 650 (34)	664 (30)
Congestive heart failure	53 293 (40)	52 291 (40)	1002 (46)
Coagulopathy	13 961 (11)	13 768 (11)	193 (9)
Depression	20 326 (15)	20 038 (15)	288 (13)
Diabetes without chronic complications	48 124 (37)	47 380 (37)	744 (34)
Diabetes with chronic complications	17 725 (13)	17 514 (14)	211 (10)
Disability	36 671 (28)	36 015 (28)	657 (30)
Drug abuse	3533 (3)	3491 (3)	42 (2)
Endovascular ablation in year before index hospitalization	1404 (1)	805 (1)	599 (27)
Fluid and electrolyte disorders	49 815 (38)	49 155 (38)	660 (30)
Hypertension	97 580 (74)	95 943 (74)	1637 (75)
Hypothyroidism	24 270 (18)	23 813 (18)	457 (21)
Presence of ICD‡	26 289 (20)	25 297 (20)	992 (45)
Ischemic heart disease‡	108 744 (83)	106 839 (83)	1905 (87)
Liver disease	5623 (4)	5549 (4)	74 (3)
Lymphoma	2566 (2)	2540 (2)	26 (1)
Metastatic cancer	3772 (3)	3748 (3)	24 (1)
History of myocardial infarction‡	23 021 (17)	22 673 (18)	348 (16)
Other neurologic condition	18 227 (14)	18 067 (14)	160 (7)
Obesity	20 295 (15)	19 912 (15)	383 (17)
Peripheral vascular disease	29 067 (22)	28 655 (22)	412 (19)
Pulmonary circulation disease	12 933 (10)	12 762 (10)	171 (8)

(*Continued*)

Table 1. Continued

Key characteristic	Overall (n=131 645)	No ablation received (n=129 455)	Received ablation (n=2190)
Psychosis	7867 (6)	7798 (6)	69 (3)
Renal failure	41 975 (32)	41 385 (32)	590 (27)
Rheumatoid arthritis	6285 (5)	6183 (5)	102 (5)
Solid tumor without metastasis	13 690 (10)	13 508 (10)	182 (8)
Valvular disease	26 779 (20)	26 299 (20)	480 (22)
History of ventricular tachycardia‡	18 257 (14)	17 474 (14)	783 (36)
Weight loss	13 233 (10)	13 125 (10)	108 (5)
Medical school affiliation			
Major	401 645 (31)	39 117 (30)	1048 (48)
Minor	31 975 (24)	31 476 (24)	499 (23)
None	59 505 (45)	58 862 (45)	643 (29)
Nonprofit status	98 600 (75)	96 960 (75)	1640 (75)
Hospital discharge volume§			
Highest tertile	110 306 (84)	108 222 (84)	2084 (95)
Middle and lowest tertile	21 339 (16)	21 233 (16)	106 (5)
Location of patient residence			
Urban	90 009 (71)	91 492 (71)	1517 (69)
Suburban	12 529 (10)	12 306 (10)	223 (10)
Large rural	13 452 (10)	13 213 (10)	239 (11)
Small rural	12 655 (10)	12 444 (10)	211 (10)

All variables are listed as number (percentage) unless otherwise indicated. Paralysis, peptic ulcer disease, and AIDS not shown because of Medicare data cell suppression rules. ADI indicates Area Deprivation Index; HCC, hierarchical condition category; ICD, implantable cardioverter-defibrillator; and VT, ventricular tachycardia.

*Neighborhood socioeconomic disadvantage, as determined by ADI.

†"Other" race category composed of Research Triangle Institute race codes Asian/Pacific Islander, Hispanic, American Indian/Alaskan Native, and other.

‡Comorbidity identified in year before index hospitalization.

§Hospital discharge volume in 2014. Highest tertile hospitals discharged 2846 to 39 471 patients, and middle and lowest tertile hospitals discharged 0 to 2844 patients.

demographics, medical comorbidities, hospital characteristics, and disability factors. These results indicate that the benefits of VT ablation are differentially delivered, with historically underresourced groups least likely to receive advanced care.

The underlying drivers for these associations are unclear. One possible explanation may be that female patients, patients identifying as Black race, and patients from the most socioeconomically disadvantaged neighborhoods are more likely to present with reversible causes of VT (such as decompensated heart failure) or have a higher rate of nonischemic cardiomyopathy–situations where ablation may not be indicated or is less effective, resulting in lower rates of ablation. However, in our analysis, the disparity in receiving ablation persisted despite robust adjustment for multiple comorbid conditions which could impact the decision to proceed with ablation (including electrolyte abnormalities, renal failure, pulmonary disease, congestive heart failure, alcohol abuse, and drug abuse), and adjusting for ischemic heart disease, previous myocardial infarction, and valvular heart disease. In addition, our secondary analyses investigating rates of ablation in patients with previously implanted ICD and our sensitivity analysis including only patients with previous myocardial infarction or ischemic cardiomyopathy both found that sex, race, and neighborhood socioeconomic disparity had a similar impact on rates of ablation as found in the overall analysis. Another explanation for the lower rate of ablation in female patients could be concern for increased rates of complication during the procedure, but this perceived difference in complication rates has not been found in recent studies.[26–28]

A plausible explanation for this association is implicit bias or systemic racism,[29] resulting in decreased access to VT ablation. For example, this could manifest through lack of referral or delayed referral for ablation, when a procedure may be less effective or higher risk. Physician referral bias based on sex and race has previously been shown to impact who receives other cardiovascular procedures.[30–33] Lack of treating physician awareness to the benefits of ablation or poor access to centers capable of performing VT ablation may

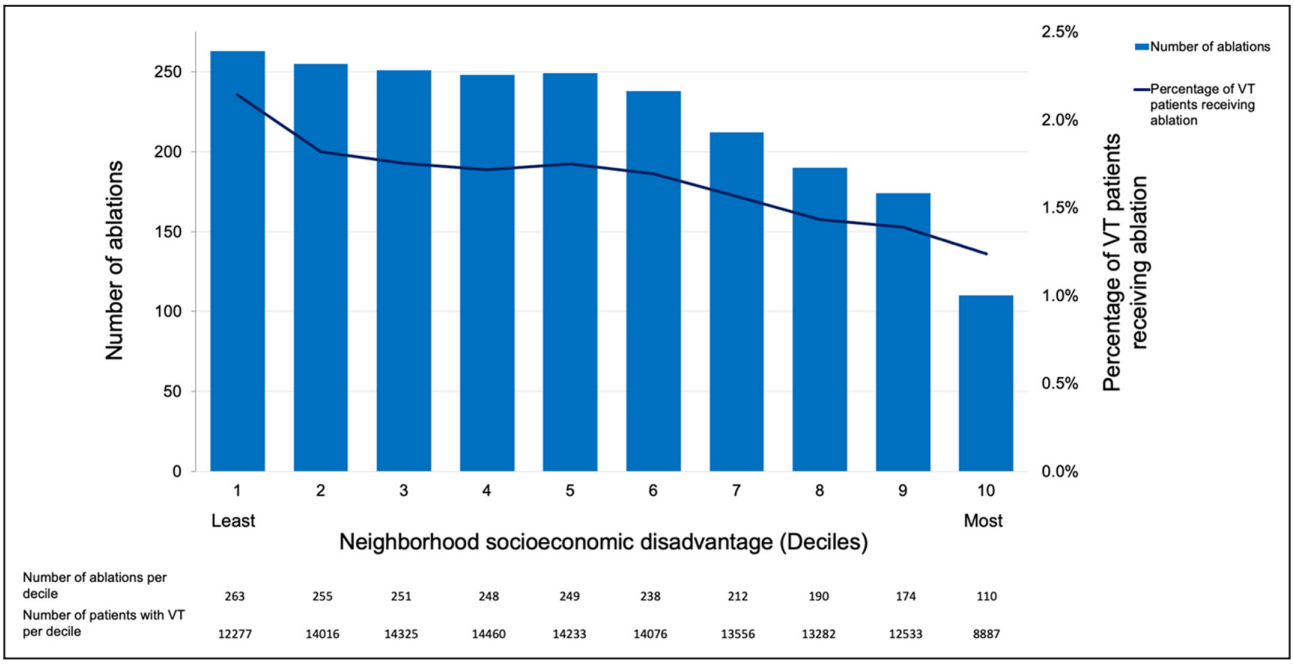

Figure 2. Neighborhood socioeconomic disadvantage and ablation.
Patients living in the most socioeconomically disadvantaged neighborhood deciles received fewer ablations than those living in the more affluent neighborhoods. Living in a more disadvantaged neighborhood was also associated with a decreasing percentage of patients with ventricular tachycardia (VT) receiving ablation. The primary vertical axis (bars) is number of ablations in patients with VT in each decile of neighborhood socioeconomic disadvantage. The secondary vertical axis (line) is percentage of patients with VT receiving ablation in each decile of neighborhood socioeconomic disadvantage.

similarly limit referral or reduce the chances of transfer to a facility that offers the procedure.

A previous study found that patients identified as Black race and Hispanic ethnicity, compared with patients identified as White race, were less likely to subsequently proceed with primary prevention ICD implantation after receiving counseling on device benefits.[33] This differential response to counseling could similarly impact rates of ablation. The cause for this difference may be related to the medical system failing to earn the patients' trust, suboptimal communication, concern about the risks and efficacy of the procedure, concern about social responsibilities, financial implications for having the procedure, or recovery time.

Although it is important to recognize that this disparity exists, additional studies are required to further understand the cause of this disparity to begin changes in clinical practice. Inclusion of patients admitted with VT and other ventricular arrhythmias in registries could better define the comorbidities and profiles of patients offered, and not offered, ablation, and improve understanding of real-world patient outcomes. Although consortiums track ablation outcomes from large-volume centers,[34] nationally representative data on outcomes linked to individual patient- and neighborhood-level sociodemographic factors from the large number of lower-volume centers may further improve understanding of treatment patterns and outcomes for patients with VT.

Study Strengths and Limitations

Despite the strength of this nationally representative 100% Medicare data set with a multivariable assessment of neighborhood socioeconomic disparity and robust adjustments, there are several key limitations. The data used for the present analysis are from 2014. However, the differential rates of ablation in female patients, patients identifying as Black race, and patients living in the most socioeconomically disadvantaged neighborhoods have most likely not changed significantly since that time. In fact, these disparities may be even more marked today because of the disproportionate impact of the COVID-19 pandemic on cardiovascular disease.[35] Although all patients in the data set had VT coded during their hospitalization, a low percentage of patients ultimately received ablation. In our secondary analyses including only patients with previously implanted ICDs (who may be more likely to receive a VT ablation when hospitalized with VT), the differences in ablation rates for female patients, patients identifying as Black race, and patients from the most disadvantaged neighborhoods were similar to those seen in the primary analysis. Because of limitations in use of administrative data, patients may have

Table 2. Association of Patient Demographics, Neighborhood Socioeconomic Status, Clinical Comorbidities, and Hospital Characteristics With Ablation During Hospitalization With VT

Key characteristic	Unadjusted			Adjusted			
	Odds ratio	95% CI		Odds ratio	95% CI		Predicted rate of ablation, %
Residence in a neighborhood with lower socioeconomic disadvantage (ADI ≤85)*	Reference			Reference			1.69
Residence in a neighborhood with high socioeconomic disadvantage (ADI >85)*	0.71	0.61	0.82	0.81	0.69	0.95	1.42
Race							
White/unknown	Reference			Reference			1.70
Black	0.62	0.54	0.72	0.75	0.62	0.90	1.33
Other†	0.85	0.71	1.02	1.12	0.93	1.34	1.86
Sex							
Male	Reference			Reference			1.78
Female	0.54	0.49	0.59	0.75	0.67	0.84	1.40
Age, y							
18–49	0.78	0.60	1.01	1.00	0.73	1.37	2.22
50–59	0.83	0.70	1.00	1.14	0.91	1.43	2.48
60–69	Reference			Reference			2.22
70–79	0.89	0.80	0.99	0.81	0.72	0.92	1.87
>80	0.36	0.32	0.41	0.40	0.34	0.47	1.01
Medicaid status	0.64	0.57	0.72	0.88	0.78	1.02	1.53
HCC community score				0.88	0.86	0.91	
Comorbid conditions							
AIDS/HIV	0.16	0.02	1.15	0.21	0.02	2.11	0.43
Alcohol abuse	0.84	0.66	1.08	0.84	0.64	1.11	1.45
Anemia, chronic blood loss	0.50	0.34	0.72	0.64	0.41	0.98	1.14
Anemia, deficiency	0.60	0.55	0.66	0.84	0.73	0.96	1.49
Atrial fibrillation‡	1.97	1.81	2.15	1.68	1.52	1.87	2.06
History of cardiac arrest‡	0.58	0.33	1.03	0.39	0.22	0.68	0.75
Chronic pulmonary disease	0.86	0.78	0.94	1.01	0.90	1.14	1.68
Congestive heart failure	1.24	1.14	1.35	1.07	0.95	1.21	1.72
Coagulopathy	0.81	0.70	0.94	0.93	0.78	1.13	1.58
Depression	0.83	0.73	0.94	1.04	0.88	1.22	1.71
Diabetes without chronic complication	0.89	0.82	0.97	0.99	0.88	1.11	1.65
Diabetes with chronic complication	0.68	0.59	0.79	1.04	0.87	1.24	1.71
Disability	1.11	1.01	1.22	0.77	0.68	0.89	1.44
Drug abuse	0.71	0.52	0.96	0.76	0.51	1.12	1.32
Endovascular ablation in year before index hospitalization	60.17	53.54	67.62	38.41	32.40	45.54	27.18
Fluid and electrolyte disorder	0.70	0.64	0.77	0.89	0.80	1.00	1.56
Hypertension	1.03	0.94	1.14	1.09	0.97	1.24	1.70
Hypothyroidism	1.17	1.06	1.30	1.21	1.06	1.37	1.89
Presence of ICD‡	3.41	3.13	3.71	1.68	1.48	1.92	2.22
Ischemic heart disease‡	1.41	1.25	1.60	1.08	0.93	1.26	1.68
Liver disease	0.78	0.62	0.99	0.98	0.76	1.28	1.64
Lymphoma	0.60	0.41	0.89	0.90	0.60	1.35	1.53
Metastatic cancer	0.37	0.25	0.56	0.76	0.48	1.21	1.33

(*Continued*)

Table 2. Continued

Key characteristic	Unadjusted			Adjusted			
	Odds ratio	95% CI		Odds ratio	95% CI		Predicted rate of ablation, %
History of myocardial infarction‡	0.89	0.79	1.00	0.92	0.81	1.04	1.57
Other neurologic condition	0.49	0.41	0.57	0.73	0.61	0.89	1.31
Obesity	1.17	1.04	1.30	1.09	0.95	1.13	1.77
Paralysis	0.49	0.36	0.67	0.89	0.62	1.27	1.51
Peptic ulcer disease	0.48	0.07	3.41	0.58	0.04	7.55	1.05
Peripheral vascular disease	0.82	0.73	0.91	0.92	0.80	1.05	1.57
Pulmonary circulation disease	0.77	0.66	0.91	0.84	0.70	1.01	1.45
Psychoses	0.51	0.40	0.65	0.75	0.57	1.00	1.32
Renal failure	0.78	0.71	0.86	0.86	0.76	0.98	1.52
Rheumatoid arthritis	0.97	0.80	1.19	1.38	1.11	1.73	2.16
Solid tumor without metastasis	0.78	0.67	0.91	1.11	0.93	1.32	1.80
Valvular disease	1.10	0.99	1.22	0.99	0.87	1.12	1.65
History of ventricular tachycardia‡	3.57	3.26	3.90	1.77	1.54	2.03	2.39
Weight loss	0.46	0.38	0.56	0.82	0.66	1.03	1.43
Medical school affiliation							
Major	Reference			Reference			2.21
Minor	0.59	0.53	0.66	0.66	0.54	0.81	1.56
None	0.41	0.37	0.45	0.51	0.43	0.61	1.25
Hospital discharge volume§							
Highest tertile	Reference			Reference			1.79
Middle tertile	0.27	0.22	0.33	0.37	0.26	0.52	0.76
Lowest tertile	0.14	0.06	0.31	0.21	0.09	0.51	0.47
Nonprofit status	1.00	0.91	1.10	0.88	0.73	1.05	1.62
Location of patient residence							
Urban	Reference			Reference			1.64
Suburban	1.09	0.95	1.26	1.02	0.85	1.22	1.67
Large rural	1.09	0.95	1.25	1.17	0.98	1.40	1.87
Small rural	1.02	0.88	1.18	1.01	0.85	1.21	1.66

Model adjusted for variables listed in the table. See Table S1 for the multivariable analysis with age stratified by 5-year increments. ADI indicates Area Deprivation Index; HCC, hierarchical condition category; ICD, implantable cardioverter-defibrillator; and VT, ventricular tachycardia.

*Neighborhood socioeconomic disadvantage, as determined by ADI nationwide percentile rank.

†"Other" race category composed of Research Triangle Institute race codes Asian/Pacific Islander, Hispanic, American Indian/Alaskan Native, and other.

‡Comorbidity identified in year before index hospitalization.

§Hospital discharge volume in 2014. Highest tertile hospitals discharged 2846 to 39471 patients, middle tertile hospitals discharged 735 to 2844 patients, and lowest tertile hospitals discharged 0 to 732 patients.

received ablation for arrhythmias other than VT during their hospitalization. To investigate this possibility, in our sensitivity analyses, we excluded patients with a history of atrial fibrillation and separately only included those with ischemic heart disease, who are more likely to receive ablation for VT. In both analyses, the differences in rate of ablation for female patients, patients identifying as Black race, and patients from the most disadvantaged neighborhoods were again similar to the results seen in the primary analysis.

Table 3. Predictive Rates of Ablation During Hospitalization With VT Compared With Female Patients Identifying as Black Race

Patients	Predicted rate of ablation, %	95% CI		*P* value
Black female patients	0.94	0.70	1.18	Reference
White female patients	1.42	1.30	1.54	<0.001
Black male patients	1.53	1.29	1.77	<0.001
White male patients	1.82	1.73	1.92	<0.001

Table 4. Association of Race, Sex, and Neighborhood Socioeconomic Status With Ablation During Hospitalization in Patients With Previous ICD Implantation and in Patients With History of Previous Myocardial Infarction or Ischemic Cardiomyopathy and Previous ICD Implantation

Variable	Previous ICD implantation*				History of previous myocardial infarction or ischemic cardiomyopathy and previous ICD implantation†			
	Adjusted odds ratio	95% CI		*P* value	Adjusted odds ratio	95% CI		*P* value
Sex								
Male	Reference				Reference			
Female	0.66	0.54	0.81	<0.001	0.67	0.55	0.82	<0.001
Socioeconomic disadvantage								
Residence in a neighborhood with low socioeconomic disadvantage (ADI ≤85%)‡	Reference				Reference			
Residence in a neighborhood with high socioeconomic disadvantage (ADI >85)‡	0.66	0.53	0.90	0.007	0.70	0.53	0.92	0.01
Race								
White/unknown	Reference				Reference			
Black	0.65	0.50	0.84	0.001	0.62	0.48	0.81	<0.001
Other§	1.08	0.79	1.49	0.63	1.09	0.79	1.50	0.59

ADI indicates Area Deprivation Index; and ICD, implantable cardioverter-defibrillator.

*Adjusted for patient characteristics (race, sex, neighborhood socioeconomic disadvantage, age, disability status, Medicaid status, and rural-urban residence), comorbid conditions in the year prior (AIDS/HIV, alcohol abuse, deficiency anemia, rheumatoid arthritis, blood loss anemia, congestive heart failure, chronic pulmonary disease, coagulopathy, depression, diabetes without chronic complication, diabetes with chronic complication, drug abuse, hypertension, hypothyroidism, liver disease, lymphoma, fluid and electrolyte disorder, metastatic cancer, other neurologic condition, obesity, paralysis, peripheral vascular disease, psychoses, pulmonary circulation disease, renal failure, solid tumor without metastasis, peptic ulcer disease, valvular disease, weight loss, disability, myocardial infarction in year before index hospitalization, ischemic heart disease in year before index hospitalization, atrial fibrillation in year before hospitalization, ventricular tachycardia in year before index hospitalization, cardiac arrest in year before index hospitalization, and endocardial ablation in year before index hospitalization), and hospital characteristics (medical school affiliation, nonprofit status, and hospital volume).

†Adjusted for patient characteristics (race, sex, neighborhood socioeconomic disadvantage, age, disability status, Medicaid status, and rural-urban residence), comorbid conditions in the year prior (AIDS/HIV, alcohol abuse, deficiency anemia, rheumatoid arthritis, blood loss anemia, congestive heart failure, chronic pulmonary disease, coagulopathy, depression, diabetes without chronic complication, diabetes with chronic complication, drug abuse, hypertension, hypothyroidism, liver disease, lymphoma, fluid and electrolyte disorder, metastatic cancer, other neurologic condition, obesity, paralysis, peripheral vascular disease, psychoses, pulmonary circulation disease, renal failure, solid tumor without metastasis, peptic ulcer disease, valvular disease, weight loss, disability, atrial fibrillation in year before hospitalization, ventricular tachycardia in year before index hospitalization, cardiac arrest in year before index hospitalization, and endocardial ablation in year before index hospitalization), and hospital characteristics (medical school affiliation, nonprofit status, and hospital volume).

‡Neighborhood socioeconomic disadvantage as determined by ADI.

§"Other" race category composed of Research Triangle Institute race codes Asian/Pacific Islander, Hispanic, American Indian/Alaskan Native, and other.

Because of use of administrative data sets, we cannot account for detailed patient information, such as functional status, ejection fraction, or burden of VT, which may impact patient candidacy for ablation. Likewise, although we attempted to control for comorbid conditions that could influence the decision to perform ablation, we could not account for all comorbidities in our analysis. Data sets with this degree of granularity are limited in size, in contrast to what we present from a nationwide cohort. Although our data set is limited in depth, these findings shine a light on the knowledge gap of who receives VT ablation. Approximately 60% to 65% of VT ablations may be performed as an outpatient or with outpatient short-stay hospitalizations.[12] Because our data set does not include procedures performed as an outpatient, these results may not reflect referral patterns for outpatient VT ablation. Although this study only includes ablation performed during hospitalization, we believe that investigating ablation on hospitalized patients with VT who are often critically ill with a high acuity facilitates investigation of socioeconomic disparities in delivery of electrophysiologic care. Finally, our data did not fully allow for in-depth examination of patients who self-identified as races other than Black or White.[19] This requires further investigation.

CONCLUSIONS

Female patients, patients identifying as Black race, and patients living in the most disadvantaged neighborhoods are 19% to 25% less likely to receive ablation during hospitalization with VT. Overall, female patients identifying as Black race were 50% less likely than male patients identifying as White race to receive VT ablation. Sex, race, and neighborhood socioeconomic status had a stronger association with rate

of ablation than most comorbid medical conditions. Further studies are required to understand the cause of this disparity and the impact on outcomes, and to develop strategies to improve equitable access to VT ablation.

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VT indicates ventricular tachycardia.

Supplemental Material

Data S1
Tables S1–S4

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SUPPLEMENTAL MATERIAL

Data S1. Supplemental Methods

Medical comorbidities and procedures identified from ICD-9 or procedure codes during the 1 year prior to study inclusion:

Ventricular tachycardia- ICD-9 codes 427.1x

Endovascular ablation- procedure code 37.34

Cardiac arrest- ICD-9 code 427.5

Presence of an ICD- ICD-9 diagnosis code V45.02 or ICD-9 procedure code 37.94

Supplemental Tables

Table S1. Association of patient demographics (age categorized in 5-year increments), neighborhood socioeconomic status, clinical comorbidities, and hospital characteristics with ablation during hospitalization with ventricular tachycardia

	Unadjusted odds ratio			**Adjusted odds ratio**		
Key characteristic	**Odds ratio**	**95% confidence interval**		**Odds ratio**	**95% confidence interval**	
Residence in a neighborhood with lower socioeconomic disadvantage (ADI ≤85)*	Ref			Ref		
Residence in a neighborhood with high socioeconomic disadvantage (ADI >85)*	**0.71**	**0.61**	**0.82**	**0.81**	**0.69**	**0.95**
Race						
White/ unknown	Ref			Ref		
Black	**0.62**	**0.54**	**0.72**	**0.74**	**0.62**	**0.89**
Other†	0.85	0.71	1.02	1.10	0.92	1.33
Sex						
Male	Ref			Ref		
Female	**0.54**	**0.49**	**0.59**	**0.76**	**0.68**	**0.85**

Age						
18-49 yr	**0.70**	**0.53**	**0.91**	0.93	0.68	1.27
50-54 yr	**0.70**	**0.53**	**0.93**	0.96	0.68	1.36
55-59 yr	**0.78**	**0.62**	**0.97**	1.12	0.86	1.45
60-64 yr	**0.62**	**0.51**	**0.77**	**0.76**	**0.60**	**0.96**
65-69 yr	Ref			Ref		
70-74 yr	0.88	0.77	1.00	**0.85**	**0.73**	**0.98**
75-79 yr	**0.72**	**0.63**	**0.83**	**0.70**	**0.60**	**0.81**
80-84 yr	**0.50**	**0.43**	**0.58**	**0.51**	**0.43**	**0.60**
>85 yr	**0.19**	**0.16**	**0.23**	**0.25**	**0.20**	**0.31**
Medicaid status	**0.64**	**0.57**	**0.72**	0.90	0.78	1.03
HCC community score				**0.88**	**0.86**	**0.92**
Comorbid conditions						
AIDS/ HIV	0.16	0.02	1.15	0.20	0.02	2.13
Alcohol abuse	0.84	0.66	1.08	0.84	0.64	1.11
Anemia, chronic blood loss	**0.50**	**0.34**	**0.72**	**0.63**	**0.41**	**0.98**
Anemia, deficiency	**0.60**	**0.55**	**0.66**	**0.84**	**0.73**	**0.96**
Atrial fibrillation[‡]	1.97	1.81	2.15	**1.70**	**1.53**	**1.89**
History of cardiac arrest[‡]	0.58	0.33	1.03	**0.39**	**0.22**	**0.69**
Chronic pulmonary disease	**0.86**	**0.78**	**0.94**	1.00	0.89	1.12
Congestive heart failure	1.24	1.14	1.35	1.07	0.95	1.21
Coagulopathy	**0.81**	**0.70**	**0.94**	0.93	0.77	1.12

Depression	**0.83**	**0.73**	**0.94**	1.03	0.88	1.22
Diabetes without chronic complication	**0.89**	**0.82**	**0.97**	0.97	0.87	1.09
Diabetes with chronic complication	**0.68**	**0.59**	**0.79**	1.02	0.85	1.22
Disability	**1.11**	**1.01**	**1.22**	**0.80**	**0.70**	**0.92**
Drug abuse	**0.71**	**0.52**	**0.96**	0.77	0.52	1.13
Endovascular ablation in year prior to index hospitalization	**60.17**	**53.54**	**67.62**	**37.58**	**31.73**	**44.51**
Fluid and electrolyte disorder	**0.70**	**0.64**	**0.77**	0.89	0.80	1.00
Hypertension	1.03	0.94	1.14	1.10	0.97	1.24
Hypothyroidism	**1.17**	**1.06**	**1.30**	**1.21**	**1.07**	**1.37**
Presence of ICD‡	**3.41**	**3.13**	**3.71**	**1.65**	**1.45**	**1.88**
Ischemic heart disease‡	**1.41**	**1.25**	**1.60**	1.10	0.95	1.28
Liver disease	**0.78**	**0.62**	**0.99**	0.97	0.75	1.27
Lymphoma	**0.60**	**0.41**	**0.89**	0.89	0.60	1.34
Metastatic cancer	**0.37**	**0.25**	**0.56**	0.74	0.47	1.18
History of myocardial infarction‡	0.89	0.79	1.00	0.92	0.81	1.05
Other neurologic condition	**0.49**	**0.41**	**0.57**	**0.74**	**0.61**	**0.90**

Obesity	**1.17**	**1.04**	**1.30**	1.08	0.93	1.25
Paralysis	**0.49**	**0.36**	**0.67**	0.88	0.62	1.25
Peptic ulcer disease	0.48	0.07	3.41	0.59	0.04	7.86
Peripheral vascular disease	**0.82**	**0.73**	**0.91**	0.90	0.79	1.03
Pulmonary circulation disease	**0.77**	**0.66**	**0.91**	0.83	0.69	1.00
Psychoses	**0.51**	**0.40**	**0.65**	0.76	0.57	1.00
Renal failure	**0.78**	**0.71**	**0.86**	**0.87**	**0.76**	**0.98**
Rheumatoid arthritis	0.97	0.80	1.19	**1.37**	**1.10**	**1.71**
Solid tumor without metastasis	**0.78**	**0.67**	**0.91**	1.09	0.92	1.30
Valvular disease	1.10	0.99	1.22	0.99	0.87	1.12
History of ventricular tachycardia‡	**3.57**	**3.26**	**3.90**	**1.75**	**1.53**	**2.01**
Weight loss	**0.46**	**0.38**	**0.56**	0.82	0.65	1.02
Medical school affiliation						
Major	Ref			Ref		
Minor	**0.59**	**0.53**	**0.66**	**0.66**	**0.54**	**0.81**
None	**0.41**	**0.37**	**0.45**	**0.51**	**0.43**	**0.62**
Hospital discharge volume§						
Highest tertile	Ref			Ref		
Middle tertile	**0.27**	**0.22**	**0.33**	**0.37**	**0.26**	**0.52**

Lowest tertile	**0.14**	**0.06**	**0.31**	**0.22**	**0.09**	**0.52**
Nonprofit status	1.00	0.91	1.10	0.88	0.74	1.05
Location of patient residence						
Urban	Ref			Ref		
Suburban	1.09	0.95	1.26	1.01	0.85	1.21
Large rural	1.09	0.95	1.25	1.16	0.97	1.39
Small rural	1.02	0.88	1.18	1.00	0.84	1.19

Abbreviations: ADI- Area deprivation index, HCC- Hierarchical condition category, ICD- Implantable Cardioverter Defibrillator, yr- year

* - Neighborhood Socioeconomic Disadvantage as determined by Area Deprivation Index (ADI) nationwide percentile rank

† - "Other" race category comprised of RTI race codes Asian/ Pacific Islander, Hispanic, American Indian/ Alaskan Native, and Other.

‡ - Comorbidity identified in year prior to index hospitalization

§ - Hospital discharge volume in 2014. Highest tertile hospitals discharged 2846-39471 patients, middle tertile hospitals discharged 735-2844 patients, lowest tertile hospitals discharged 0-732 patients.

Bolded results indicate result with Odds Ratio not crossing 1.

Model adjusted for: Variables listed in the table

Table S2. Rate of previous ICD implantation by race, sex, and neighborhood socioeconomic status.

	ICD implantation prior to hospitalization	No ICD implantation prior to hospitalization
Overall (%)	26289 (20)	105356 (80)
Female (%)	5967 (12)	43473 (88)
Residence in a neighborhood with high socioeconomic disadvantage (ADI >85) * (%)	3100 (21)	11848 (79)
Race		
White/ unknown (%)	20607 (20)	84910 (80)
Black (%)	4161 (24)	13533 (76)
Other† (%)	1521 (18)	6913 (82)

Abbreviations: ADI- Area deprivation index, ICD- Implantable Cardioverter Defibrillator

* - Neighborhood Socioeconomic Disadvantage as determined by Area Deprivation Index (ADI).

† - "Other" race category comprised of RTI race codes Asian/ Pacific Islander, Hispanic, American Indian/ Alaskan Native, and Other.

Table S3. Association of race, sex, and neighborhood socioeconomic status with ablation during hospitalization with ventricular tachycardia in patients without history of atrial fibrillation and in patients with history of previous myocardial infarction or ischemic cardiomyopathy

	No history of atrial fibrillation*				History of previous myocardial infarction or ischemic cardiomyopathy†			
	Odds Ratio	95% Confidence Interval		P-value	Odds Ratio	95% Confidence Interval		P-value
Sex								
Male	Ref				Ref			
Female	0.70	0.59	0.84	<0.001	0.75	0.66	0.85	<0.001
Socioeconomic disadvantage								
Residence in a neighborhood with low socioeconomic	Ref				Ref			

disadvantage (ADI ≤85) ‡								
Residence in a neighborhood with high socioeconomic disadvantage (ADI >85) ‡	0.63	0.47	0.84	0.001	0.82	0.69	0.99	0.03
Race								
White/ unknown	Ref				Ref			
Black	0.71	0.55	0.92	0.008	0.74	0.62	0.89	0.001
Other§	1.01	0.75	1.37	0.95	1.12	0.90	1.39	0.30

Abbreviations: ADI- Area deprivation index

* - Adjusted for patient characteristics (race, sex, neighborhood socioeconomic disadvantage, age, disability status, Medicaid status, rural-urban residence), comorbid conditions in the year prior (AIDS/ HIV, alcohol abuse, deficiency anemia, rheumatoid arthritis, blood loss anemia, congestive heart failure, chronic pulmonary disease, coagulopathy, depression, diabetes without chronic complication, diabetes with chronic complication, drug abuse, hypertension, hypothyroidism, liver disease, lymphoma, fluid and electrolyte disorder, metastatic cancer, other neurologic condition, obesity, paralysis, peripheral vascular disease, psychoses, pulmonary circulation disease, renal failure, solid tumor without metastasis, peptic ulcer

disease, valvular disease, weight loss, disability, myocardial infarction in year prior to index hospitalization, ischemic heart disease in year prior to index hospitalization, VT in year prior to index hospitalization, cardiac arrest in year prior to index hospitalization, presence of ICD, endocardial ablation in year prior to index hospitalization), and hospital characteristics (medical school affiliation, non-profit status, and hospital volume).

† - Adjusted for patient characteristics (race, sex, neighborhood socioeconomic disadvantage, age, disability status, Medicaid status, rural-urban residence), comorbid conditions in the year prior (AIDS/ HIV, alcohol abuse, deficiency anemia, rheumatoid arthritis, blood loss anemia, congestive heart failure, chronic pulmonary disease, coagulopathy, depression, diabetes without chronic complication, diabetes with chronic complication, drug abuse, hypertension, hypothyroidism, liver disease, lymphoma, fluid and electrolyte disorder, metastatic cancer, other neurologic condition, obesity, paralysis, peripheral vascular disease, psychoses, pulmonary circulation disease, renal failure, solid tumor without metastasis, peptic ulcer disease, valvular disease, weight loss, disability, atrial fibrillation in year prior to hospitalization, VT in year prior to index hospitalization, cardiac arrest in year prior to index hospitalization, presence of ICD, endocardial ablation in year prior to index hospitalization), and hospital characteristics (medical school affiliation, non-profit status, and hospital volume).

‡ - Neighborhood Socioeconomic Disadvantage as determined by Area Deprivation Index (ADI).

§ - “Other” race category comprised of RTI race codes Asian/ Pacific Islander, Hispanic, American Indian/ Alaskan Native, and Other.

Table S4. Association of race, sex, and neighborhood socioeconomic status with ablation during hospitalization with ventricular tachycardia in patients with known race

	Odds Ratio	95% Confidence Interval		P-value
Sex				
Male	Ref			
Female	0.71	0.63	0.79	<0.001
Socioeconomic disadvantage				
Residence in a neighborhood with low socioeconomic disadvantage (ADI ≤85) *	Ref			
Residence in a neighborhood with high socioeconomic disadvantage (ADI >85) *	0.81	0.68	0.96	0.01
Race				
White	Ref			
Black	0.75	0.64	0.89	0.001
Other†	1.12	0.91	1.36	0.28

Abbreviations: ADI- Area deprivation index

* - Neighborhood Socioeconomic Disadvantage as determined by Area Deprivation Index (ADI).

† - “Other” race category comprised of RTI race codes Asian/ Pacific Islander, Hispanic, American Indian/ Alaskan Native, and Other.

SUPPLEMENTAL MATERIAL

Data S1.

Supplemental Methods

Medical comorbidities and procedures identified from ICD-9 or procedure codes during the 1 year prior to study inclusion:

Ventricular tachycardia- ICD-9 codes 427.1x

Endovascular ablation- procedure code 37.34

Cardiac arrest- ICD-9 code 427.5

Presence of an ICD- ICD-9 diagnosis code V45.02 or ICD-9 procedure code 37.94

Table S1. Association of patient demographics (age categorized in 5-year increments), neighborhood socioeconomic status, clinical comorbidities, and hospital characteristics with ablation during hospitalization with ventricular tachycardia.

	Unadjusted odds ratio			**Adjusted odds ratio**		
Key characteristic	**Odds ratio**	**95% confidence interval**		**Odds ratio**	**95% confidence interval**	
Residence in a neighborhood with lower socioeconomic disadvantage (ADI ≤85)*	Ref			Ref		
Residence in a neighborhood with high socioeconomic disadvantage (ADI >85)*	**0.71**	**0.61**	**0.82**	**0.81**	**0.69**	**0.95**
Race						
White/ unknown	Ref			Ref		
Black	**0.62**	**0.54**	**0.72**	**0.74**	**0.62**	**0.89**
Other†	0.85	0.71	1.02	1.10	0.92	1.33
Sex						
Male	Ref			Ref		
Female	**0.54**	**0.49**	**0.59**	**0.76**	**0.68**	**0.85**
Age						

18-49 yr	**0.70**	**0.53**	**0.91**	0.93	0.68	1.27
50-54 yr	**0.70**	**0.53**	**0.93**	0.96	0.68	1.36
55-59 yr	**0.78**	**0.62**	**0.97**	1.12	0.86	1.45
60-64 yr	**0.62**	**0.51**	**0.77**	**0.76**	**0.60**	**0.96**
65-69 yr	Ref			Ref		
70-74 yr	0.88	0.77	1.00	**0.85**	**0.73**	**0.98**
75-79 yr	**0.72**	**0.63**	**0.83**	**0.70**	**0.60**	**0.81**
80-84 yr	**0.50**	**0.43**	**0.58**	**0.51**	**0.43**	**0.60**
>85 yr	**0.19**	**0.16**	**0.23**	**0.25**	**0.20**	**0.31**
Medicaid status	**0.64**	**0.57**	**0.72**	0.90	0.78	1.03
HCC community score				**0.88**	**0.86**	**0.92**
Comorbid conditions						
AIDS/ HIV	0.16	0.02	1.15	0.20	0.02	2.13
Alcohol abuse	0.84	0.66	1.08	0.84	0.64	1.11
Anemia, chronic blood loss	**0.50**	**0.34**	**0.72**	**0.63**	**0.41**	**0.98**
Anemia, deficiency	**0.60**	**0.55**	**0.66**	**0.84**	**0.73**	**0.96**
Atrial fibrillation[‡]	1.97	1.81	2.15	**1.70**	**1.53**	**1.89**
History of cardiac arrest[‡]	0.58	0.33	1.03	**0.39**	**0.22**	**0.69**
Chronic pulmonary disease	**0.86**	**0.78**	**0.94**	1.00	0.89	1.12
Congestive heart failure	1.24	1.14	1.35	1.07	0.95	1.21
Coagulopathy	**0.81**	**0.70**	**0.94**	0.93	0.77	1.12
Depression	**0.83**	**0.73**	**0.94**	1.03	0.88	1.22

Diabetes without chronic complication	**0.89**	**0.82**	**0.97**	0.97	0.87	1.09
Diabetes with chronic complication	**0.68**	**0.59**	**0.79**	1.02	0.85	1.22
Disability	**1.11**	**1.01**	**1.22**	**0.80**	**0.70**	**0.92**
Drug abuse	**0.71**	**0.52**	**0.96**	0.77	0.52	1.13
Endovascular ablation in year prior to index hospitalization	**60.17**	**53.54**	**67.62**	**37.58**	**31.73**	**44.51**
Fluid and electrolyte disorder	**0.70**	**0.64**	**0.77**	0.89	0.80	1.00
Hypertension	1.03	0.94	1.14	1.10	0.97	1.24
Hypothyroidism	**1.17**	**1.06**	**1.30**	**1.21**	**1.07**	**1.37**
Presence of ICD‡	**3.41**	**3.13**	**3.71**	**1.65**	**1.45**	**1.88**
Ischemic heart disease‡	**1.41**	**1.25**	**1.60**	1.10	0.95	1.28
Liver disease	**0.78**	**0.62**	**0.99**	0.97	0.75	1.27
Lymphoma	**0.60**	**0.41**	**0.89**	0.89	0.60	1.34
Metastatic cancer	**0.37**	**0.25**	**0.56**	0.74	0.47	1.18
History of myocardial infarction‡	0.89	0.79	1.00	0.92	0.81	1.05
Other neurologic condition	**0.49**	**0.41**	**0.57**	**0.74**	**0.61**	**0.90**
Obesity	**1.17**	**1.04**	**1.30**	1.08	0.93	1.25

Paralysis	**0.49**	**0.36**	**0.67**	0.88	0.62	1.25
Peptic ulcer disease	0.48	0.07	3.41	0.59	0.04	7.86
Peripheral vascular disease	**0.82**	**0.73**	**0.91**	0.90	0.79	1.03
Pulmonary circulation disease	**0.77**	**0.66**	**0.91**	0.83	0.69	1.00
Psychoses	**0.51**	**0.40**	**0.65**	0.76	0.57	1.00
Renal failure	**0.78**	**0.71**	**0.86**	**0.87**	**0.76**	**0.98**
Rheumatoid arthritis	0.97	0.80	1.19	**1.37**	**1.10**	**1.71**
Solid tumor without metastasis	**0.78**	**0.67**	**0.91**	1.09	0.92	1.30
Valvular disease	1.10	0.99	1.22	0.99	0.87	1.12
History of ventricular tachycardia‡	**3.57**	**3.26**	**3.90**	**1.75**	**1.53**	**2.01**
Weight loss	**0.46**	**0.38**	**0.56**	0.82	0.65	1.02
Medical school affiliation						
Major	Ref			Ref		
Minor	**0.59**	**0.53**	**0.66**	**0.66**	**0.54**	**0.81**
None	**0.41**	**0.37**	**0.45**	**0.51**	**0.43**	**0.62**
Hospital discharge volume§						
Highest tertile	Ref			Ref		
Middle tertile	**0.27**	**0.22**	**0.33**	**0.37**	**0.26**	**0.52**
Lowest tertile	**0.14**	**0.06**	**0.31**	**0.22**	**0.09**	**0.52**

Nonprofit status	1.00	0.91	1.10	0.88	0.74	1.05
Location of patient residence						
Urban	Ref			Ref		
Suburban	1.09	0.95	1.26	1.01	0.85	1.21
Large rural	1.09	0.95	1.25	1.16	0.97	1.39
Small rural	1.02	0.88	1.18	1.00	0.84	1.19

ADI- Area deprivation index, HCC- Hierarchical condition category, ICD- Implantable Cardioverter Defibrillator, yr- year

* - Neighborhood Socioeconomic Disadvantage as determined by Area Deprivation Index (ADI) nationwide percentile rank

† - “Other” race category comprised of RTI race codes Asian/ Pacific Islander, Hispanic, American Indian/ Alaskan Native, and Other.

‡ - Comorbidity identified in year prior to index hospitalization

§ - Hospital discharge volume in 2014. Highest tertile hospitals discharged 2846-39471 patients, middle tertile hospitals discharged 735-2844 patients, lowest tertile hospitals discharged 0-732 patients.

Model adjusted for: Variables listed in the table

Table S2. Rate of previous ICD implantation by race, sex, and neighborhood socioeconomic status.

	ICD implantation prior to hospitalization	No ICD implantation prior to hospitalization
Overall (%)	26289 (20)	105356 (80)
Female (%)	5967 (12)	43473 (88)
Residence in a neighborhood with high socioeconomic disadvantage (ADI >85) * (%)	3100 (21)	11848 (79)
Race		
White/ unknown (%)	20607 (20)	84910 (80)
Black (%)	4161 (24)	13533 (76)
Other† (%)	1521 (18)	6913 (82)

ADI- Area deprivation index, ICD- Implantable Cardioverter Defibrillator

* - Neighborhood Socioeconomic Disadvantage as determined by Area Deprivation Index (ADI).

† - "Other" race category comprised of RTI race codes Asian/ Pacific Islander, Hispanic, American Indian/ Alaskan Native, and Other.

Table S3. **Association of race, sex, and neighborhood socioeconomic status with ablation during hospitalization with ventricular tachycardia in patients without history of atrial fibrillation and in patients with history of previous myocardial infarction or ischemic cardiomyopathy.**

	No history of atrial fibrillation[*]				History of previous myocardial infarction or ischemic cardiomyopathy[†]			
	Odds Ratio	95% Confidence Interval		P-value	Odds Ratio	95% Confidence Interval		P-value
Sex								
Male	Ref				Ref			
Female	0.70	0.59	0.84	<0.001	0.75	0.66	0.85	<0.001
Socioeconomic disadvantage								
Residence in a neighborhood with low socioeconomic	Ref				Ref			

disadvantage (ADI ≤85) ‡								
Residence in a neighborhood with high socioeconomic disadvantage (ADI >85) ‡	0.63	0.47	0.84	0.001	0.82	0.69	0.99	0.03
Race								
White/ unknown	Ref				Ref			
Black	0.71	0.55	0.92	0.008	0.74	0.62	0.89	0.001
Other§	1.01	0.75	1.37	0.95	1.12	0.90	1.39	0.30

ADI- Area deprivation index

* - Adjusted for patient characteristics (race, sex, neighborhood socioeconomic disadvantage, age, disability status, Medicaid status, rural-urban residence), comorbid conditions in the year prior (AIDS/ HIV, alcohol abuse, deficiency anemia, rheumatoid arthritis, blood loss anemia, congestive heart failure, chronic pulmonary disease, coagulopathy, depression, diabetes without chronic complication, diabetes with chronic complication, drug abuse, hypertension, hypothyroidism, liver disease, lymphoma, fluid and electrolyte disorder, metastatic cancer, other neurologic condition, obesity, paralysis, peripheral vascular disease, psychoses,

pulmonary circulation disease, renal failure, solid tumor without metastasis, peptic ulcer disease, valvular disease, weight loss, disability, myocardial infarction in year prior to index hospitalization, ischemic heart disease in year prior to index hospitalization, VT in year prior to index hospitalization, cardiac arrest in year prior to index hospitalization, presence of ICD, endocardial ablation in year prior to index hospitalization), and hospital characteristics (medical school affiliation, non-profit status, and hospital volume).

† - Adjusted for patient characteristics (race, sex, neighborhood socioeconomic disadvantage, age, disability status, Medicaid status, rural-urban residence), comorbid conditions in the year prior (AIDS/ HIV, alcohol abuse, deficiency anemia, rheumatoid arthritis, blood loss anemia, congestive heart failure, chronic pulmonary disease, coagulopathy, depression, diabetes without chronic complication, diabetes with chronic complication, drug abuse, hypertension, hypothyroidism, liver disease, lymphoma, fluid and electrolyte disorder, metastatic cancer, other neurologic condition, obesity, paralysis, peripheral vascular disease, psychoses, pulmonary circulation disease, renal failure, solid tumor without metastasis, peptic ulcer disease, valvular disease, weight loss, disability, atrial fibrillation in year prior to hospitalization, VT in year prior to index hospitalization, cardiac arrest in year prior to index hospitalization, presence of ICD, endocardial ablation in year prior to index hospitalization), and hospital characteristics (medical school affiliation, non-profit status, and hospital volume).

‡ - Neighborhood Socioeconomic Disadvantage as determined by Area Deprivation Index (ADI).

§ - “Other” race category comprised of RTI race codes Asian/ Pacific Islander, Hispanic, American Indian/ Alaskan Native, and Other.

Table S4. Association of race, sex, and neighborhood socioeconomic status with ablation during hospitalization with ventricular tachycardia in patients with known race.

	Odds Ratio	95% Confidence Interval		P-value
Sex				
Male	Ref			
Female	0.71	0.63	0.79	<0.001
Socioeconomic disadvantage				
Residence in a neighborhood with low socioeconomic disadvantage (ADI ≤85) *	Ref			
Residence in a neighborhood with high socioeconomic disadvantage (ADI >85) *	0.81	0.68	0.96	0.01
Race				
White	Ref			
Black	0.75	0.64	0.89	0.001
Other†	1.12	0.91	1.36	0.28

ADI- Area deprivation index

* - Neighborhood Socioeconomic Disadvantage as determined by Area Deprivation Index (ADI).

† - “Other” race category comprised of RTI race codes Asian/ Pacific Islander, Hispanic, American Indian/ Alaskan Native, and Other.