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ORIGINAL RESEARCH

Disparities in the Management of Newly Diagnosed Paroxysmal Supraventricular Tachycardia for Women Versus Men in the United States

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BACKGROUND: Information on differences in paroxysmal supraventricular tachycardia (PSVT) diagnosis, healthcare resource use, expenditures, and treatment among women versus men is limited.

METHODS AND RESULTS: Study participants identified in the IBM MarketScan Commercial Research Databases were aged 18 to 40 years with newly diagnosed PSVT (*International Classification of Diseases, Ninth Revision* [*ICD-9*]: 427.0; *International Classification of Diseases, Tenth Revision* [*ICD-10*]: I47.1) from October 1, 2012, through September 30, 2016, observable 1 year preindex and postindex diagnosis. Study outcomes were mean annual per-patient healthcare resource use and expenditures before and after diagnosis. Among 5466 patients newly diagnosed with PSVT, most (66.9%) were women. Compared with men, women with PSVT tended to have higher rates of anxiety (13.9% versus 10.9%; $P<0.01$) and chronic pulmonary disease (10.9% versus 8.3%; $P<0.01$). Following diagnosis, mean annual per-patient expenditures increased for all patients, but were significantly lower for women ($26922 versus $33112; $P<0.05$), reflecting lower spending for services billed as a result of a PSVT diagnosis ($8471 versus $11405; $P<0.05$). After diagnosis, nearly half of all patients had at least 1 emergency department visit (women versus men, 49.6% versus 44.5%; $P<0.01$) and more had hospital admissions (women versus men, 24.7% versus 20.0%; $P<0.01$). Fewer women were treated with cardiac ablation (12.6% versus 15.3%; $P<0.01$), and more were treated with medical therapy, including β blockers or calcium channel blockers (odds ratio, 1.15; 95% CI, 1.02–1.31).

CONCLUSIONS: Among patients aged 18 to 40 years, ≈2 of 3 patients diagnosed with PSVT were women. After diagnosis, spending was significantly lower for women, reflecting lower ablation rates and less spending on services with a PSVT diagnosis.

Key Words: economic burden ■ health expenditures ■ paroxysmal supraventricular tachycardia ■ sex disparities

Paroxysmal supraventricular tachycardia (PSVT) is a clinical syndrome characterized by the presence of a regular and rapid tachycardia of abrupt onset and termination.[1,2] Our use of the term "PSVT" excludes atrial fibrillation and atrial flutter, but includes atrial tachycardia. Short-term episodes of PSVT manifest as a rapid heart rate, palpitations, lightheadedness, shortness of breath, chest pain, anxiety, and potentially with syncope.[2] A confirmatory diagnosis of PSVT is made via ECG or other rhythm-recording device during a short-term episode.[3] Because of its variable duration and sporadic nature, confirming a diagnosis of PSVT can be challenging. Consequently, patients may be initially misdiagnosed with anxiety or other rhythm disorders.[1,4,5] In some cases, female patients with PSVT reported that clinicians did not take their symptoms seriously, delaying their diagnosis of PSVT and suggesting a bias in clinical diagnosis and

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CLINICAL PERSPECTIVE

What is New?

- In the year following paroxysmal supraventricular tachycardia (PSVT) diagnosis, healthcare expenditures increased significantly for all patients, but this increase was significantly greater for men than women because of expenditures related to ablations in men.
- In patients newly diagnosed with PSVT, women were more likely to be treated with medical therapy (eg, β blockers or calcium channel blockers) than cardiac ablations compared with men.
- After PSVT diagnosis, women had significantly higher emergency department use and hospital admissions related to PSVT, and less ablations performed, than men.

What Are the Clinical Implications?

- Management of PSVT in women should follow published guidelines and include evaluation and referral for ablation as often as in men.
- Attempts should be made to correctly evaluate and diagnose women with PSVT, avoiding misdiagnoses of anxiety/panic disorder and delay in accessing potentially curative therapy.
- Further studies that evaluate long-term management of PSVT in pregnant women may help to determine whether PSVT symptoms that can first occur during pregnancy abate following pregnancy.

Nonstandard Abbreviations and Acronyms

CCI	Charlson Comorbidity Index
ED	emergency department
HRU	healthcare resource use
PSVT	paroxysmal supraventricular tachycardia
PREEMPT	Population-Based Risk and Epidemiology of Paroxysmal Supraventricular Tachycardias

treatment practices for women versus men.[6] However, once PSVT is diagnosed, long-term management consists of surveillance and/or prophylactic medical therapy with variable rates of effectiveness and with potential adverse effects, especially in young, active, and otherwise healthy patients.[7] In addition, patients may be treated with catheter ablation, which is considered curative in most cases.[2]

Published epidemiological studies report that PSVT is more prevalent among women.[8] Despite a substantial body of literature on the existence of differences in the diagnosis and treatment of cardiovascular disease in women versus men, information on disparities between women and men with cardiac rhythm disorders, including PSVT, is limited. Differences by sex in diagnosis and treatment of cardiac arrhythmias, particularly atrial fibrillation, have been reported, revealing that women were more likely than men to be diagnosed later in their disease course.[9] Women with PSVT were referred for ablation later and were more likely to be misdiagnosed with panic disorder or anxiety.[10]

The relationship between sex and healthcare resource use (HRU) and expenditures in patients with PSVT has not been explored. The objectives of this analysis were to assess whether, and the extent to which, diagnosis, treatment, HRU, and expenditures differ for women versus men with newly diagnosed PSVT.

METHODS

Detailed results of the analyses reported herein are available from the corresponding author on reasonable request, as are detailed descriptions of the software code used to generate these results. This longitudinal retrospective study used demographic, enrollment, and insurance claims data for a 4-year period (October 1, 2012 to September 30, 2016) from the IBM MarketScan Research Databases. This database contains medical and pharmaceutical claims, enrollment, and demographic information for ≈90 million individuals with commercial insurance coverage over the 4-year time period. This study was exempt from institutional review board approval, as it did not involve any interventional biomedical research with human subjects.

Patient inclusion was limited to newly diagnosed cases of PSVT. Because we were interested in the effects of PSVT diagnosis on HRU and costs, we limited study patients to those aged 18 to 40 years, as younger patients would be expected to have lower rates of comorbid conditions that could affect their HRU and expenditures. Patients were required to be enrolled in their health plans and observable for 1 year before and 1 year after index diagnosis, with no diagnoses for PSVT (*International Classification of Diseases, Ninth Revision* [*ICD-9*]: 427.0; *International Classification of Diseases, Tenth Revision* [*ICD-10*]: I47.1) and no diagnoses for any related cardiac rhythm disorders that could be confused with PSVT, for at least 1 year before their first PSVT diagnosis. Related cardiac rhythm disorders were those verified and published by the PREEMPT (Population-Based Risk and Epidemiology of Paroxysmal Supraventricular Tachycardias) study.[1] We refer to this set of cardiac arrhythmias as PSVT-related arrhythmias. Descriptions of the *ICD-9* diagnosis codes used to identify these cardiac arrhythmias are listed in Table S1).

Patients were considered newly diagnosed if they had no diagnoses of PSVT and no diagnoses for PSVT-related arrhythmias for 12 months, followed by (1) a first diagnosis of PSVT or (2) a first diagnosis of a PSVT-related arrhythmia and a subsequent PSVT diagnosis in the postindex 12 months. This second patient identification method was used because of the episodic nature of PSVT and the attendant difficulties in arriving at definitive diagnosis, and allowed for an assessment of HRU and costs related to initial misdiagnosis with PSVT-related arrhythmias.

In addition, all patients were required to have both medical and pharmacy benefits throughout the observation window. Because the last year of the study period, October 1, 2015 to September 30, 2016, coincided with the introduction of the *ICD-10-Clinical Modification* (*ICD-10-CM*), revision, only *ICD-9* diagnosis codes were used to identify newly diagnosed patients, as the 12-month follow-up requirement meant that all patients were newly diagnosed before October 1, 2015.

Study Measures

Patient age, sex, and geographic region were reported as of the index diagnosis date. The Charlson Comorbidity Index (CCI) was calculated using diagnosis codes on medical claims from the year before the index diagnosis.[11] The CCI is a widely used measure of patient health status that lists 19 conditions, where each condition is assigned a severity score weight of 1 to 6. Scores are summed to yield a final CCI score ranging from 0 to 37, with higher numbers indicating more severe comorbidities.[12] The CCI score was treated as a continuous variable in the analyses. Patient comorbidities, including diabetes mellitus, cardiovascular disease, cerebrovascular disease, chronic pulmonary disease, renal disease, cancer, and anxiety or panic disorder, were also identified in the preindex year. The *ICD-9* diagnosis codes used to identify comorbidities are listed in Table S2).

To evaluate the impact of PSVT on HRU in women and men, we examined office visits, outpatient hospital visits, emergency department (ED) visits, inpatient admissions, and prescription drug use before and after index diagnosis. These groupings of HRU and expenditure by setting of care follow standard groupings for organizing provider payments. For example, outpatient hospital visits covered services provided in an outpatient hospital setting and billed by the hospital. We calculated mean per-patient annual numbers of office, outpatient hospital and ED visits, inpatient admissions, and prescription medication fills for β blockers and calcium channel blockers, which can be used for PSVT management. Because women in our study were of child-bearing age, we also examined rates of contraceptive prescriptions. We then calculated the proportions of patients with at least 1 ED visit, ≥1 hospitalization, and ≥1 medication fill. The analysis also identified the subset of medical encounters with a PSVT or a PSVT-related diagnosis in the postindex year to assess the contribution of PSVT and PSVT-related services to HRU following initial diagnosis and examine whether PSVT and PSVT-related service use differed for women versus men.

Rates of PSVT catheter ablations for women versus men were calculated in the year after PSVT diagnosis. Current Procedural Terminology and Healthcare Common Procedure Coding System codes identified ablations; claims for the same patient within 7 days were grouped as a single ablation. Ablations were required to occur in an inpatient or outpatient hospital setting, and all claims with a procedure code for ablation that occurred within 7 days of the first observed ablation claim were considered a single ablation, as reablation would not be expected to occur within 7 days. Because the same procedure codes for ablation can be used for PSVT and other rhythm disorders, ablations were grouped according to whether they had at least 1 PSVT diagnosis. Clinical codes used to identify ablations are listed in Table S3. The proportion of women versus men and women with at least 1 ablation in the 12 months after diagnosis was calculated.

Medical and prescription drug expenditures in the year before and after index diagnosis were calculated overall for women and men and by service setting: outpatient (office visits, outpatient hospital visits, ED visits, and other), inpatient, and prescription drugs. To assess the contribution of PSVT to healthcare spending, expenditures for services with a PSVT diagnosis were measured. Because PSVT can be misdiagnosed, we also examined expenditures for services with PSVT-related arrhythmia. Spending on cardiac ablations was calculated, including the mean expenditures per ablation. Mean annual per-patient expenditures for ablations were calculated across all ablations, and by the setting in which the ablation was conducted (inpatient versus outpatient).

Statistical Analyses

Univariate and bivariate analyses of patient characteristics, healthcare expenditures, and HRU were conducted. We used 2-sample *t*-tests for continuous variables and χ^2 tests for categorical variables to assess whether differences between men and women in HRU and costs were significant in the prediagnosis period, and, separately, in the postdiagnosis period. We used paired *t*-tests and McNemar tests to examine whether HRU and costs among women were significantly different before and after diagnosis, and separately, whether they were significantly different for men. We then used multivariate logistic regression to estimate the odds of treatment with ablation and, separately, the odds of new treatment with prophylactic mediation in the year following diagnosis, with sex as the key independent variable. Because healthcare expenditures are typically not normally distributed, we examined the distribution of expenditures for all patients, grouping expenditures by decile, maintaining all patients' total expenditure amounts. We conducted logistic regression to estimate the relationship of sex to postdiagnosis expenditures. Controlling variables in all models were age, sex, CCI, comorbid conditions, and preindex year spending in all models.

Sensitivity Analyses

Given that the age range of women in this study is typically prime childbearing age, and PSVT is not uncommonly first discovered during pregnancy, we conducted a sensitivity analysis to identify pregnant women in the cohort and assess the impact of PSVT diagnosis in women who were not pregnant. Pregnant women were identified as those with at least 1 claim with a procedure code for labor and delivery, which encompass services for labor and delivery as well as prenatal and postnatal visits. We then assessed rates of pregnancy in this cohort. Because pregnancy might affect treatment following PSVT diagnosis, with ablation delayed for pregnant women, we examined demographics, HRU, and costs in the prediagnosis and postdiagnosis period, limiting our analyses to women who were not pregnant in the year following diagnosis. We compared rates of HRU and costs in nonpregnant women and men in the postdiagnosis year and reran multivariate analyses that estimated the odds of ablation, with pregnancy as an additional independent variable. Codes used to identify pregnancy are listed in Table S4.

All analyses were conducted using SAS version 9.4 (Raleigh, NC).

RESULTS

A total of 5466 patients met study inclusion criteria, of whom 3655 (66.9%) were women. Women were slightly older than men (30.4 [SD, 6.9] versus 29.4 [SD, 7.28] years; $P<0.0001$), but there were no significant differences in health status as measured by the CCI. Rates of hypertension, atrial fibrillation, congestive heart failure, and cerebrovascular disease, albeit low, were significantly higher in men (all $P<0.01$), whereas rates of chronic pulmonary disease and anxiety/panic disorder were significantly higher in women (all $P<0.01$) (Table 1).

HRU: Women Versus Men

In the 12 months before index diagnosis, rates of HRU were higher for women in most settings, compared with men (women versus men: office visits, 10.32 versus 6.25; outpatient hospital visits, 2.71 versus 1.47; ED visits, 0.60 versus 0.34 [all $P<0.0001$]; inpatient admissions, 0.13 versus 0.09 [$P<0.05$]; prescription drug fills, 16.18 versus 10.35 [$P<0.0001$]). Prescription fills for contraceptives (1.91 per patient) did not account for this difference.

Compared with men, more women had at least 1 ED visit (28.9% versus 21.6%; $P<0.0001$) and at least 1 inpatient admission (9% versus 5%; $P<0.0001$). Fewer women were prescribed any β blockers or calcium channel blockers in the preindex year (12.2% versus 14.1%; $P<0.05$) (Table 2, Figure 1).

Following diagnosis, HRU was significantly higher for both women and men in all settings, and women continued to have higher rates than men (women versus men: office visits, 14.95 versus 11.12 [$P<0.0001$]; outpatient hospital visits, 4.95 versus 4.22 [$P<0.01$]; ED visits, 1.09 versus 0.92 [$P<0.01$]; inpatient admissions, 0.38 versus 0.35; prescription drug fills, 20.39 versus 15.92 [$P<0.0001$]). Differences in prescription drug fills following diagnosis were similar to prediagnosis

Table 1. Patient Characteristics

Clinical and Demographic Characteristics	Women (N=3655)	Men (N=1811)
Age, y		
Mean (SD)***	30.4 (6.9)	29.4 (7.28)
Median	32	30
Charlson Comorbidity Index (prediagnosis), mean (SD)	0.27 (0.74)	0.29 (0.85)
Specific comorbidities in prediagnosis period, n (%)		
Diabetes mellitus	150 (4.1)	75 (4.14)
Congestive heart failure**	47 (1.3)	47 (2.6)
Peripheral vascular disease	19 (0.5)	15 (0.8)
Acute myocardial infarction	<11	<11
Mitral valve prolapse	66 (1.8)	37 (2.0)
Atrial fibrillation***	30 (0.82)	53 (2.9)
Congenital cardiac defects	44 (1.2)	16 (0.9)
Hypertension***	358 (9.8)	277 (15.3)
Cerebrovascular disease**	21 (0.6)	24 (1.3)
Chronic obstructive pulmonary disease**	399 (10.9)	151 (8.3)
Chronic renal disease	38 (1.04)	28 (1.55)
Malignancy	62 (1.7)	23 (1.3)
Anxiety/panic disorder**	507 (13.9)	197 (10.9)

*$P<0.05$, **$P<0.01$, ***$P<0.0001$ (women vs men).

Table 2. Healthcare Resource Utilization

	Pre-Diagnosis			Post-Diagnosis			Pre vs. Post†	
	Women (N=3655)	Men (N=1811)	*P* Value†	Women (N=3655)	Men (N=1811)	*P* Value†	Women (*P* Value)	Men (*P* Value)
Healthcare resource use (per patient)*								
Outpatient								
Office visits	10.32	6.25	<0.0001	14.95	11.12	<0.0001	<0.0001	<0.0001
PSVT				1.35	1.18	<0.0001		
PSVT-related				3.47	2.85	<0.0001		
Outpatient hospital	2.71	1.47	<0.0001	4.95	4.22	0.005	<0.0001	<0.0001
PSVT				0.51	0.48	0.199		
PSVT-related				1.44	1.32	0.034		
Emergency department visits	0.60	0.34	<0.0001	1.09	0.92	0.006	<0.0001	<0.0001
PSVT				0.11	0.09	0.042		
PSVT-related				0.44	0.42	0.564		
% with at least 1 ER Visits	28.89%	21.59%	<0.0001	49.58%	44.51%	<0.0001	<0.0001	<0.0001
% with at least 1 PSVT ER Visits				9.33%	7.45%	0.021		
% with at least 1 PSVT-related ER Visits				30.67%	29.38%	0.327		
Inpatient								
Inpatient admissions	0.13	0.09	0.012	0.38	0.35	0.407	<0.0001	<0.0001
PSVT				0.10	0.13	0.007		
PSVT-related				0.18	0.21	0.069		
% patients with at least 1 IP Admission	8.70%	5.40%	<0.0001	24.71%	19.99%	<0.0001	<0.0001	<0.0001
% patients with at least 1 PSVT IP Admission				9.63%	12.31%	0.002		
% patients with at least 1 PSVT-related IP Admission				14.36%	16.79%	0.019		
Pharmacy (prescription fills)								
Number of fills (any type)	16.18	10.35	<0.0001	20.39	15.92	<0.0001	<0.0001	<0.0001
Number of beta blocker fills	0.46	0.55	0.123	1.73	1.79	0.562	<0.0001	<0.0001
Number of calcium channel blocker fills	0.14	0.20	0.083	0.43	0.69	<0.0001	<0.0001	<0.0001
Number of beta blocker or calcium channel blocker fills	0.61	0.75	0.032	2.16	2.47	0.007	<0.0001	<0.0001
Number of contraceptive fills	2.01		1.89		0.008			
% Patients with beta blocker fills	9.69%	10.77%	0.210	40.60%	36.72%	0.006	<0.0001	<0.0001
% Patients with calcium channel blockers	3.20%	4.42%	0.023	11.82%	14.36%	0.008	<0.0001	<0.0001
% Patients with beta blocker or calcium channel blockers	12.18%	14.08%	0.047	46.07%	44.17%	0.184	<0.0001	<0.0001
% Patients with contraceptive fills	31.68%			30.42%			0.046	
Cardiac ablations								
Any ablations				0.14	0.19	<0.0001		
PSVT ablations				0.12	0.14	0.0675		
Inpatient				0.01	0.03	<0.0001		
Outpatient Hospital				0.13	0.16	0.006		
% patients with at least 1 cardiac ablation				12.60%	15.30%	0.006		

ER indicates emergency room; IP, inpatient admission; and PSVT, paroxysmal supraventricular tachycardia.

*PSVT-related healthcare resource utilization is for related cardiac rhythm disorders which were verified and published by the Population-Based Risk and Epidemiology of Paroxysmal Supraventricular Tachycardias (PREEMPT) study 1. Descriptions of the ICD-9 diagnosis codes used to identify these cardiac arrhythmias are listed in the Supplementary Material. Note that patients had no healthcare services for PSVT in the pre-diagnosis period. Men had no contraceptives.

†*P*-values shown under the heading "Pre-Diagnosis and under the heading "Post-Diagnosis" reflect significance of inter-group differences between women and men in the pre-period and between women and men in the post-period. *P*-values shown under the heading "Pre vs. Post" columns reflect intra-group differences for women in the pre- and post-diagnosis periods, and intra-group differences for men in the pre- and post-diagnosis periods.

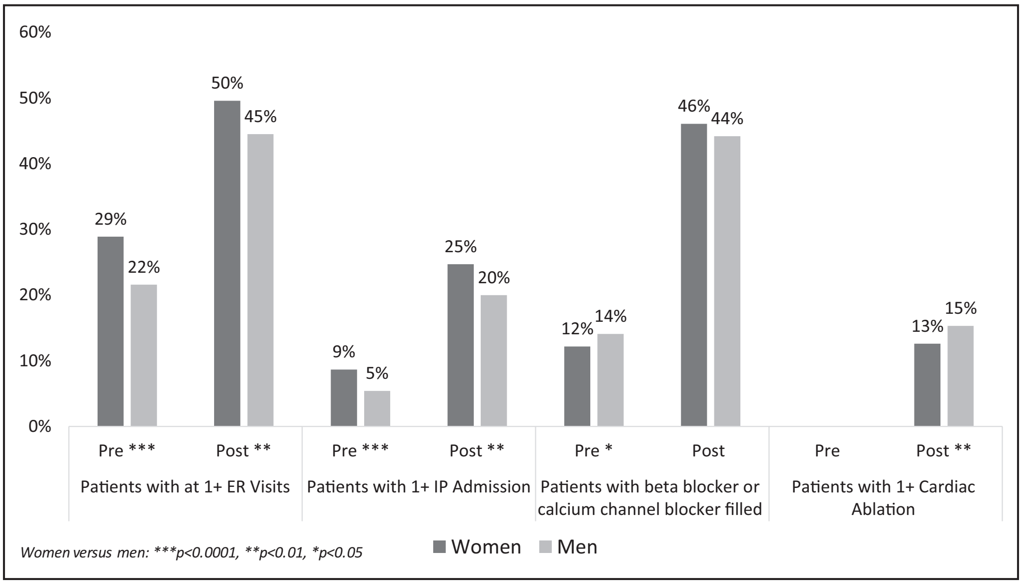

Figure 1. Healthcare resource use before and after diagnosis. ER indicates emergency room; and IP, inpatient admission.

differences, with contraceptive fills (1.91 per patient, on average) responsible for only part of the difference. Although the changes in outpatient and inpatient service use in the year before and year after PSVT diagnosis were greater for men, the use of β blockers and calcium channel blockers was slightly higher for women after diagnosis (46.07% versus 44.17%) (Table 2). The proportion of patients having at least 1 ED visit and at least 1 hospital admission was higher for both groups after diagnosis, with more women than men having at least 1 ED visit (49.6% versus 44.5%; $P<0.01$) and at least 1 inpatient admission (24.7% versus 20.0%; $P<0.01$) (Table 2, Figure 1).

Healthcare encounters with a PSVT or a PSVT-related diagnosis accounted for most of the higher HRU use for both women and men. Mean annual ED visit rates increased 0.49 per patient for women (from 0.60 to 1.09) and 0.58 per patient for men (from 0.34–0.92). Nearly all of these increases were caused by services with a PSVT or a PSVT-related diagnosis (women: 0.44 of the 0.49 increase; men: 0.43 of the 0.58 increase). Higher inpatient admission rates also reflected PSVT or PSVT-related diagnoses for women and men, with rates of hospitalizations with PSVT or PSVT-related diagnoses for men greater than the increase in inpatient admissions (women: 0.28 of the 0.25 increase; 22 men: 0.34 of the 0.26 increase) (Table 2).

Fewer women were treated with cardiac ablation in the year following diagnosis (12.59% versus 15.30%; $P<0.01$), with significantly lower mean per-patient ablation rates in women (0.14 versus 0.19; $P<0.01$). Women also had lower rates of ablation for PSVT (0.12 versus 0.14; $P<0.1$). Most ablations were performed in outpatient settings, with lower outpatient (0.13 versus 0.16; $P<0.01$) and inpatient (0.01 versus 0.03; $P<0.01$) ablation rates in women (Table 2, Figure 1).

Expenditures: Women Versus Men

In the prediagnosis year, mean annual per-patient expenditures were higher for women, compared with men ($9734 versus $7833), reflecting higher expenditures for outpatient office visits ($5321 versus $3185; $P<0.0001$), outpatient hospital visits ($2384 versus $1447; $P<0.0001$), ED visits ($581 versus $279; $P<0.0001$), and prescription drugs ($1542 versus $1136; $P<0.05$). Expenditures for inpatient admissions, however, were lower for women compared with men ($2871 versus $3512) (Table 3).

Mean annual per-patient expenditures increased dramatically for both women and men in the year following diagnosis (Table 3). The increase in expenditures, however, was lower for women ($17 188 versus $25 279; $P<0.01$), and total expenditures were significantly lower for women in the postdiagnosis year ($26 922 versus $33 112; $P<0.05$), despite higher expenditures in the prediagnosis year, reflecting lower expenditures for inpatient admissions ($10 462 versus $16 543; $P<0.01$) and outpatient hospital visits ($8905 versus $9995). Office visit expenditures remained higher for women ($2388 versus $1643; $P<0.0001$), but these relatively higher expenditures were consistent with more frequent, but less expensive, care. Prescription medication expenditures were also higher for women ($2190 versus $1761), but the lower office visit and prescription

Table 3. Expenditures

	Pre-Diagnosis			Post-Diagnosis			Pre vs. Post†	
	Women (N=3655)	Men (N=1811)	*P* Value†	Women (N=3655)	Men (N=1811)	*P*-Value†	Women (*P* value)	Men (*P* value)
Expenditures (Payer reimbursement amounts per patient)*,‡								
Outpatient	$5,321	$3,185	<0.0001	$14,271	$14,808	0.528	<0.0001	<0.0001
PSVT				$4,416	$4,597	0.662		
PSVT-related				$6,887	$7,342	0.354		
Office visits	$1,445	$832	<0.0001	$2,388	$1,643	<0.0001	<0.0001	<0.0001
PSVT				$224	$194	0.005		
PSVT-related				$609	$501	<0.0001		
Outpatient Hospital	$2,384	$1,447	<0.0001	$8,905	$9,995	0.101	<0.0001	<0.0001
PSVT				$3,883	$4,142	0.518		
PSVT-related				$5,416	$5,956	0.243		
Emergency department visits	$581	$279	<0.0001	$1,210	$1,049	0.063	<0.0001	<0.0001
PSVT				$142	$124	0.344		
PSVT-related				$549	$542	0.883		
Other outpatient	$912	$628	0.081	$1,768	$2,120	0.341	<0.0001	<0.0001
PSVT				$167	$137	0.639		
PSVT-related				$313	$343	0.738		
Inpatient								
Inpatient admissions	$2,871	$3,512	0.599	$10,462	$16,543	0.009	<0.0001	<0.0001
PSVT				$4,020	$6,773	0.014		
PSVT-related				$6,499	$12,010	0.004		
Pharmacy (Prescription Fills - any prescription)								
Prescription fills (any prescription)	$1,542	$1,136	0.039	$2,190	$1,761	0.148	<0.0001	0.008
Beta blockers	$11	$9	0.336	$26	$24	0.348	<0.0001	<0.0001
Calcium channel blockers	$3	$6	0.075	$8	$12	0.088	<0.0001	<0.0001
Contraceptives	$113			$113			0.982	
Cardiac ablations§								
All ablations				$4,184	$5,881	0.001		
PSVT ablations				$4,019	$4,906	0.113		
Inpatient				$483	$1,245	0.005		
Outpatient Hospital				$3,644	$4,552	0.034		
Total expenditures	$9,734	$7,833	0.164	$26,922	$33,112	0.027	<0.0001	<0.0001
PSVT or PSVT-related expenditures				$13,420	$19,387	0.003		
PSVT expenditures only				$8,471	$11,405	0.013		
PSVT-related expenditures only				$4,949	$7,982	0.036		
Non-PSVT or PSVT-related expenditures				$13,502	$13,725	0.875		

PSVT indicates paroxysmal supraventricular tachycardia.

*PSVT-related expenditures are for related cardiac rhythm disorders which were verified and published by the Population-Based Risk and Epidemiology of Paroxysmal Supraventricular Tachycardias (PREEMPT) study 1. Descriptions of the ICD-9 diagnosis codes used to identify these cardiac arrhythmias are listed in the online appendix. Note that patients had no costs for PSVT in the pre-diagnosis period. Men had no costs for contraceptives.

†*P*-values shown under the heading "Pre-Diagnosis and under the heading "Post-Diagnosis" reflect significance of inter-group differences between women and men in the pre-period and between women and men in the post-period. *P*-values shown under the heading "Pre vs. Post" columns reflect intra-group differences for women in the pre- and post-diagnosis periods, and intra-group differences for men in the pre- and post-diagnosis periods.

‡Expenditures use net pay (amount paid by insurer).

§Expenditures cardiac ablations are reported separately here, but are included in outpatient hospital and inpatient per patient expenditures.

drug expenditures did not offset the higher expenditures of hospitalizations and outpatient hospital visits (Table 3).

Expenditures associated with PSVT and PSVT-related services accounted for most of the expenditure increases for both women (78% of the increase) and men (77% of the increase), whereas a PSVT diagnosis accounted for 49% of the increase for women and 45% of the increase for men. Expenditures for services with a PSVT diagnosis were lower for women than ($8471 versus $11 405; *P*<0.05). Expenditures for ablations were also lower for women ($4184 versus $5881; *P*<0.01), consistent with lower observed ablation rates (Table 3). Expenditures per ablation were nonsignificantly higher for men ($30 604 versus $29 240). Ablations performed in outpatient, compared with inpatient, settings were less expensive, with mean expenditure per outpatient ablation ranging from $28 031 (women) to $28 450 (men), and mean expenditure for inpatient ablation ranging from $47 690 (women) to $49 031 (men) (Figure 2).

Adjusted Results

In multivariate analyses, female sex was significantly associated with lower odds of receiving an ablation in the postdiagnosis year (odds ratio [OR], 0.83; 95% CI, 0.70–0.98) and higher odds of being treated with prophylactic medication (OR, 1.15; 95% CI, 1.02–1.31). Older age was also associated with significantly lower odds of receiving an ablation, whereas comorbid atrial fibrillation was significantly associated with a higher likelihood of undergoing an ablation (Figure 3). Hypertension and congestive heart failure were associated with lower odds of receiving medication, whereas older age was associated with increased odds of receiving medication (*P*<0.01) (Figure S1).

Expenditures were unevenly distributed, with much higher spending at and above the 90th percentile. Female sex was associated with lower odds of being in the top spending decile for total expenditures (OR, 0.69; 95% CI, 0.56–0.85). Other significant factors in the model were CCI, congenital cardiac defects, and hypertension (*P*<0.01) (Figure S2).

Sensitivity Analyses

We identified 411 of 3655 women (11.2%) who were pregnant in the postdiagnosis year, a rate higher than the rate of child birth for women aged 15 to 44 years in the United States, which was 62 of 1000 (6.2%) in 2016, the last year in our study period (Figure 4; Table S5). Analyses comparing demographics, HRU, and costs in nonpregnant women and men generated results that were consistent with most of the results reported above, with the exception of lower rates of inpatient admissions and higher rates of ablation in nonpregnant women following diagnosis. Inpatient admission rates in the postdiagnosis year were significantly lower for nonpregnant women, compared with men (0.27 versus 0.35; *P*<0.0001), as were the proportions of nonpregnant women with at least 1 inpatient admission (15.3% versus 20.0%; *P*<0.0001). Ablation rates remained significantly lower in nonpregnant women, compared with men (0.16 versus 0.19; *P*<0.05), whereas rates of ablation with a PSVT diagnosis were slightly, but not significantly, lower in women (0.13 versus 014). There were no differences in the proportion of nonpregnant women and

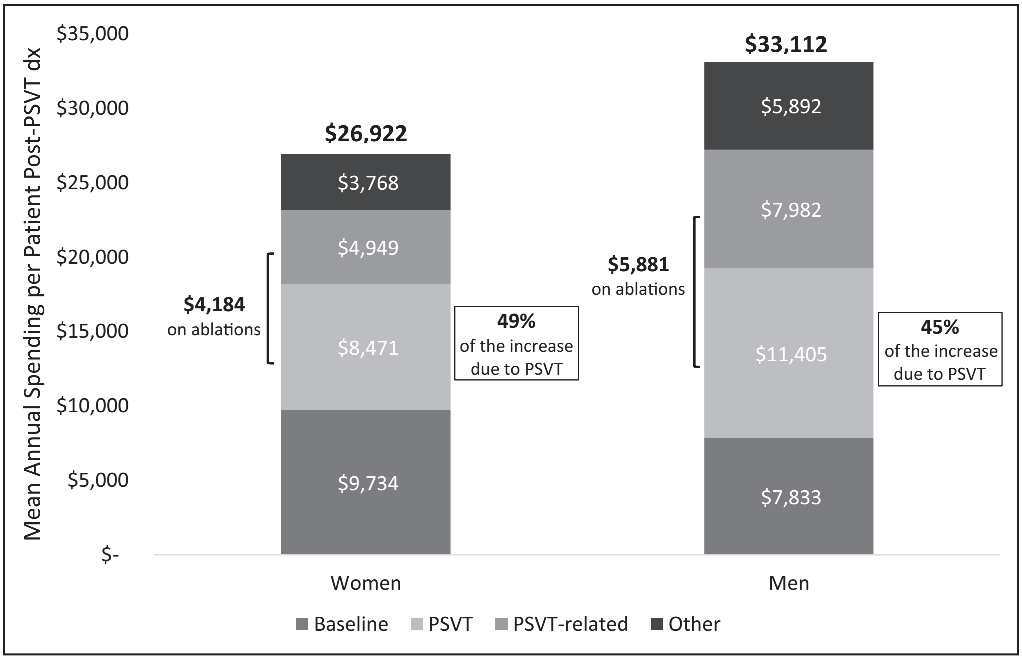

Figure 2. **Postdiagnosis spending increases for paroxysmal supraventricular tachycardia (PSVT), PSVT-related diagnoses (dxs), and ablations.**

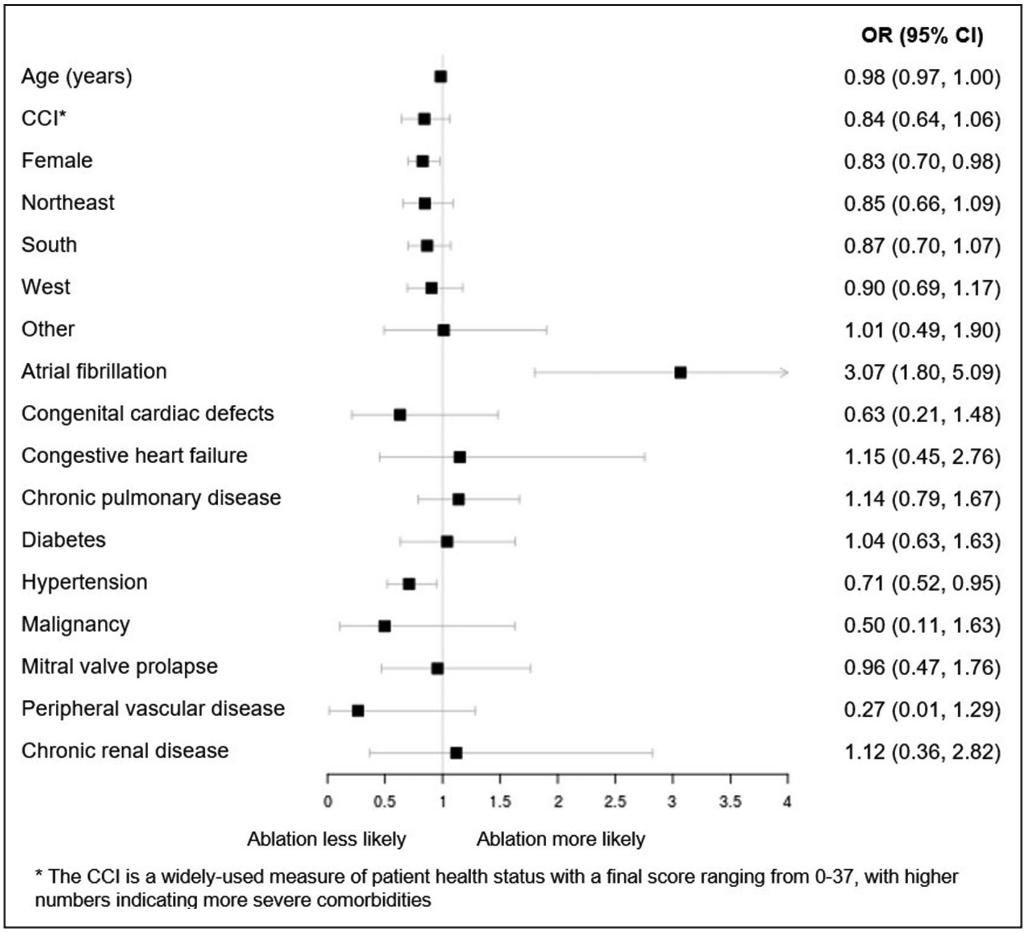

Figure 3. Factors associated with ablation during postindex period.
Patients with the following characteristics were not included because either 0 or 1 patient with these characteristics had an ablation: acute myocardial infarction, atherosclerotic cardiovascular disease, cerebrovascular disease, carotid stenosis, stroke, and transient ischemic attack. CCI indicates Charlson Comorbidity Index; and OR, odds ratio.

men treated with at least 1 ablation (15.09% versus 15.30%), suggesting that men had more repeated ablations. In multivariate analyses in which pregnancy was added as covariate, female sex was not significantly predicted with lower odds of cardiac ablation (Tables S6–S8).

DISCUSSION

The findings showed that healthcare expenditures increased significantly in younger patients after being diagnosed with PSVT. However, female sex was associated with lower expenditures after a PSVT diagnosis relative to male sex, reflecting lower ablation rates and spending for services with a PSVT diagnosis in women. Women were more likely than men to receive medical therapy after the diagnosis of PSVT.

The study quantified differences by sex in the economic and symptomatic burden of PSVT for adults aged 18 to 40 years. For both men and women, there were significantly higher HRU and expenditures in the postdiagnosis year, with much of the spending increase driven by services for PSVT patient care. This study expands knowledge of the economic burden of cardiovascular arrhythmias, quantifying the expenditures associated with PSVT diagnosis and treatment, as well as evaluating differences by sex. Higher rates of HRU and expenditures in the year before diagnosis were observed for women, which is consistent with higher rates of HRU by women in general.[13] In the postdiagnosis period, however, expenditures were higher for men, reflecting higher expenditures for hospitalizations and outpatient hospital visits, as well as higher expenditures for PSVT services.

Differences by sex in PSVT diagnosis and ablation treatment were identified. In the year before diagnosis, more women were treated for panic/anxiety disorder, whereas more men were treated for

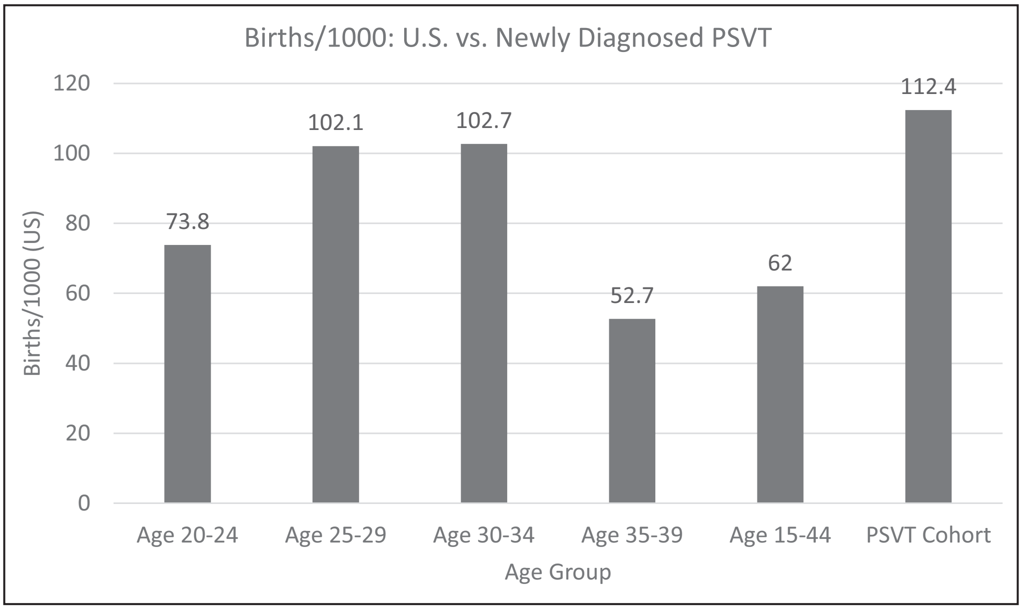

Figure 4. US birth rates and newly diagnosed paroxysmal supraventricular tachycardia (PSVT). Source: National Vital Statistics Reports, Volume 68, No. 13, November 27, 2019. Table 2. Birth rates, by age of mother: United States, 2010 to 2018, and by age and race and Hispanic origin of mother, United States, 2016 to 2018. Accessed April 30, 2020 at https://www.cdc.gov/nchs/data/nvsr/nvsr68/nvsr68_13-508.pdf.

atrial fibrillation. These results are consistent with other findings in the literature noting challenges for women in obtaining a diagnosis for other long-term illness, such as breast cancer or diabetes mellitus.[14] Investigators have reported that women's complaints of PSVT symptoms were often minimized and that women struggled to obtain a correct diagnosis after symptoms initially occurred.[3,6,10] When seen in the ED, for example, women were more often misdiagnosed as having high or low blood pressure or angina instead of PSVT. In addition, women with PSVT have been noted to receive misdiagnoses of anxiety or panic disorder.[3,6,9,10,15-17] The reasons for these misdiagnoses included providers' tendency to attribute symptoms, such as palpitations, dizziness, and shortness of breath, in women to anxiety, panic disorders, and psychological problems, such as depression, instead of PSVT.[3,6,10] When describing their experiences with obtaining a PSVT diagnosis, women have said that they were not believed or did not have their symptoms taken seriously.[3,6,10] In their study, Carnlof and colleagues found that, although 51% of male patients with PSVT reported their diagnosis was obtained at the first office visit with their providers, only 38% of female patients reported the same, whereas there were no associations between the specialists' sex and accuracy of diagnosis.[10] These findings seem at least in part attributable to provider difficulties in interpreting PSVT symptoms in women. Although not typically fatal, PSVT can negatively affect quality of life by limiting activities of daily living and causing fear and uncertainty around when the next PSVT episode will occur.[6] Some of these patients are unable to continue employment, which can potentially cause a decrease in patient productivity.[1,18,19] This lost productivity may constitute a societal burden, leading to indirect cost increases.

In sensitivity analyses, we found that childbirth rates among women newly diagnosed with PSVT in our study were considerably higher than national rates. This finding is supported by other reports in the literature, which demonstrated a higher incidence of PSVT and more pronounced PSVT symptoms during pregnancy.[20-22] Lee and colleagues, for example, reported a higher rate of ED visits or hospital admissions for symptomatic PSVT in the third trimester of pregnancy, especially in women with a history of PSVT before pregnancy.[23] Furthermore, PSVT episodes during pregnancy have been associated with adrenergic sensitivity by estrogens, increased plasma volume, stress, and anxiety that occur during pregnancy.[24] More prospective studies are needed to determine if there is a higher prevalence of a specific mechanism of PSVT during pregnancy and which symptoms are more often reported.

In our sensitivity analyses, we also found that rates of ablation among nonpregnant women were lower, compared with men, but we found no significant differences in rates of ablations with a PSVT diagnosis. Evaluating long-term management of PSVT in these women who were pregnant in the year following diagnosis would help determine whether ablation is delayed, or whether PSVT symptoms abate following pregnancy.

Limitations

The limitations of this study include a reliance on claims data to identify those patients newly diagnosed with PSVT who had commercial insurance coverage. Thus, the analysis lacked access to the medical records with physiological measures and/or medical test results. However, study patients had no recorded diagnoses of PSVT or other related cardiac rhythm disorders in the year before diagnosis, and nearly half of the increase in postdiagnosis expenditures was for services with a PSVT diagnosis. It is possible that the observed HRU and expenditure increases were associated with a greater illness burden. However, cardiovascular and other disease rates were low in this younger, healthy population, and it is unlikely that the small proportions of patients with cardiovascular disease and other chronic disease were responsible for the observed increases. Finally, the study time frame was limited, and it is unclear whether the high levels of HRU and expenditures in the year following index diagnosis would continue in subsequent years.

CONCLUSIONS

Among patients aged 18 to 40 years, ≈2 of 3 patients diagnosed with PSVT were women, and PSVT imposes a significant economic and health burden on patients with PSVT. Despite the fact that ED visits and hospital admissions were more common in women than men after a PSVT diagnosis, spending after a PSVT diagnosis was significantly lower for women, reflecting lower ablation rates and spending for services in women with a PSVT diagnosis. As first reported over 2 decades ago, women with PSVT continue to be misdiagnosed, experience symptomatic PSVT for a longer duration of time, and are referred for potentially curative ablation significantly later than men. This suggests a need for clinician education to address differences by sex in diagnosis and treatment of patients with PSVT.

ARTICLE INFORMATION

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Supplementary Materials

Tables S1–S8
Figures S1–S2

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SUPPLEMENTAL MATERIAL

Table S1. Clinical Diagnoses Codes used to Identify PSVT and other cardiac rhythm disorders.

ICD-9 Code	Description
PSVT	
427.0*	Paroxysmal supraventricular tachycardia
PSVT-related	
426.7	Anomalous atrioventricular excitation
427.2	Paroxysmal tachycardia, unspecified
427.61	Supraventricular premature beats
427.89	Other specified cardiac dysrhythmias
427.9	Cardiac dysrhythmia, unspecified
785.0	Tachycardia, unspecified
785.1	Palpitations

*PSVT diagnosis; other codes are classified as other cardiac rhythm disorders

Table S2. Clinical codes used to identify comorbidities.

Disease Area	ICD-9 Codes
Mitral Valve Disorders	424.0
Atrial Fibrillation	427.31
Congenital Cardiac Defects	745.10, 745.11, 745.12, 745.19, 745.2, 745.3, 745.4, 745.5, 745.60, 745.61, 745.69, 745.7, 745.8
Hypertension	745.9, 401.0, 401.1, 401.9, 402.00, 402.01, 402.10, 402.11, 402.90, 402.91, 403.00, 403.01, 403.10, 403.11, 403.90, 403.91, 404.00, 404.01, 404.02, 404.03, 404.10, 404.11, 404.12, 404.13, 404.90, 404.91, 404.92, 404.93, 405.01, 405.09, 405.11, 405.19, 405.91, 405.99
Stroke	430, 431, 432.0, 432.1, 432.9, 433.01, 433.11, 433.21, 433.31, 433.81, 433.91, 434.01, 434.11 434.91
Transient Ischemic Attack	435.0, 435.1, 435.2, 435.3, 435.8, 435.9
Stenosis	433.10
Anxiety/Panic Disorder	300.00, 300.01, 300.02, 300.09

Comorbidities were identified using the Charlson Comorbidity Index [Quan et al., 2011]: Liver disease (Mild and Moderate/Severe liver disease were combined), cardiovascular disease, peripheral vascular disease (diagnosis and surgical procedure were combined), renal disease, congestive heart failure, chronic obstructive pulmonary disease, diabetes (diabetes and diabetes with complications were combined) and malignancy (any malignancy and metastatic solid tumor in one) [Quan et al., 2011]. Additional comorbidities of interest were identified using ICD-9 diagnosis codes listed in the table.

Table S3. Clinical Codes Used to Identify Cardiac Ablations.

Code Type	Code	Description
CPT/HCPCS	33250	Operative ablation of supraventricular arrhythmogenic focus or pathway (eg, Wolff-Parkinson-White, atrioventricular node re-entry), tract(s) and/or focus (foci); without cardiopulmonary bypass.
CPT/HCPCS	33251	Operative ablation of supraventricular arrhythmogenic focus or pathway (eg, Wolff-Parkinson-White, atrioventricular node re-entry), tract(s) and/or focus (foci); with cardiopulmonary bypass.
CPT/HCPCS	93650	Intracardiac catheter ablation of atrioventricular node function, atrioventricular conduction for creation of complete heart block, with or without temporary pacemaker placement. *, †
CPT/HCPCS	93653	Comprehensive electrophysiologic evaluation including insertion and repositioning of multiple electrode catheters with induction or attempted induction of an arrhythmia with right atrial pacing and recording, right ventricular pacing and recording (when necessary), and His bundle recording (when necessary) with intracardiac catheter ablation of arrhythmogenic focus; with treatment of supraventricular tachycardia by ablation of fast or slow atrioventricular pathway, accessory atrioventricular connection, cavo-tricuspid isthmus or other single atrial focus or source of atrial re-entry. *
CPT/HCPCS	93654	Comprehensive electrophysiologic evaluation including insertion and repositioning of multiple electrode catheters with induction or attempted induction of an arrhythmia with right atrial pacing and recording, right ventricular pacing and recording (when necessary), and His bundle recording (when necessary) with intracardiac catheter ablation of arrhythmogenic focus; with treatment of ventricular tachycardia or focus of ventricular ectopy including intracardiac electrophysiologic 3D mapping, when performed, and left ventricular pacing and recording, when performed. *,†
CPT/HCPCS	93655	Intracardiac catheter ablation of a discrete mechanism of arrhythmia which is distinct from the primary ablated mechanism, including repeat diagnostic maneuvers, to treat a spontaneous or induced arrhythmia (List separately in addition to code for primary procedure). *
CPT/HCPCS	93656	Comprehensive electrophysiologic evaluation including transseptal catheterizations, insertion and repositioning of multiple electrode catheters with induction or attempted induction of an arrhythmia including left or right atrial pacing/recording when necessary, right ventricular pacing/recording when necessary, and His bundle recording when necessary with intracardiac catheter ablation of atrial fibrillation by pulmonary vein isolation. *
CPT/HCPCS	C1732	Catheter, electrophysiology, diagnostic/ablation, 3d or vector mapping. *
CPT/HCPCS	C1866	Catheter, ablation
ICD9 Procedure	3734	Excision or destruction of other lesion or tissue of heart, endovascular approach *
ICD10 Procedure	02583ZZ	Destruction of Conduction Mechanism, Percutaneous Approach *

*Procedure codes listed may not be used exclusively for PSVT ablations, but were included in the analysis because PSVT ablations may be accompanied by an evaluation and/or an ablation for another cardiac rhythm disorder. A review of catheter ablation procedure codes found for study patients indicated that nearly all codes were used for PSVT. The codes that successfully identified ablations are marked by an asterisk.

† These codes represent a total of 3% of all ablation procedure codes in our analysis

Table S4. Clinical Codes Used to Identify Pregnancy.

Common Procedure Code	Description
59400	Vaginal delivery, antepartum, postpartum care
59401	Vaginal delivery, antepartum, postpartum care
59402	Vaginal delivery, antepartum, postpartum care
59403	Vaginal delivery, antepartum, postpartum care
59404	Vaginal delivery, antepartum, postpartum care
59405	Vaginal delivery, antepartum, postpartum care
59406	Vaginal delivery, antepartum, postpartum care
59407	Vaginal delivery, antepartum, postpartum care
59408	Vaginal delivery, antepartum, postpartum care
59409	Vaginal delivery, antepartum, postpartum care
59410	Vaginal delivery, antepartum, postpartum care
59510	Cesarean delivery
59511	Cesarean delivery
59512	Cesarean delivery
59513	Cesarean delivery
59514	Cesarean delivery
59515	Cesarean delivery
59610	Routine obstetric care including…vaginal delivery
59612	Vaginal delivery only, after previous cesarean delivery
59614	Vaginal delivery only…including postpartum care
59618	Routine obstetrical care including cesarean delivery
59620	Cesarean delivery only
59622	Cesarean delivery, including postpartum care

Table S5. Number of Women with Labor and Delivery Codes Pre- and Post-PSVT Diagnosis.

# of Women with New PSVT Diagnosis	# of newly diagnosed women with labor and delivery within 1-year post-dx (i.e., pregnant)	# of newly diagnosed women with no labor & delivery within 1-year post-dx (i.e., not pregnant)	# of women with labor and delivery within 1 year before dx (i.e., pregnant)	# of women with no labor and delivery within 1 year before dx (i.e., not pregnant)	# of women with labor and delivery within 1 year before AND 1 year after dx (i.e., 2 pregnancies)
3,655	411 (11%)	3,244	119 (3%)	3,536	11

Table S6. Patient Characteristics: Non-Pregnant Women Versus Men.

Clinical and Demographic Characteristics	**Non-Pregnant Women** (N=3,244)	**Men** (N=1,811)
Age (years)		
Mean/SD ***	30.39 (7.11)	29.4 (7.28)
Median	32	30
Charlson Comorbidity Index (pre) Mean (SD)	0.28 (0.77)	0.29 (0.85)
Specific Comorbidities in Pre-Period		
Diabetes	137 (4.22%)	75 (4.14%)
Congestive heart failure (CHF) **	< 11	47 (2.6%)
Peripheral vascular disease	19 (0.59%)	15 (0.8%)
Acute myocardial infarction (AMI)	< 11	< 11
Mitral valve prolapse	< 11	37 (2.0%)
Atrial Fibrillation (AFib) ***	< 11	53 (2.9%)
Congenital cardiac defects	< 11	16 (0.9%)
Hypertension***	334 (10.3%)	277 (15.3%)
Cerebrovascular disease (CBD)*	21 (0.65%)	24 (1.3%)
Chronic pulmonary disease (CPD)**	365 (11.25%)	151 (8.3%)
Chronic renal disease	< 11	28 (1.55%)
Malignancy	< 11	23 (1.3%)
Anxiety/Panic Disorder**	473 (14.58%)	197 (10.9%)

*Women versus men: ***p<0.0001, **p<0.01, *p<0.05*

Table S7. Healthcare Resource Utilization: Non-pregnant women versus men.

	Pre-Diagnosis			Post-Diagnosis			Pre vs. Post**	
	Non-Pregnant Women (N=3,244)	Men (N=1,811)	p-value**	Non-Pregnant Women (N=3,244)	Men (N=1,811	p-value**	Non-Pregnant Women (p-value)	Men (p-value)
<u>Healthcare Resource Use (per patient)*</u>								
Outpatient								
Office Visits	10.17	6.25	*<0.0001*	14.91	11.12	*<0.0001*	*<0.0001*	*<0.0001*
PSVT	*N/A*			1.15	1.18	*<0.0001*		
PSVT-related	*N/A*			2.88	2.85	*<0.0001*		
Outpatient Hospital	2.71	1.47	*<0.0001*	4.88	4.22	*0.033*	*<0.0001*	*<0.0001*
PSVT	*N/A*			0.52	0.48	*0.136*		
PSVT-related	*N/A*			1.47	1.32	*0.016*		
Emergency Department Visits	0.58	0.34	*<0.0001*	1.10	0.92	*0.006*	*<0.0001*	*<0.0001*
PSVT	*N/A*			0.10	0.09	*0.061*		
PSVT-related	*N/A*			0.44	0.42	*0.388*		
% with at least 1 ER Visits	28.88%	21.59%	*<0.0001*	49.29%	44.51%	*0.001*	*<0.0001*	*<0.0001*
% with at least 1 **PSVT** ER Visits	*N/A*			9.25%	7.45%	*0.029*		
% with at least 1 **PSVT-related** ER Visits	*N/A*			30.98%	29.38%	*0.235*		
Inpatient								
Inpatient Admissions	0.13	0.09	*0.012*	0.27	0.35	*0.004*	*<0.0001*	*<0.0001*
PSVT	*N/A*			0.08	0.13	*<0.0001*		
PSVT-related	*N/A*			0.15	0.21	*<0.0001*		
% patients with at least 1 IP Admission	8.72%	5.40%	*<0.0001*	15.32%	19.99%	*<0.0001*	*<0.0001*	*<0.0001*
% patients with at least 1 **PSVT** IP Admission	*N/A*			9.63%	12.31%	*<0.0001*		
% patients with at least 1 **PSVT-related** IP Admission	*N/A*			11.68%	16.79%	*<0.0001*		

Cardiac Ablations	*N/A*			0.16	0.19	*0.016*		
PSVT (ANY)				0.13	0.14	*0.352*		
Inpatient	*N/A*			0.01	0.03	*0.001*		
Outpatient Hospital	*N/A*			0.15	0.16	*0.206*		
% patients with at least 1 cardiac ablation	*N/A*			15.07%	15.30%	*0.12*		
Pharmacy (Prescription Fills - any type)	16.76	10.35	*<0.0001*	21.36	15.92	*<0.0001*	*<0.0001*	*<0.0001*
Number of Beta blocker fills	0.49	0.55	*0.323*	1.84	1.79	*0.59*	*<0.0001*	*<0.0001*
Number of Calcium Channel blocker fills	0.15	0.2	*0.14*	0.46	0.69	*<0.0001*	*<0.0001*	*<0.0001*
Number of Beta blocker or Calcium Channel blockers	0.64	0.75	*0.122*	2.30	2.47	*0.147*	*<0.0001*	*<0.0001*
% patients with Beta blocker fills	5.93%	10.77%	*0.552*	42.0%	36.72%	*<0.0001*	*<0.0001*	*<0.0001*
% patients with Calcium Channel blockers	2.66%	4.42%	*0.023*	12.3%	14.36%	*0.04*	*<0.0001*	*<0.0001*
% patients with Beta blocker or Calcium Channel blockers	12.18%	14.08%	*0.146*	47.6%	44.17%	*0.018*	*<0.0001*	*<0.0001*
Contraceptives	1.91	*N/A*		2.04	*N/A*		0.0230	*N/A*
% patients with contraceptive fills	30.23%	*N/A*		31.9%	*N/A*		0.1231	*N/A*

*PSVT-related healthcare resource utilization is for related cardiac rhythm disorders which were verified and published by the Population-Based Risk and Epidemiology of Paroxysmal Supraventricular Tachycardias (PREEMPT) study (1).. Descriptions of the ICD-9 diagnosis codes used to identify these cardiac arrhythmias are listed in the online appendix

**P-values shown under the heading "Pre-Diagnosis and under the heading "Post-Diagnosis" reflect significance of inter-group differences between women and men in the pre-period and between women and men in the post-period. P-values shown under the heading "Pre vs. Post" columns reflect intra-group differences for women in the pre- and post-diagnosis periods, and intra-group differences for men in the pre- and post-diagnosis periods

Abbreviations: Paroxysmal Supraventricular Tachycardia (PSVT)

Table S8. Expenditures: Non-pregnant women versus men.

	Pre-Diagnosis			Post-Diagnosis			Pre vs. Post**	
	Non-Pregnant Women (N=3,244)	**Men** (N=1,811)	**p-value****	**Non-Pregnant Women** (N=3,244)	**Men** (N=1,811)	**p-value****	**Non-Pregnant Women** (p-value)	**Men** (p-value)
Expenditures (Payer Reimbursement Amounts per Patient)* †								
Outpatient	$ 5,457	$3,185	*<0.0001*	$ 15,070	$14,808	*0.897*	*<0.0001*	*<0.0001*
PSVT	*N/A*			$ 4,790	$4,597	*0.876*		
PSVT-related	*N/A*			$ 7,426	$7,342	*0.811*		
Office Visits	$ 1,427	$832	*<0.0001*	$ 2,402	$1,643	*<0.0001*	*<0.0001*	*<0.0001*
PSVT	*N/A*			$ 232	$194	*0.004*		
PSVT-related	*N/A*			$ 631	$501	*<0.0001*		
Outpatient Hospital	$ 2,657	$1,447	*<0.0001*	$ 9,824	$9,995	*0.371*	*<0.0001*	*<0.0001*
PSVT	*N/A*			$ 4,285	$4,142	*0.987*		
PSVT-related	*N/A*			$ 5,956	$5,956	*0.619*		
Emergency Department Visits	$ 578	$279	*<0.0001*	$ 1,250	$1,049	*0.058*	*<0.0001*	*<0.0001*
PSVT	*N/A*			$ 139	$124	*0.551*		
PSVT-related	*N/A*			$ 570	$542	*0.773*		
Other Outpatient	$ 795	$628	*0.088*	$ 1,594	$2,120	*0.331*	*<0.0001*	*<0.0001*
PSVT	*N/A*			$ 134	$137	*0.649*		
PSVT-related	*N/A*			$ 270	$343	*0.894*		
Inpatient								
Inpatient Admissions	$ 2,480	$3,512	0.662	$ 9,684	$16,543	*0.003*	*<0.0001*	*<0.0001*
PSVT	*N/A*			$ 4,128	$6,773	*0.018*		
PSVT-related	*N/A*			$ 6,470	$12,010	*0.004*		
Cardiac Ablations ‡	*N/A*			$ 5,251	$5,881	*0.014*		

PSVT (any)				$ 4,327		*0.317*		
Inpatient	*N/A*			$ 902	$1,245	*0.036*		
Outpatient Hospital	*N/A*			$ 4,350	$4,552	*0.156*		
Pharmacy (Prescription Fills - any prescription)	$ 1,656	$1,136	*0.023*	$ 2,430	$1,761	*0.052*	*<0.0001*	*<0.001*
Beta blockers or Calcium Channel blockers				$ 38	$35	*0.612*		
Beta blockers	$ 13	$9	*0.174*	$ 30	$24	*0.101*	*<0.0001*	*<0.0001*
Calcium Channel blockers	$ 3	$6	*0.094*	$ 9	$12	*0.155*	*<0.0001*	*<0.0001*
Contraceptives	$ 122	*N/A*		$ 121	*N/A*		*0.6569*	
Total Expenditures	$9,734	$7,833	0.137	$ 27,184	$33,112	*0.021*	*<0.0001*	*<0.0001*
PSVT-related expenditures	*N/A*			$ 13,935	$19,387	*0.004*		
PSVT expenditures	*N/A*			$ 8,957	$11,405	*0.029*		
PSVT-related expenditures	*N/A*			$ 4,978	$7,982	*0.031*		
Non-PSVT or PSVT-related expenditures	*N/A*			$ 13,249	$13,725	*0.59*		

*PSVT-related expenditures are for related cardiac rhythm disorders which were verified and published by the Population-Based Risk and Epidemiology of Paroxysmal Supraventricular Tachycardias (PREEMPT) study (1).. Descriptions of the ICD-9 diagnosis codes used to identify these cardiac arrhythmias are listed in the online appendix

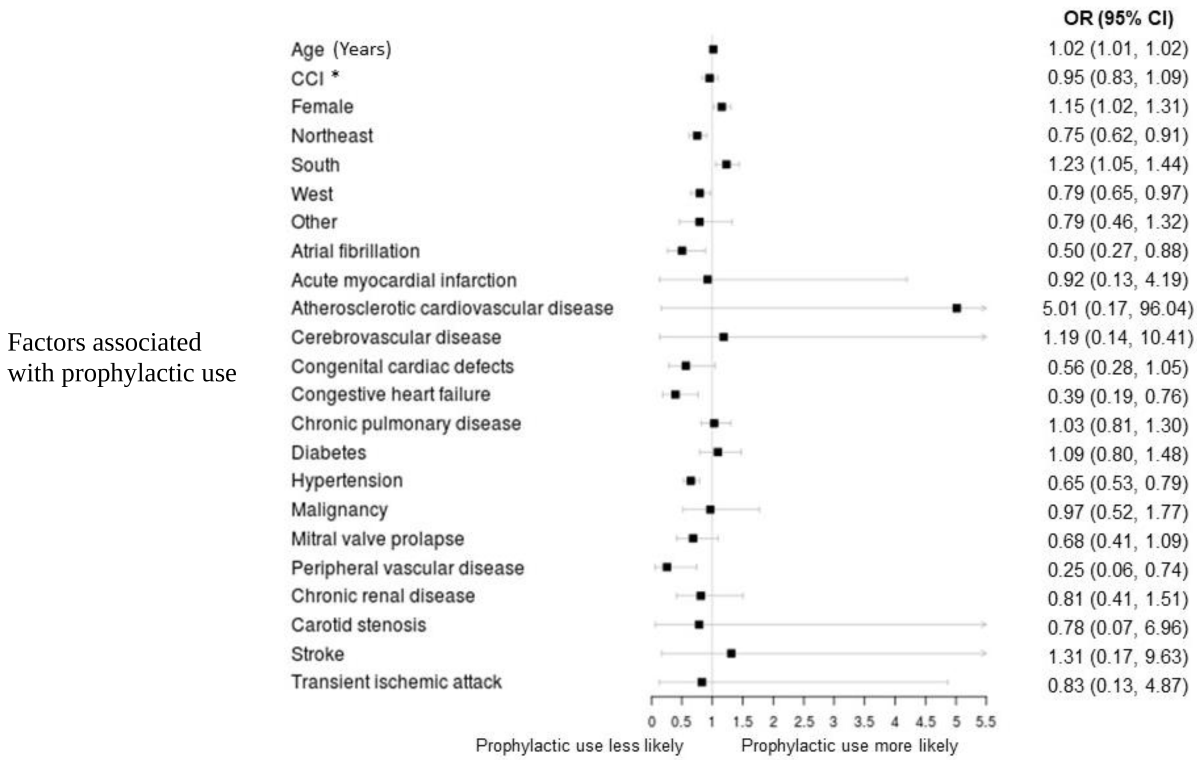
**P-values shown under the heading “Pre-Diagnosis and under the heading “Post-Diagnosis” reflect significance of inter-group differences between women and men in the pre-period and between women and men in the post-period. P-values shown under the heading “Pre vs. Post” columns reflect intra-group differences for women in the pre- and post-diagnosis periods, and intra-group differences for men in the pre- and post-diagnosis periods

† Expenditures use net pay (amount paid by insurer); amounts are adjusted to 2018 dollars using the medical care component of the Consumer Price Index

‡ Expenditures of cardiac ablations are reported separately here, but are included in outpatient hospital and inpatient per patient expenditures

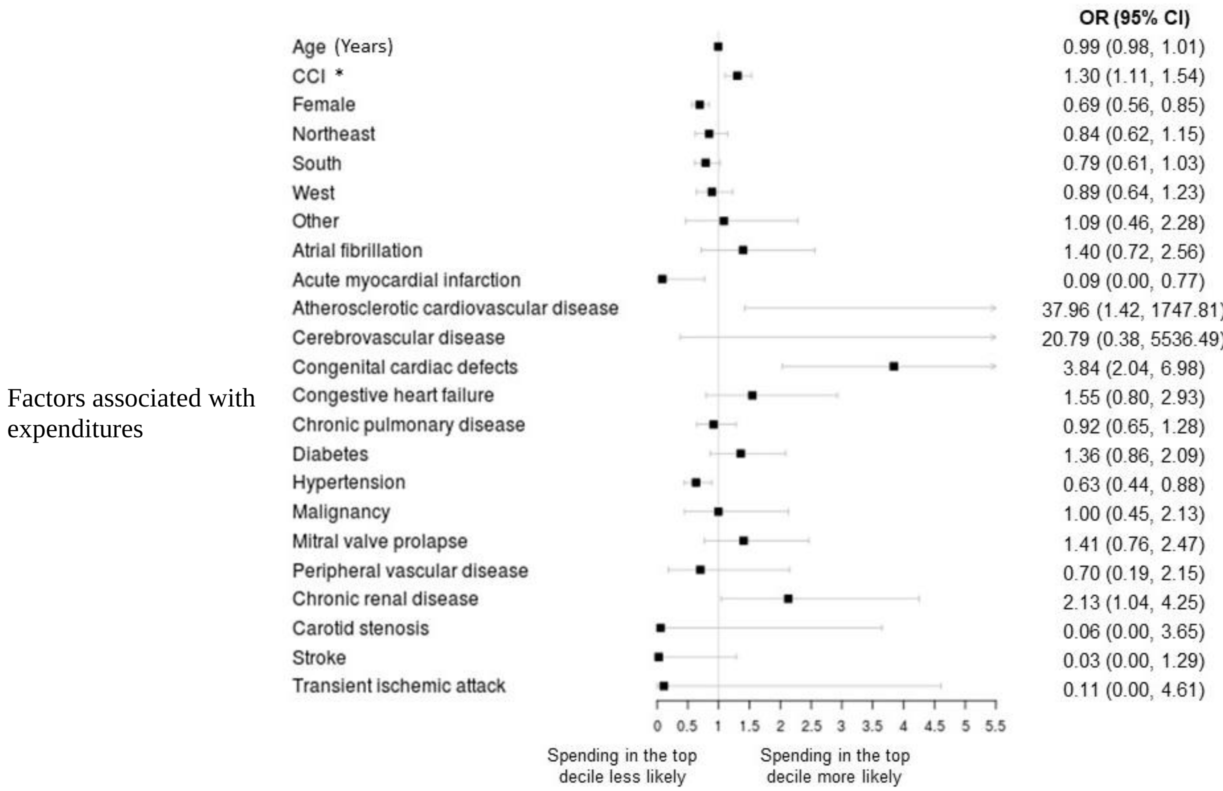
Abbreviations: Paroxysmal Supraventricular Tachycardia (PSVT)

Figure S1. **Factors associated with prophylactic use during post-index period.**



* The CCI is a widely-used measure of patient health status with a final score ranging from 0-37, with higher numbers indicating more severe comorbidities

Figure S2. Factors associated with expenditures in the top decile during post-diagnosis period.



* The CCI is a widely-used measure of patient health status with a final score ranging from 0-37, with higher numbers indicating more severe comorbidities