

Supplemental Material

Table S1. Diagnosis and Procedure Codes Used in Determining Eligibility

Diagnosis/Procedure Description	ICD-9 Diagnosis Codes	ICD-10 Diagnosis Codes	CPT code	ICD-9 Procedure Codes	ICD-10 Procedure Codes
Atrial fibrillation	427.31	I48.0, I48.1x, I48.2x, I48.91	-	-	-
Atrial flutter	427.32	I48.3, I48.4, I48.92	-	-	-
Native mitral stenosis	394.0, 394.2, 396.0, 396.1	I05.0, I05.2, I05.8, I05.9, I08.0, I08.1, I08.3, I34.2, Q23.2	92987	-	-
Mechanical valve replacement	996.02, V43.3	T82.0x	33405	35.22, 35.24, 35.26, 35.28	O2RG0JZ, O2RG3JZ, O2RG4JZ, O2RF0JZ, O2RF4JZ, O2RH0JZ, O2RH4JZ, O2RJ0JZ, O2RJ4JZ
Bioprosthetic valve replacement	996.71, V42.2	T82.22x, T82.6x, Z95.2x, Z95.3x	33430, 33406, 33410, 33411, 33412, 33413, 33465, 33475	35.21, 35.23, 35.25, 35.27	O2RG07Z, O2RG08Z, O2RG0KZ, O2RF07Z, O2RF08Z, O2RF0KZ, O2RH07Z, O2RH08Z, O2RH0KZ, O2RJ07Z, O2RJ08Z, O2RJ0KZ

Table S2. Categories of Surgeries Included in the Study

Multi-level CCS Category	CCS Description
1	Operations on the nervous system
2	Operations on the endocrine system
3	Operations on the eye
4	Operations on the ear
5	Operations on the nose; mouth; and pharynx
6	Operations on the respiratory system
7	Operations on the cardiovascular system
9	Operations on the digestive system
10	Operations on the urinary system
11	Operations on the male genital organs
12	Operations on the female genital organs
14	Operations on the musculoskeletal system
15	Operations on the integumentary system

Procedure codes, including International Classification of Diseases, Ninth Revision (ICD-9), International Classification of Diseases, Tenth Revision (ICD-10), Healthcare Common Procedure Coding System (HCPC), and Current Procedural Terminology (CPT), were linked to Clinical Classification Software (CCS) procedure categories that were used to define and categorize surgery.

Table S3. Oral Anticoagulant Initiation by Surgical Category in POAF

Surgical Category	N(%)¹	OAC Initiation, N(%)²	OAC Initiation among men with CHA2DS2-VASc≥2 or women with CHA2DS2-VASc≥3
Overall	118366 (100.0%)	42803 (36.2%)	39131 (37.1%)
Operation on the Cardiovascular System	40586 (34.3%)	15832 (39.0%)	14451 (39.2%)
Operation on the Digestive System	13663 (11.5%)	3772 (27.6%)	3370 (29.2%)
Operation on the Ear	2882 (2.4%)	1157 (40.2%)	1068 (41.2%)
Operation on the Endocrine System	2983 (2.5%)	991 (33.2%)	916 (33.4%)
Operation on the Eye	9016 (7.6%)	3539 (39.3%)	3383 (39.8%)
Operation on the Genital Organs	2064 (1.7%)	590 (28.6%)	517 (33.0%)
Operation on the Integumentary System	9131 (7.7%)	2943 (32.2%)	2689 (33.8%)
Operation on the Musculoskeletal System	27933 (23.6%)	10020 (35.9%)	9015 (36.8%)
Operation on the Nervous System	9068 (7.7%)	2792 (30.8%)	2485 (32.7%)
Operation on the Nose, Mouth and Pharynx	11808(10.0%)	4620 (39.1%)	4369 (39.7%)
Operation on the Respiratory System	2058 (1.7%)	521 (25.3%)	446 (26.3%)
Operation on the Urinary System	4232 (3.6%)	1231 (29.1%)	1123 (30.2%)

1. % is calculated as the % of patients undergoing a particular type of surgery among the post-op AF cohort.
2. % is calculated as the % of patients who initiated OAC within 90 days among patients who underwent a particular type of surgery

Table S4. Factors Associated with OAC Initiation and Adherence in POAF

	Initiation		Adherence		Discontinuation	
	OR (95% CI)	p-value	OR (95% CI)	p-value	sHR (95% CI)	p-value
Age						
18-64 years	ref	ref	ref	ref	ref	ref
65-74 years	1.12 (1.08, 1.17)	<0.0001	1.09 (1.00, 1.17)	0.0399	0.87 (0.84, 0.90)	<0.0001
75+ years	1.21 (1.16, 1.26)	<0.0001	1.31 (1.21, 1.42)	<0.0001	0.82 (0.79, 0.85)	<0.0001
Female	1.00 (0.97, 1.03)	0.9664	1.20 (1.14, 1.26)	<0.0001	0.89 (0.87, 0.91)	<0.0001
Race						
White	ref	ref	ref	ref	ref	ref
Asian	0.72 (0.66, 0.79)	<0.0001	0.88 (0.74, 1.06)	0.1717	1.12 (1.02, 1.23)	0.0131
Black	0.86 (0.82, 0.90)	<0.0001	0.87 (0.81, 0.94)	0.0004	1.10 (1.06, 1.15)	<0.0001
Hispanic/Latino	0.80 (0.76, 0.84)	<0.0001	0.81 (0.75, 0.89)	<0.0001	1.14 (1.09, 1.19)	<0.0001
Other/Unknown	0.87 (0.80, 0.94)	0.0005	0.96 (0.83, 1.12)	0.6263	1.03 (0.96, 1.11)	0.3780
Year of AF Diagnosis						
2012	ref	ref	ref	ref	ref	ref
2013	0.99 (0.92, 1.06)	0.7521	1.01 (0.88, 1.17)	0.8481	0.96 (0.90, 1.03)	0.2190
2014	1.05 (0.98, 1.14)	0.1752	1.16 (1.01, 1.34)	0.0334	0.88 (0.82, 0.94)	0.0001
2015	1.06 (0.99, 1.15)	0.0956	1.23 (1.07, 1.40)	0.0030	0.79 (0.74, 0.84)	<0.0001
2016	1.18 (1.10, 1.26)	<0.0001	1.30 (1.15, 1.49)	0.0001	0.73 (0.69, 0.78)	<0.0001
2017	1.21 (1.13, 1.29)	<0.0001	1.64 (1.46, 1.86)	<0.0001	0.69 (0.65, 0.73)	<0.0001
2018	1.54 (1.44, 1.64)	<0.0001	1.61 (1.43, 1.81)	<0.0001	0.69 (0.65, 0.73)	<0.0001
2019	1.61 (1.51, 1.72)	<0.0001	1.72 (1.53, 1.94)	<0.0001	0.68 (0.65, 0.73)	<0.0001
2020	1.93 (1.80, 2.06)	<0.0001	1.86 (1.65, 2.10)	<0.0001	0.68 (0.64, 0.72)	<0.0001
2021	2.01 (1.88, 2.14)	<0.0001	1.79 (1.58, 2.02)	<0.0001	0.71 (0.67, 0.75)	<0.0001
Medical History						
Heart Failure	1.08 (1.05, 1.11)	<0.0001	0.98 (0.93, 1.04)	0.5987	1.03 (1.00, 1.07)	0.0265
Hypertension	1.09 (1.03, 1.15)	0.0030	1.13 (1.02, 1.24)	0.0141	0.89 (0.85, 0.93)	<0.0001
Diabetes mellitus	1.04 (1.01, 1.06)	0.0136	1.01 (0.97, 1.07)	0.5573	0.99 (0.96, 1.01)	0.3905
Thromboembolism	1.11 (1.07, 1.15)	<0.0001	1.13 (1.06, 1.20)	0.0001	0.92 (0.89, 0.95)	<0.0001
Other supraventricular arrhythmia	0.81 (0.77, 0.86)	<0.0001	1.06 (0.96, 1.17)	0.2847	1.01 (0.96, 1.06)	0.8146

	Initiation		Adherence		Discontinuation	
	OR (95% CI)	p-value	OR (95% CI)	p-value	sHR (95% CI)	p-value
Ventricular arrhythmia	0.86 (0.81, 0.90)	<0.0001	1.01 (0.91, 1.11)	0.8723	0.96 (0.91, 1.01)	0.1132
CAD	0.78 (0.76, 0.80)	<0.0001	0.81 (0.76, 0.85)	<0.0001	1.12 (1.09, 1.15)	<0.0001
PAD	1.00 (0.97, 1.04)	0.8705	0.98 (0.92, 1.04)	0.5157	1.06 (1.03, 1.10)	0.0004
Major bleeding	0.98 (0.93, 1.04)	0.5255	1.05 (0.95, 1.16)	0.3091	1.01 (0.96, 1.06)	0.7868
Stage 3-5 CKD	1.03 (1.00, 1.07)	0.0735	1.02 (0.96, 1.09)	0.4939	1.02 (0.98, 1.05)	0.3468
Liver disease	0.95 (0.91, 0.99)	0.0202	0.95 (0.88, 1.02)	0.1778	1.05 (1.01, 1.09)	0.0209
Non-skin cancer	0.94 (0.91, 0.97)	0.0001	0.95 (0.90, 1.01)	0.1027	1.08 (1.05, 1.11)	<0.0001
Fall	0.92 (0.89, 0.96)	<0.0001	0.95 (0.90, 1.01)	0.0992	1.11 (1.07, 1.14)	<0.0001
Anemia	0.90 (0.87, 0.92)	<0.0001	0.90 (0.86, 0.95)	0.0001	1.11 (1.08, 1.14)	<0.0001
Alcoholism	0.88 (0.83, 0.93)	<0.0001	0.90 (0.81, 1.01)	0.0639	1.08 (1.02, 1.14)	0.0095
Concomitant use of antiplatelet	0.79 (0.76, 0.82)	<0.0001	1.15 (1.06, 1.24)	0.0004	0.93 (0.89, 0.97)	0.0004
Contraindications of OAC use						
Intracranial bleeding	0.80 (0.72, 0.87)	<0.0001	0.92 (0.77, 1.11)	0.3852	0.97 (0.88, 1.07)	0.5092
Recent bleed event	0.60 (0.55, 0.66)	<0.0001	0.91 (0.76, 1.10)	0.3308	1.12 (1.02, 1.22)	0.0198
Cerebral amyloid angiopathy	0.24 (0.08, 0.71)	0.0098	0.34 (0.03, 3.89)	0.3882	1.95 (0.54, 7.00)	0.3077
Cerebral aneurysm	0.88 (0.76, 1.02)	0.0840	1.24 (0.92, 1.67)	0.1533	1.00 (0.86, 1.15)	0.9557
Pericarditis/pericardial effusions	0.79 (0.61, 1.02)	0.0714	0.90 (0.55, 1.47)	0.6718	1.07 (0.82, 1.40)	0.6179
Renal failure requiring dialysis	0.81 (0.74, 0.89)	<0.0001	0.76 (0.63, 0.91)	0.0027	1.29 (1.19, 1.40)	<0.0001
Coagulation defects	1.63 (1.54, 1.73)	<0.0001	1.34 (1.21, 1.49)	<0.0001	0.80 (0.76, 0.84)	<0.0001
End stage liver disease	0.92 (0.86, 0.99)	0.0165	1.09 (0.96, 1.24)	0.1646	0.97 (0.92, 1.04)	0.4132
GI cancer	1.00 (0.95, 1.05)	0.8684	0.92 (0.83, 1.01)	0.0930	1.03 (0.98, 1.08)	0.2901
Other GI contraindications	0.94 (0.89, 1.00)	0.0375	0.93 (0.83, 1.03)	0.1713	1.00 (0.95, 1.06)	0.9753
Provider Specialty						
Surgery and Others	ref	ref	ref	ref	ref	ref
Cardiology	2.94 (2.83, 3.05)	<0.0001	1.21 (1.12, 1.30)	<0.0001	0.79 (0.76, 0.82)	<0.0001
Primary Care	1.36 (1.31, 1.42)	<0.0001	1.01 (0.93, 1.10)	0.7984	0.89 (0.85, 0.93)	<0.0001
Cardiovascular Surgery	1.05 (1.02, 1.09)	0.0004	0.81 (0.77, 0.85)	<0.0001	1.10 (1.07, 1.13)	<0.0001

sHR: subdistribution hazard ratio; OR and 95% CI were obtained from multivariable logistic regression models. sHR and 95% CI were obtained from multivariable time-to-event analyses considering mortality as the competing risk using the Fine and Gray method.

Table S5. Factors Associated with OAC Initiation and Adherence in Non-POAF

	Initiation		Adherence		Discontinuation	
	OR (95% CI)	p-value	OR (95% CI)	p-value	sHR (95% CI)	p-value
Age						
18-64 years	ref	ref	ref	ref	ref	ref
65-74 years	1.13 (1.10, 1.16)	<0.0001	1.19 (1.14, 1.24)	<0.0001	0.73 (0.72, 0.75)	<0.0001
75+ years	1.12 (1.09, 1.15)	<0.0001	1.28 (1.23, 1.34)	<0.0001	0.77 (0.75, 0.78)	<0.0001
Female	0.98 (0.97, 1.00)	0.0672	1.22 (1.18, 1.25)	<0.0001	0.87 (0.86, 0.88)	<0.0001
Race						
White	ref	ref	ref	ref	ref	ref
Asian	0.80 (0.75, 0.84)	<0.0001	0.84 (0.76, 0.92)	0.0002	1.03 (0.98, 1.09)	0.2023
Black	0.85 (0.83, 0.88)	<0.0001	0.77 (0.74, 0.80)	<0.0001	1.15 (1.13, 1.18)	<0.0001
Hispanic/Latino	0.83 (0.81, 0.86)	<0.0001	0.72 (0.69, 0.76)	<0.0001	1.17 (1.14, 1.20)	<0.0001
Other/Unknown	0.93 (0.88, 0.97)	0.0029	0.90 (0.82, 0.98)	0.0123	1.09 (1.05, 1.14)	0.0001
Year of AF Diagnosis						
2012	ref	ref	ref	ref	ref	ref
2013	1.03 (0.99, 1.08)	0.1370	1.09 (1.01, 1.18)	0.0288	0.96 (0.92, 0.99)	0.0197
2014	1.07 (1.03, 1.12)	0.0019	1.11 (1.02, 1.20)	0.0113	0.93 (0.89, 0.96)	0.0001
2015	1.08 (1.03, 1.12)	0.0009	1.36 (1.26, 1.47)	<0.0001	0.80 (0.77, 0.83)	<0.0001
2016	1.25 (1.20, 1.30)	<0.0001	1.45 (1.35, 1.56)	<0.0001	0.76 (0.74, 0.79)	<0.0001
2017	1.28 (1.23, 1.33)	<0.0001	1.53 (1.43, 1.64)	<0.0001	0.74 (0.72, 0.77)	<0.0001
2018	1.63 (1.57, 1.70)	<0.0001	1.48 (1.38, 1.58)	<0.0001	0.76 (0.74, 0.79)	<0.0001
2019	1.84 (1.77, 1.91)	<0.0001	1.66 (1.55, 1.77)	<0.0001	0.74 (0.71, 0.76)	<0.0001
2020	2.23 (2.14, 2.32)	<0.0001	1.61 (1.51, 1.72)	<0.0001	0.77 (0.75, 0.80)	<0.0001
2021	2.64 (2.54, 2.75)	<0.0001	1.60 (1.50, 1.72)	<0.0001	0.86 (0.83, 0.88)	<0.0001
Medical History						
Heart Failure	0.92 (0.91, 0.94)	<0.0001	0.91 (0.88, 0.94)	<0.0001	1.12 (1.10, 1.14)	<0.0001
Hypertension	1.16 (1.13, 1.20)	<0.0001	1.14 (1.08, 1.20)	<0.0001	0.79 (0.78, 0.81)	<0.0001
Diabetes mellitus	1.07 (1.05, 1.08)	<0.0001	0.96 (0.93, 0.99)	0.0070	1.00 (0.98, 1.01)	0.7271
Thromboembolism	1.06 (1.04, 1.09)	<0.0001	1.05 (1.01, 1.09)	0.0151	0.98 (0.96, 1.00)	0.0791
Other supraventricular arrhythmia	0.70 (0.68, 0.72)	<0.0001	1.06 (1.00, 1.12)	0.0520	0.99 (0.96, 1.02)	0.4205

	Initiation		Adherence		Discontinuation	
	OR (95% CI)	p-value	OR (95% CI)	p-value	sHR (95% CI)	p-value
Ventricular arrhythmia	0.80 (0.77, 0.83)	<0.0001	1.04 (0.97, 1.10)	0.2931	0.97 (0.94, 1.00)	0.0590
CAD	0.81 (0.80, 0.82)	<0.0001	0.89 (0.87, 0.92)	<0.0001	1.05 (1.04, 1.07)	<0.0001
PAD	0.94 (0.92, 0.97)	<0.0001	0.95 (0.91, 0.98)	0.0061	1.09 (1.07, 1.11)	<0.0001
Major bleeding	0.95 (0.92, 0.99)	0.0147	1.07 (1.00, 1.14)	0.0458	1.00 (0.97, 1.03)	0.9492
Stage 3-5 CKD	0.98 (0.96, 1.00)	0.0640	0.96 (0.93, 1.00)	0.0384	1.08 (1.06, 1.10)	<0.0001
Liver disease	0.93 (0.90, 0.96)	<0.0001	0.96 (0.92, 1.01)	0.1171	1.03 (1.00, 1.05)	0.0194
Non-skin cancer	0.97 (0.95, 0.99)	0.0137	0.98 (0.95, 1.01)	0.2405	1.05 (1.03, 1.07)	<0.0001
Fall	0.88 (0.86, 0.90)	<0.0001	0.91 (0.88, 0.94)	<0.0001	1.12 (1.10, 1.14)	<0.0001
Anemia	0.88 (0.86, 0.89)	<0.0001	0.92 (0.89, 0.95)	<0.0001	1.08 (1.06, 1.09)	<0.0001
Alcoholism	0.85 (0.82, 0.89)	<0.0001	0.77 (0.73, 0.83)	<0.0001	1.14 (1.10, 1.18)	<0.0001
Concomitant use of antiplatelet	0.78 (0.76, 0.80)	<0.0001	1.14 (1.09, 1.20)	<0.0001	0.92 (0.90, 0.94)	<0.0001
Contraindications of OAC use						
Intracranial bleeding	0.87 (0.82, 0.93)	<0.0001	0.99 (0.88, 1.11)	0.8488	0.99 (0.94, 1.05)	0.7450
Recent bleed event	0.53 (0.49, 0.57)	<0.0001	0.81 (0.70, 0.94)	0.0064	1.17 (1.08, 1.26)	0.0001
Cerebral amyloid angiopathy	0.39 (0.24, 0.62)	0.0001	1.93 (0.64, 5.82)	0.2401	1.18 (0.80, 1.75)	0.4128
Cerebral aneurysm	0.93 (0.85, 1.02)	0.1359	0.94 (0.80, 1.12)	0.5036	1.12 (1.03, 1.21)	0.0088
Pericarditis/pericardial effusions	0.78 (0.62, 0.98)	0.0299	0.92 (0.61, 1.40)	0.7082	1.24 (1.00, 1.52)	0.0464
Renal failure requiring dialysis	0.81 (0.75, 0.87)	<0.0001	0.75 (0.65, 0.86)	0.0001	1.26 (1.17, 1.35)	<0.0001
Coagulation defects	1.87 (1.79, 1.95)	<0.0001	1.20 (1.12, 1.28)	<0.0001	0.82 (0.80, 0.85)	<0.0001
End stage liver disease	1.02 (0.98, 1.07)	0.2977	0.97 (0.90, 1.05)	0.4918	1.02 (0.98, 1.06)	0.3304
GI cancer	0.97 (0.94, 1.01)	0.1190	0.96 (0.91, 1.03)	0.2546	1.02 (0.98, 1.05)	0.3341
Other GI contraindications	0.98 (0.94, 1.02)	0.3208	0.88 (0.82, 0.94)	0.0002	1.04 (1.00, 1.07)	0.0441
Provider Specialty						
Surgery and Others	ref	ref	ref	ref	ref	ref
Cardiology	2.90 (2.83, 2.96)	<0.0001	1.05 (1.00, 1.09)	0.0395	0.85 (0.83, 0.87)	<0.0001
Primary Care	1.27 (1.23, 1.30)	<0.0001	0.97 (0.93, 1.02)	0.2679	0.91 (0.89, 0.93)	<0.0001

sHR: subdistribution hazard ratio; OR and 95% CI were obtained from multivariable logistic regression models. sHR and 95% CI were obtained from multivariable time-to-event analyses considering mortality as the competing risk using the Fine and Gray method.

Table S6. Oral Anticoagulant Initiated within 90 days of AF diagnosis

	Non-POAF (N=149,717)	POAF (N=42,803)	Total (N=192,520)	p-value
Initial treatment				<0.0001
Apixaban	82,273 (55.0%)	22,527 (52.6%)	104,800 (54.4%)	
Dabigatran	5271 (3.5%)	816 (1.9%)	6087 (3.2%)	
Edoxaban	93 (0.1%)	11 (0.0%)	104 (0.1%)	
Rivaroxaban	31,405 (21.0%)	7197 (16.8%)	38,602 (20.1%)	
Warfarin	30,675 (20.5%)	12,252 (28.6%)	42,927 (22.3%)	

These are aggregated data from 2012-2021. The data by year can be found in Figure 2.

Table S7. Adherence to Oral Anticoagulants

	POAF	Non-POAF
Overall	N=32,697	N=116,522
	18,647 (57.0%)	77,146 (66.2%)
Men with CHA ₂ DS ₂ -VASc ≥ 2 and women with CHA ₂ DS ₂ -VASc	N=30,003	N=99,989
≥ 3	17,343 (57.8%)	68,260 (68.3%)

Adherence was measured by the proportion of days covered (PDC) at the end of one year. Patients with a PDC≥80% were considered as being adherent. When considering discontinuation or calculating the PDC, all OACs were considered regardless of whether the dose was changed, or the patient switched from one agent to another. The adherence analysis was limited to patients who started OAC within the first 90 days and had continuous enrollment for the first 12 months after the OAC initiation and did not die within the first 12 months.

Figure S1. Cohort Creation Flow Diagram

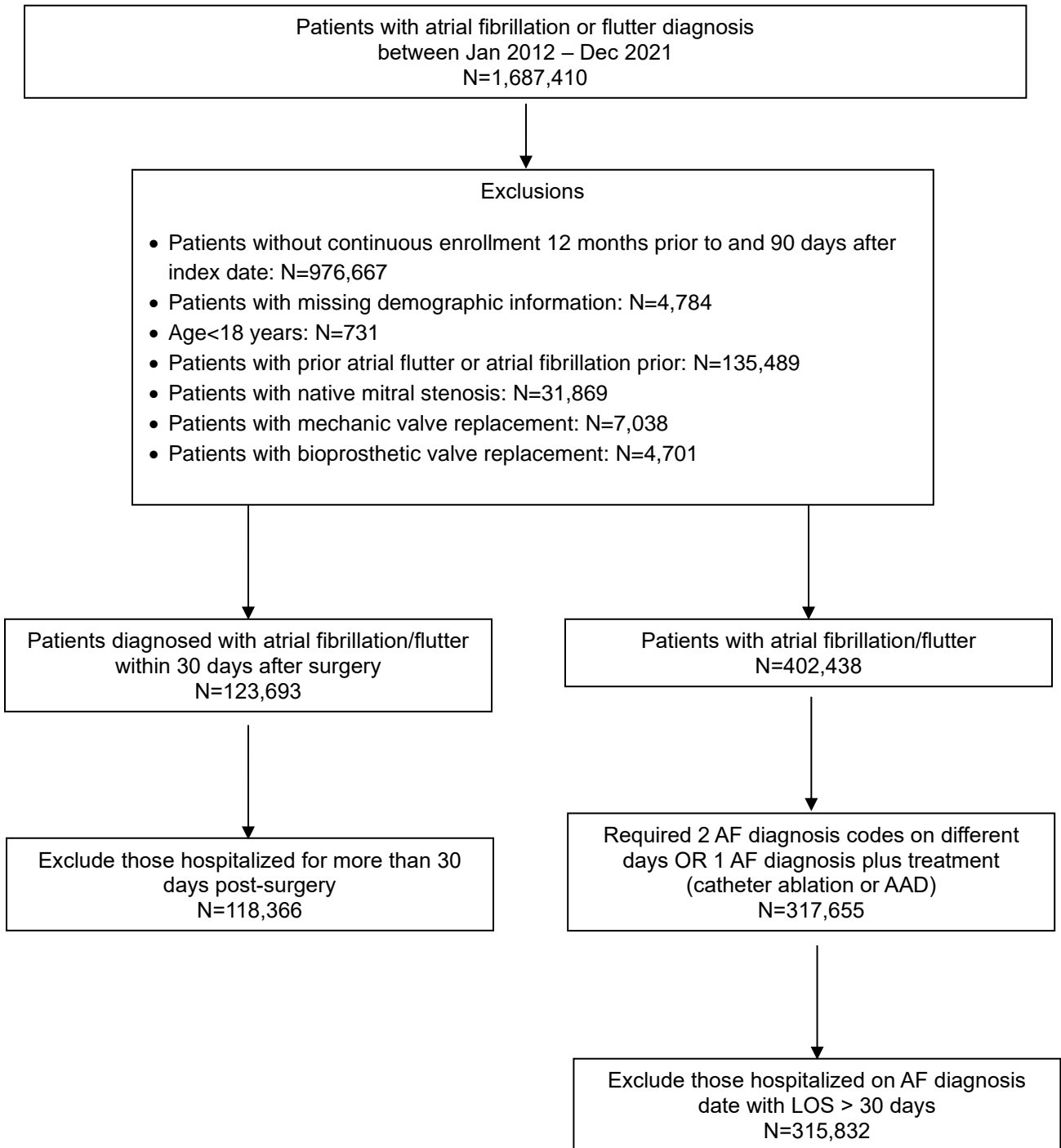


Figure S2. Trends of OAC Initiation in Overall Cohort and in Patients with Class IA Recommendation

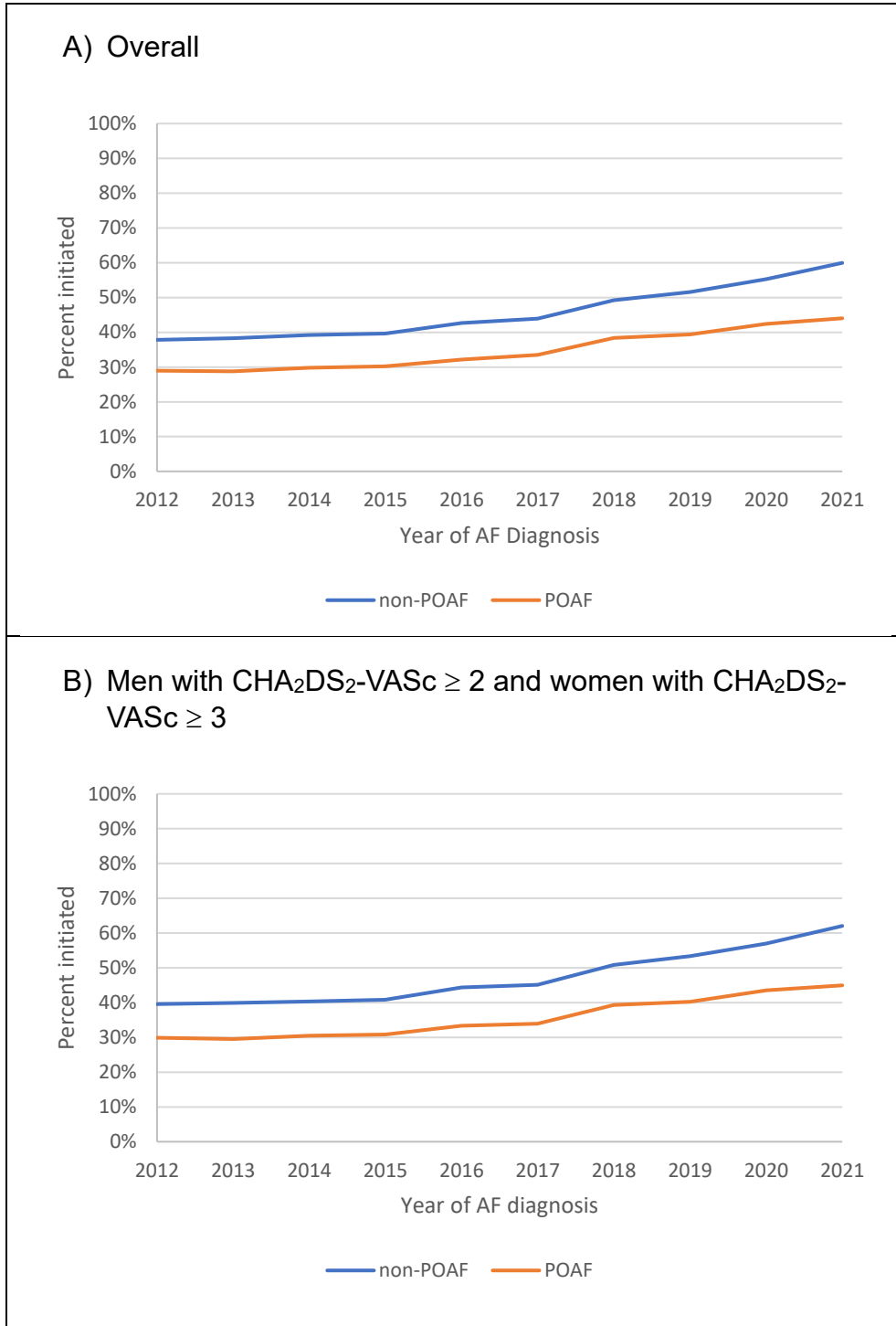
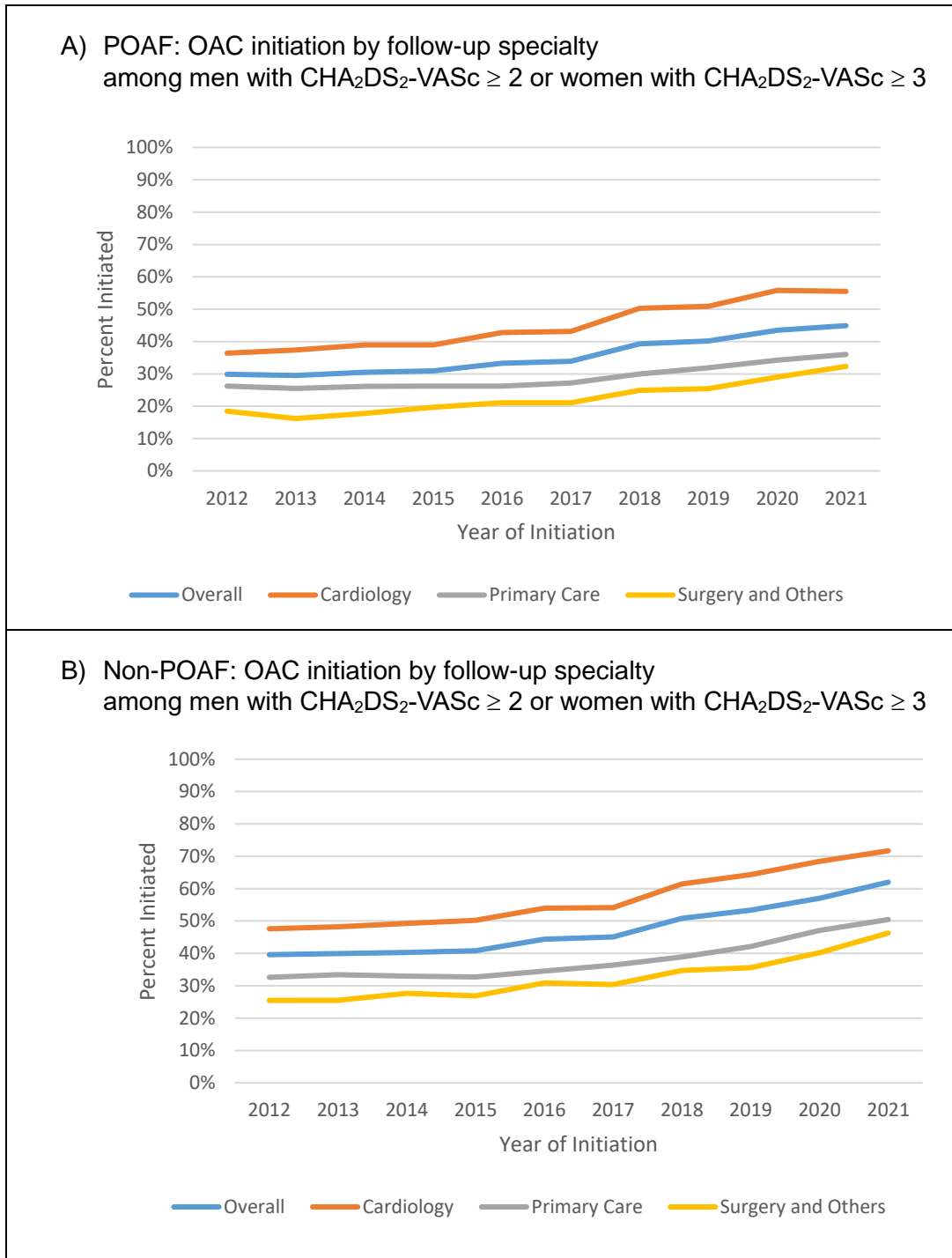


Figure S3. Trends of OAC Initiation by Follow-Up Specialty in men with CHA₂DS₂-VASc \geq 2 and women with CHA₂DS₂-VASc \geq 3



If a patient had a visit with a cardiologist within 90 days of the first AF diagnosis date, we classified the patient as in the cardiology group, if not and if the patient had a visit with a primary care clinician, we classified the patient as in the primary care group, and if the patient had neither cardiology or primary care visits, we classified the patients as in the “surgery and others” group.

Figure S4. Discontinuation of OAC in POAF and Non-POAF

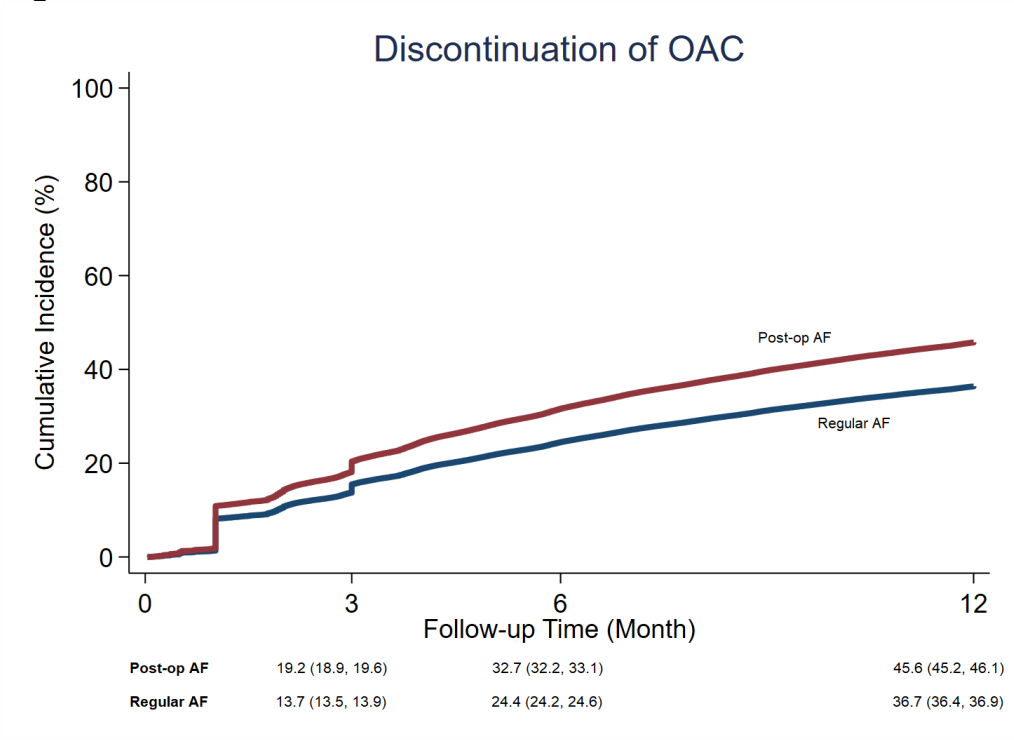
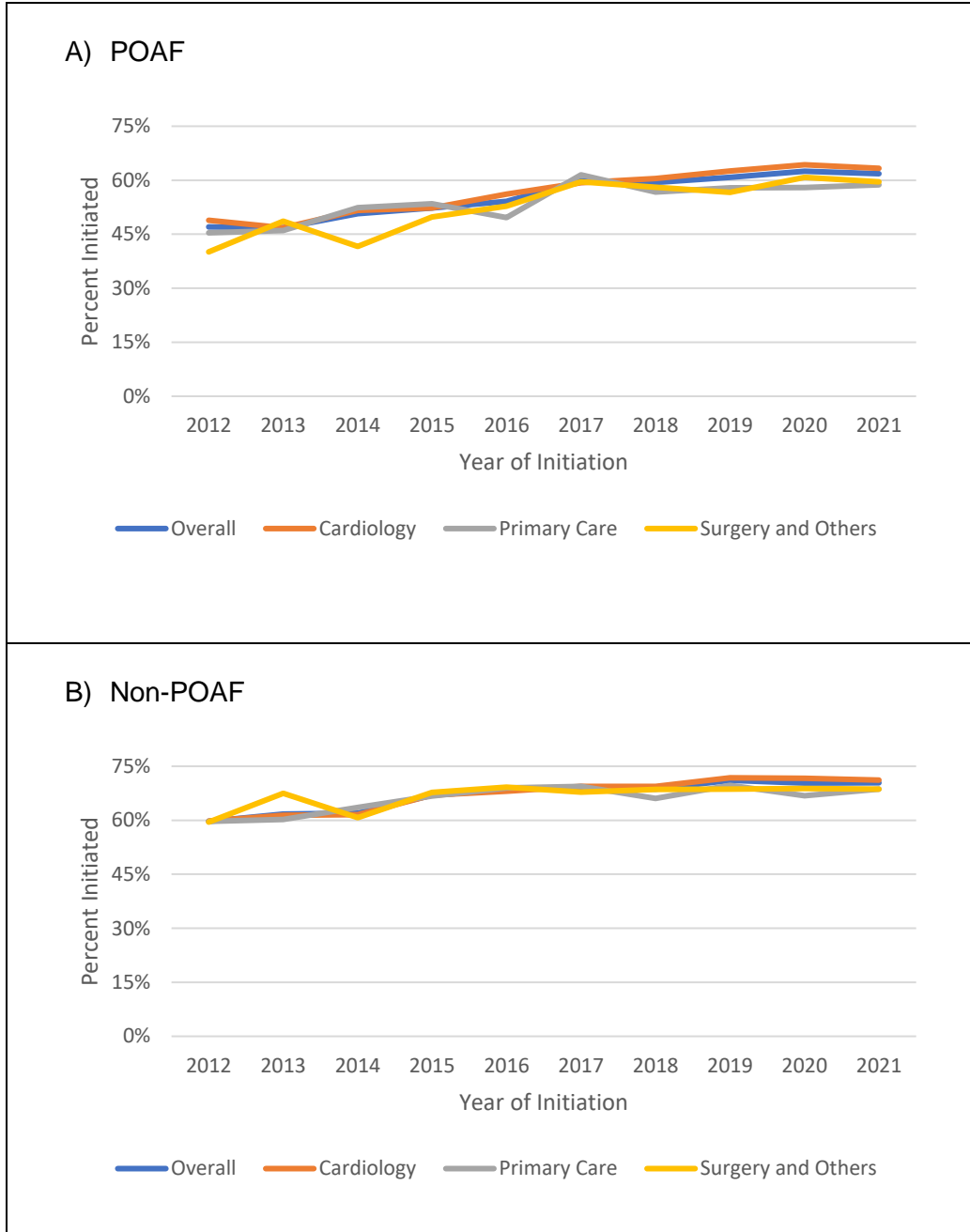


Figure S5. Trends of OAC Adherence by Follow-Up Specialty, 2012-2021



If a patient had a visit with a cardiologist within 90 days of the first AF diagnosis date, we classified the patient as in the cardiology group, if not and if the patient had a visit with a primary care clinician, we classified the patient as in the primary care group, and if the patient had neither cardiology or primary care visits, we classified the patients as in the “surgery and others” group.