

Bridging the gap following venous thromboembolism: A real-world analysis of anticoagulation treatment patterns, adherence, and readmissions in a large integrated health care system

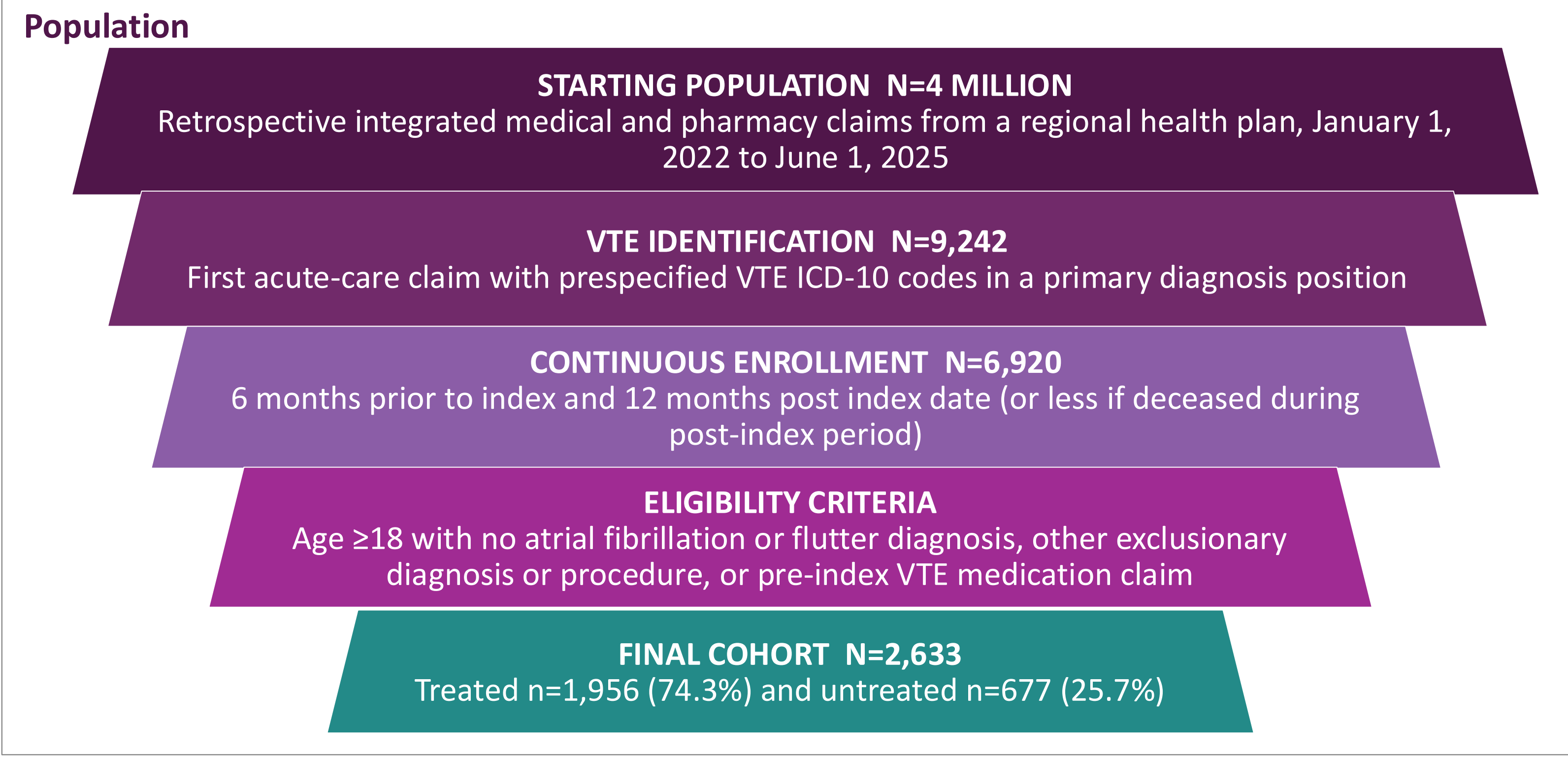
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BACKGROUND
- Venous thromboembolism (VTE) includes deep vein thrombosis (DVT) and pulmonary embolism (PE). VTE is a serious condition that can cause long-term illness, repeat hospital visits, and death. CDC estimates that VTE affects up to 900,000 people in the United States each year.¹ - Anticoagulation medications are the primary and most effective treatment for VTE. Timely anticoagulation initiation can reduce clot growth and risk of recurrence. Additionally, continued access and adherence to treatment is critical to reduce the risk of recurrent VTE events and life-threatening complications. However, medication cost, care transitions, adverse effects, complex treatment plans, and limited follow-up may affect treatment initiation and adherence. VTE also creates a large financial burden for patients and health care systems. Estimated additional medical costs during the first year after a VTE event range from \$12,000 to \$15,000 per surviving patient. The total annual health care burden in the United States has been estimated at \$7 billion to \$10 billion in 2014 dollars.²
OBJECTIVES
Primary objectives - Assess the percentage of members with any post-index anticoagulant treatment, time to initiation, treatment modality, and 6-month adherence using monthly proportion of days covered (PDC). Secondary objectives - Describe 12-month VTE readmission, post-index all-cause mortality, and documented social determinants of health (SDoH) before index. - Describe demographic characteristics, Charlson Comorbidity Index (CCI), and Population Risk Ratio (PRR) by treatment status. Population Risk Ratio (PRR) - A proprietary prospective risk measure that predicts utilization and cost risk over the following year. - A score of 1 represents the population average. - A score greater than 1 indicates higher relative risk.

METHODS

Eligibility criteria

INCLUSION CRITERIA	EXCLUSION CRITERIA
AGE Adults aged 18 years or older on the index date	ATRIAL FIBRILLATION OR FLUTTER ICD-10 code prior to index in claims history (n=2,548)
INDEX VTE EVENT First acute-care claim with prespecified VTE ICD-10 codes in a primary diagnosis position	OTHER DIAGNOSES OR PROCEDURES Prespecified ICD-10 code list including prior to index obstetric or fetal care, joint replacement or revision, heart valve procedures, vena cava devices, and selected thrombophilias (n=1,480)
INDEX DATE AND STUDY WINDOW First qualifying VTE claim from January 1, 2022 through June 1, 2025	
ENROLLMENT Continuous coverage for 6 months prior to index date and 12 months post index date (or less if deceased during post index period)	PRE-INDEX VTE MEDICATION At least one claim for an oral or injectable medication on the prespecified VTE treatment list before the index date (n=2,384)

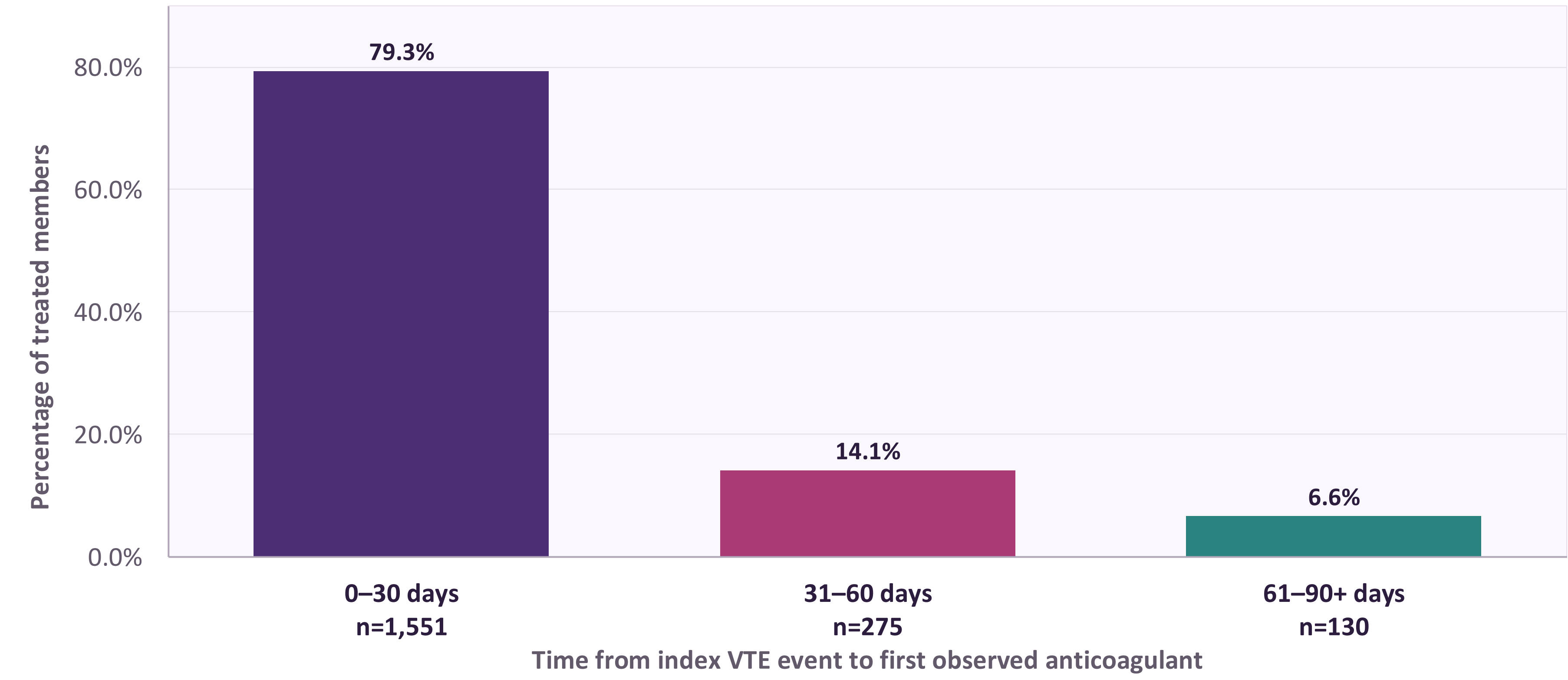


LIMITATIONS
Diagnosis and outcome capture: VTE events were identified using ICD-10 diagnosis codes and were not confirmed through medical record review. Readmission and mortality: Low event rates and small sample sizes in the untreated cohort limited the ability to make robust comparisons of VTE readmissions between treatment groups. Missing clinical information: Claims did not include VTE severity, clot location, bleeding risk, treatment contraindications, or the clinician's reason for selecting a treatment.

RESULTS			
Table 1. Cohort Characteristics			
Characteristic	Overall (n=2,633)	Treated (n=1,956)	Untreated (n=677)
DEMOGRAPHICS			
Age, years, mean (SD)	60.7 (16.3)	59.2 (16.0)	64.9 (16.5)
Age group, n (%)			
18-29 years	110 (4.2%)	89 (4.6%)	21 (3.1%)
30-39 years	221 (8.4%)	181 (9.3%)	40 (5.9%)
40-49 years	329 (12.5%)	262 (13.4%)	67 (9.9%)
50-59 years	504 (19.1%)	414 (21.2%)	90 (13.3%)
60-69 years	669 (25.4%)	487 (24.9%)	182 (26.9%)
≥70 years	800 (30.4%)	523 (26.7%)	277 (40.9%)
GENDER, n (%)			
Female	1,385 (52.6%)	1,074 (54.9%)	311 (45.9%)
Male	1,248 (47.4%)	882 (45.1%)	366 (54.1%)
RACE, n (%)			
White	1,983 (75.3%)	1,468 (75.1%)	515 (76.1%)
Black or African American	316 (12.0%)	250 (12.8%)	66 (9.7%)
Asian	60 (2.3%)	47 (2.4%)	13 (1.9%)
Other race¹	15 (0.6%)	11 (0.6%)	4 (0.6%)
Unknown or not reported	259 (9.8%)	180 (9.2%)	79 (11.7%)
ETHNICITY, n (%)			
Hispanic or Latino²	45 (1.7%)	33 (1.7%)	12 (1.8%)
Not Hispanic or Latino	2,365 (89.8%)	1,768 (90.4%)	597 (88.2%)
Unknown	223 (8.5%)	155 (7.9%)	68 (10.0%)
LINE OF BUSINESS, n (%)			
Community HealthChoices	107 (4.1%)	87 (4.4%)	20 (3.0%)
Commercial	418 (15.9%)	338 (17.3%)	80 (11.8%)
Health Insurance Exchange / Marketplace	147 (5.6%)	125 (6.4%)	22 (3.2%)
Medical Assistance / Medicaid	689 (26.2%)	548 (28.0%)	141 (20.8%)
Medicare	925 (35.1%)	616 (31.5%)	309 (45.6%)
Special Needs Plan	346 (13.1%)	241 (12.3%)	105 (15.5%)
CLINICAL AND UTILIZATION RISK			
CCI, mean (SD)³	3.42 (3.53)	3.34 (3.46)	3.85 (3.88)
Age-adjusted CCI, mean (SD)³	5.21 (4.03)	5.13 (3.95)	5.66 (4.41)
PRR, mean (SD)⁴	3.43 (2.91)	3.42 (2.90)	3.49 (3.05)
≥1 documented SDoH claim⁵	115 (4.4%)	88 (4.5%)	27 (4.0%)

Notes ¹ Other race includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and other recorded race. ² Hispanic or Latino includes one patient recorded as Puerto Rican. ³ CCI, Charlson Comorbidity Index. CCI and age-adjusted CCI values were available for 266 untreated and 1,521 treated patients. ⁴ PRR, Population Risk Ratio. PRR values were available for 187 untreated and 1,330 treated patients. ⁵ SDoH, social determinants of health. SDoH was identified by at least one documented SDoH ICD-10 code claim during the year before or on the index date.

Figure 1. Timing of anticoagulant initiation



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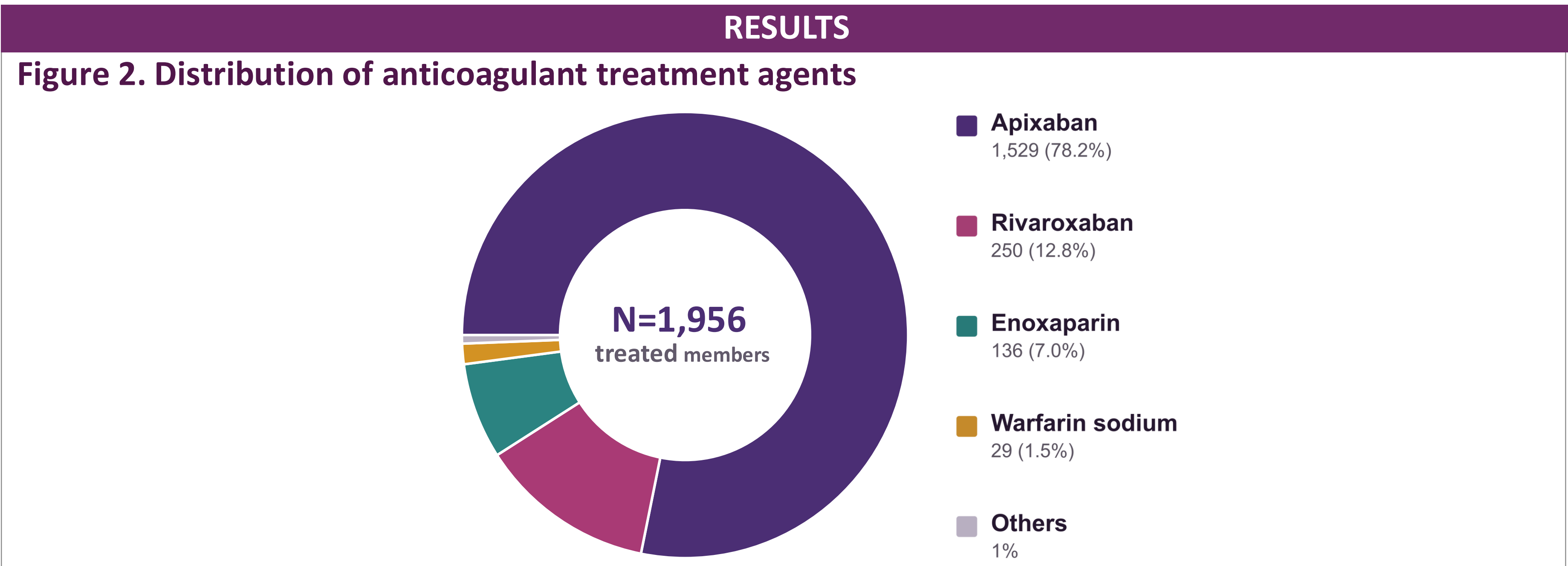


Figure 3. Mean PDC post-initiation of anticoagulation

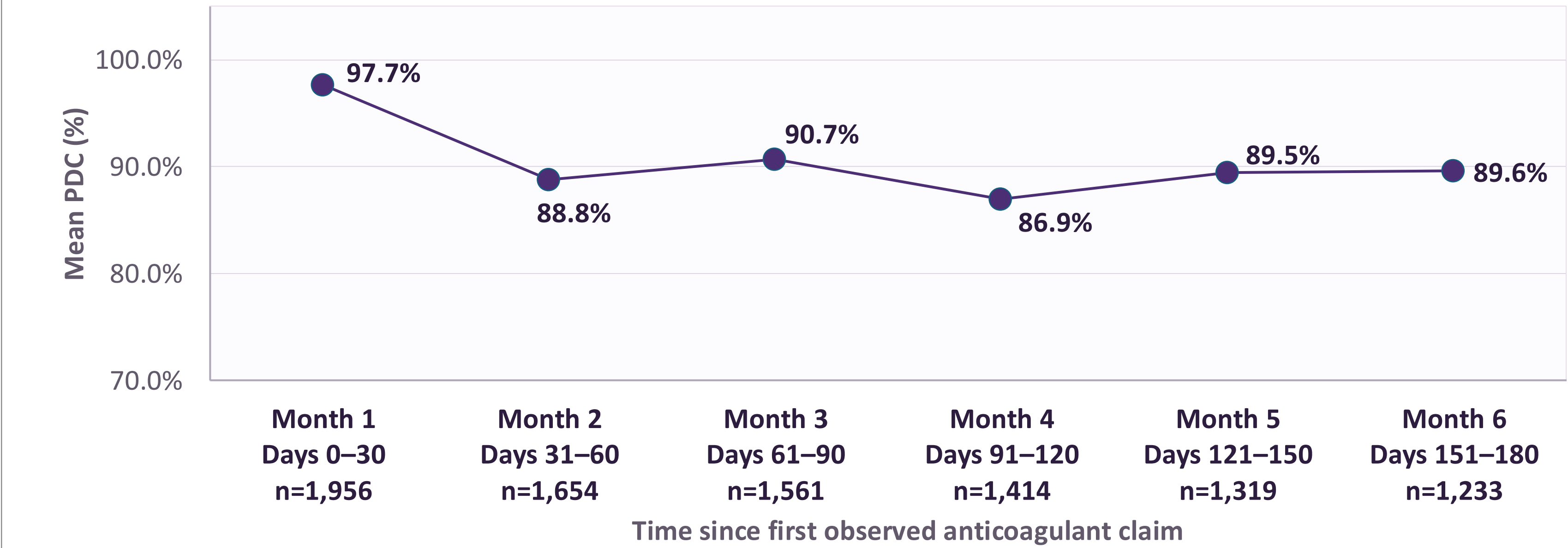


Table 2a. Outcome measures by treatment status

Outcome	Treated (n=1,956)	Untreated (n=677)
12 month VTE readmission, n (%)	70 (3.58%)	1 (0.15%)
12 month all-cause mortality, n (%)	215 (11.0%)	393 (58.1%)

Table 2b. Clinical measures in treated members by VTE readmission status

Clinical measure	Treated members with VTE readmission (n=70)	Treated members without VTE readmission (n=1,886)
CCI, mean (SD) ¹	3.75 (4.15)	3.33 (3.44)
PRR, mean (SD) ²	3.67 (3.15)	3.41 (2.89)
PDC across available months 1–6, mean % (SD) ³	86.7 (15.6)	89.1 (15.6)

Notes ¹ CCI data were available for 48 readmitted members and 1,473 members without VTE readmission. ² PRR data were available for 43 readmitted members and 1,287 members without VTE readmission. ³ PDC data were available for 70 readmitted members and 1,886 members without VTE readmission. PDC is each member's mean across available monthly values from treatment initiation through month 6.

DISCUSSION & CONCLUSION
Treatment exposure and cohort characteristics: Most treated members began anticoagulation within 0-30 days after the index VTE event. However, approximately 1 in 4 members had no observed post-index anticoagulation treatment. Differences in age and comorbidity burden between treated and untreated members suggest that treatment patterns may reflect underlying clinical complexity. Adherence: Mean PDC decreased after the first 30-day interval and then remained relatively stable through month 6. Four in five members with available month-6 data achieved PDC ≥80%. Continued pharmacist follow-up may help sustain adherence and identify access or refill barriers throughout treatment. Readmission and mortality: The higher all-cause mortality rate among untreated members indicates greater clinical vulnerability and may have limited the observed readmission rate data. Readmission and mortality should therefore be considered together when evaluating post-VTE outcomes. Readmission risk: Readmitted treated members had higher mean CCI (3.75 vs 3.33), higher mean PRR (3.67 vs 3.41), and numerically lower mean PDC (86.7% vs 89.1%). These descriptive patterns may help identify members who would benefit from closer post-discharge follow-up. Clinical implications: A pharmacist-led transition of care program could confirm the intended treatment plan, address access barriers, provide education, monitor refills, and respond to treatment gaps. Future research should evaluate whether targeted post-discharge support improves adherence and reduces recurrent VTE-related acute-care use.

REFERENCES
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