**Supplemental Material**

**Supplemental Methods: Bootstrap method for decision tree classification**

A case-control design was used at the level of follow-up period, allowing for case-crossover for patients with an ischemic stroke. Our dependent variable, a follow-up period with stroke, was compared with all other follow-up periods for patient cases and controls, resulting in an extremely rare event rate of 0.036%. To balance the data, ischemic stroke events were oversampled by labeling the five days prior to an occurrence. Control follow-ups were then randomly undersampled to match the number of oversampled follow-up cases. For patients who experienced an ischemic stroke, follow-up ended on the day prior to the occurrence to prevent the use of device measurements taken on the same day but after the stroke event happened, a situation that would introduce *look ahead* bias into the modeling. Thus, our goal was to accurately predict stroke five days in advance using all labeled follow-up cases and a random sample of follow-up controls.

A recursive partitioning and regression tree algorithm (RPART)[25, 26] was used to predict which follow-up days had an occurrence of ischemic stroke using baseline characteristics, $CHA_2DS_2$-VASc score, device parameters, and moving average offsets ($SMA_a$ minus $SMA_b$) as predictors. Although over/undersampling methods are well documented for managing imbalanced data[27, 28], including the prediction for incident AF[29], we recognized the oversampling bias in our design and used a bootstrapping routine with 1,000 repetitions to remove the bias and improve classifier accuracy. For each bootstrap iteration:

1. Patients were randomly partitioned into training (70%) and validation (30%) sets.

2. Follow-up controls were randomly sampled without replacement to equal the number of follow-up cases, resulting in a balanced training set.
3. An exhaustive classification tree with a minimum terminal node size equal to 80, a maximum depth equal to 8, and a complexity parameter equal to 0 was fit to the balanced training set.
4. The misclassification rate for each subtree in Step 3 was calculated using 10-fold cross validation. The exhaustive tree was then pruned back to the subtree with the lowest misclassification rate.
5. Variable importance and split information from the model fit in Step 4 were saved.
6. The unbalanced validation set was classified using the model fit from Step 4.
7. Area under the curve (AUC) and classification statistics from Step 6 were saved.

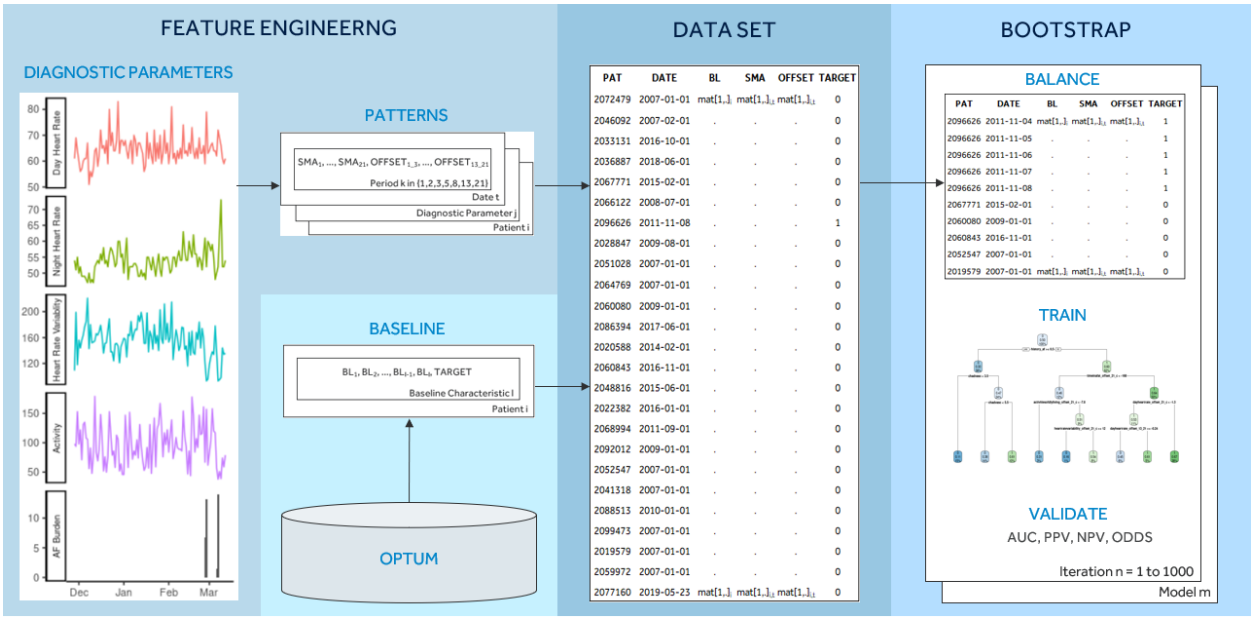


**Table S1: Codes used for conditions of interest**

| Disease | Type | ICD | Codes |
|---|---|---|---|
| Atrial Fibrillation | diag | 09 | 42731 |
| | | 10 | I480, I481, I482, I4891 |
| Heart Failure | diag | 09 | 40201, 40211, 40291, 40401, 40403, 40411, 40413, 40491, 40493, 428* |
| | | 10 | I110, I130, I132, I50* |
| Hypertension | diag | 09 | 401*, 402*, 403*, 404*, 405* |
| | | 10 | I10*, I11*, I12*, I13*, I15* |
| Stroke/TIA | diag | 09 | 433*, 434*, 435*, 436*, V1254 |
| | | 10 | G450, G451, G452, G458, G459, I163*, I165*, I66*, Z8673 |
| Vascular Disease | diag | 09 | 4400, 4402*, 4439 |
| | | 10 | I700, I702*, I739 |
| Diabetes Mellitus | diag | 09 | 250*0, 250*1, 250*2, 250*3 |
| | | 10 | E10*, E11* |
| Ischemic Stroke | diag | 09 | 436*, 43301, 43311, 43321, 43331, 43381, 43391, 43401, 43411, 43491, 99702 |
| | | 10 | I636, I638*, I639, I6300, I63011, I63012, I63013, I63019, I6302, I63031, I63032, I63033, I63039, I6309, I6310, I63111, I63112, I63113, I63119, I6312, I63131, I63132, I63133, I63139, I6319, I6320, I63211, I63212, I63213, I63219, I6322, I63231, I63232, I63233, I63239, I6329, I6330, I63311, I63312, I63313, I63319, I63321, I63322, I63323, I63329, I63331, I63332, I63333, I63339, I63341, I63342, I63343, I63349, I6339, I6340, I63411, I63412, I63413, I63419, I63421, I63422, I63423, I63429, I63431, I63432, I63433, I63439, I63441, I63442, I63443, I63449, I6349, I6350, I63511, I63512, I63513, I63519, I63521, I63522, I63523, I63529, I63531, I63532, I63533, I63539, I63541, I63542, I63543, I63549, I6359, I97810, I97811, I97820, I97821 |
| | drg | | 061, 062, 063 |

| Disease | Type | ICD | Codes |
|---|---|---|---|
| Systemic Embolism | diag | 09 | 44401, 44409, 4441, 44421, 44422, 44481, 44489, 4449 |
| | | 10 | I7401, I7409, I7410, I7411, I7419, I742, I743, I744, I745, I748, I749 |
| Myocardial Infarction | diag | 09 | 410*, 412* |
| | | 10 | I21*, I22*, I23*, I252 |
| Sleep Apnea | diag | 09 | 32720, 32721, 32723, 32729 |
| | | 10 | G4730, G4731, G4733, G4739 |
| COPD | diag | 09 | 49121 |
| | | 10 | J441 |
| Coronary Artery Disease | diag | 09 | 41400, 41401 |
| | | 10 | I2510 |
| Chronic Kidney Disease | diag | 09 | 585* |
| | | 10 | N18* |
| Valvular Heart Disease | diag | 09 | 394*, 395*, 396*, 397* |
| | | 10 | I34*, I35*, I37* |
| Hypothyroidism | diag | 09 | 2449 |
| | | 10 | E039 |
| Hyperthyroidism | diag | 09 | 24290 |
| | | 10 | E0590 |
| Ablation | proc | 09 | 3734, 93650, 93651, 93652, 93653, 93654, 93655, 93656, 93657 |
| | | 10 | 02583ZZ |

ICD indicates International Classification of Diseases; drg, diagnosis-related group; diag, diagnosis; proc, procedure; TIA, transient ischemic attack; COPD, chronic obstructive pulmonary disease;

**Figure S1: Cohort selection diagram.**

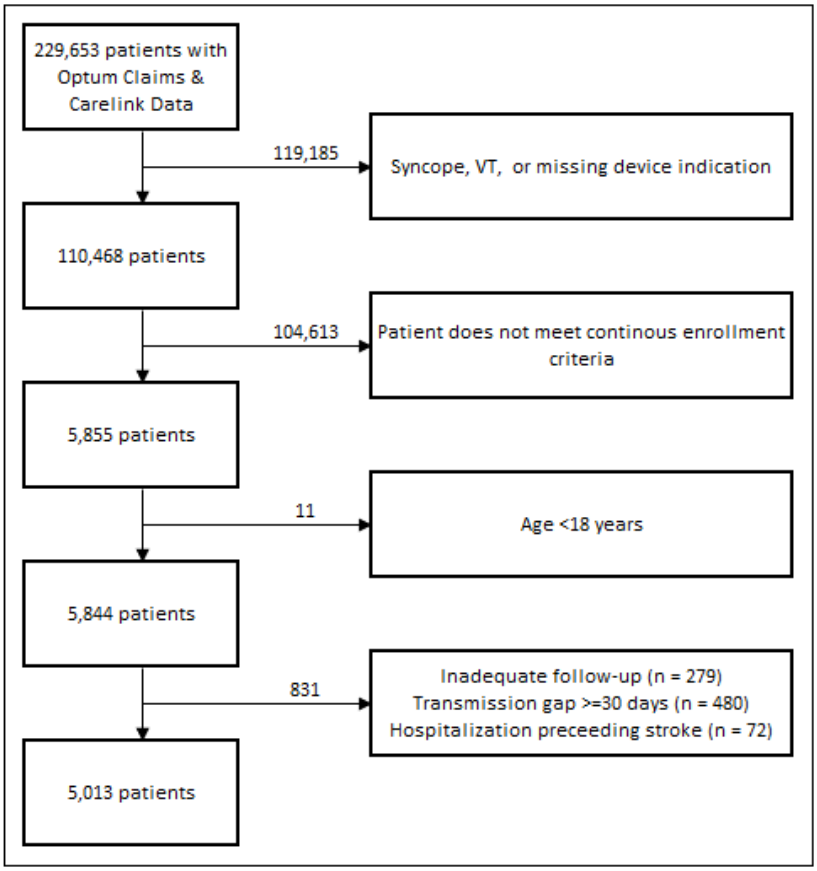


**Figure S2: Convergence of mean variable importance.**

This convergence plot illustrates the mean importance of each variable in the analysis across bootstrap iterations. For ease of presentation, device parameters show *aggregate* or average variable importance across all their respective features. A point on the plot indicates when a feature was selected by the classification algorithm as a predictor; frequently selected features will have a greater density of points. The convergence of points to a flat line indicates how many bootstraps are needed to reliably estimate variable importance for a given feature. All features except ablation, sleep apnea, and valvular heart disease reached convergence within 1,000 iterations. Given the low variable importance and selection frequency of these three variables, 1,000 bootstraps were considered sufficient for the remainder of the analysis. AFB indicates AF burden; DA, daily activity; DHR, daytime heart rate; NHR, nighttime heart rate; HRV, heart rate variability; OAC, oral anti-coagulation.

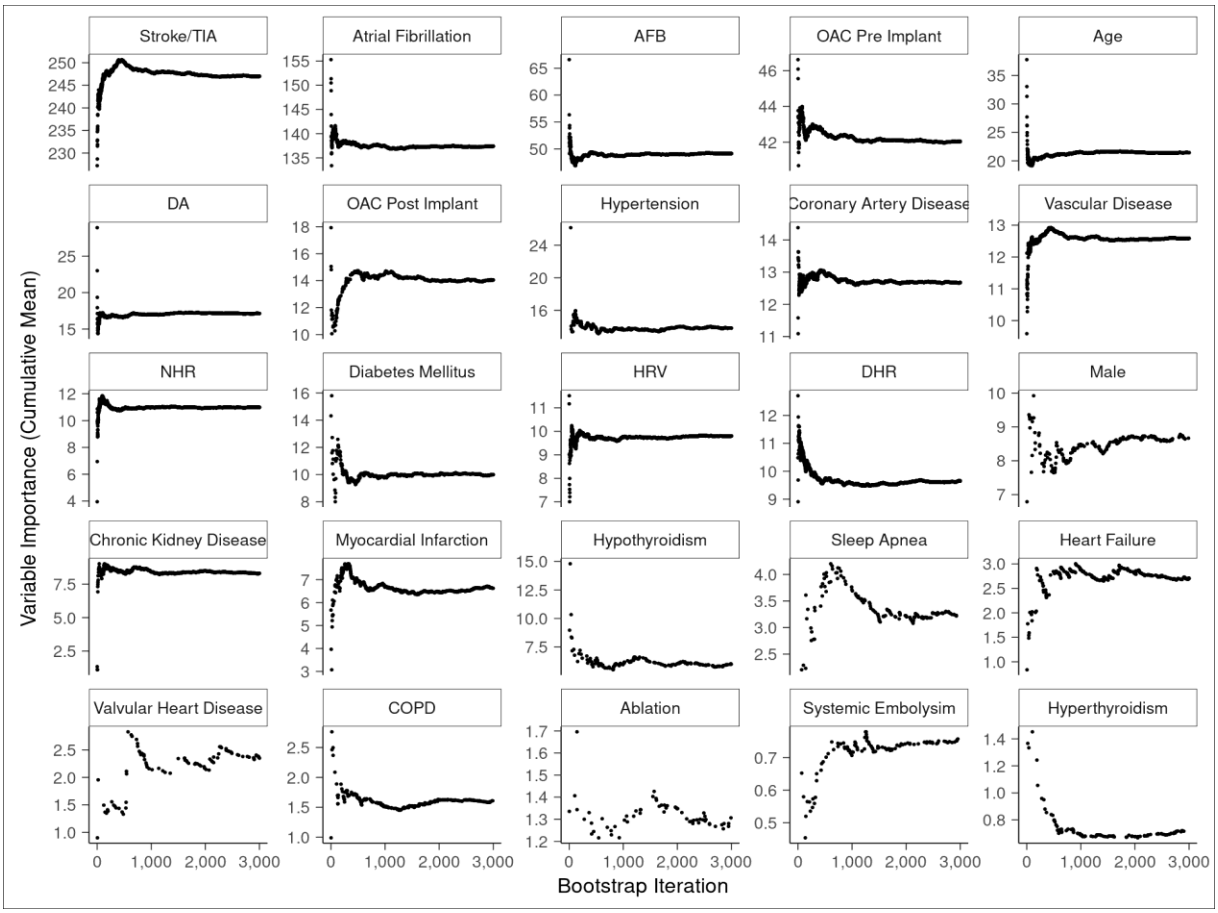

Stroke/TIA
Atrial Fibrillation
AFB
OAC Pre Implant
Age
DA
OAC Post Implant
Hypertension
Coronary Artery Disease
Vascular Disease
NHR
Diabetes Mellitus
HRV
DHR
Male
Chronic Kidney Disease
Myocardial Infarction
Hypothyroidism
Sleep Apnea
Heart Failure
Valvular Heart Disease
COPD
Ablation
Systemic Embolysim
Hyperthyroidism
Variable Importance (Cumulative Mean)
Bootstrap Iteration
0
1,000
2,000
3,000

**Figure S3: Mean variable importance for patients indicated for AF management.** This figure provides a bar plot of mean variable importance, scaled as a percent of total variable importance, by all features in the analysis. For ease of presentation, device parameters show aggregate variable importance across all their respective features. The inset presents the top 30 individual features after stroke/TIA that were selected as predictors at least 5% of the time. AFB indicates AF burden; DA, daily activity; DHR, daytime heart rate; NHR, nighttime heart rate; HRV, heart rate variability; CMA, cumulative moving average; OAC, oral anti-coagulation. All temporal trends are defined as the *p*-day SMA offset by its CMA.

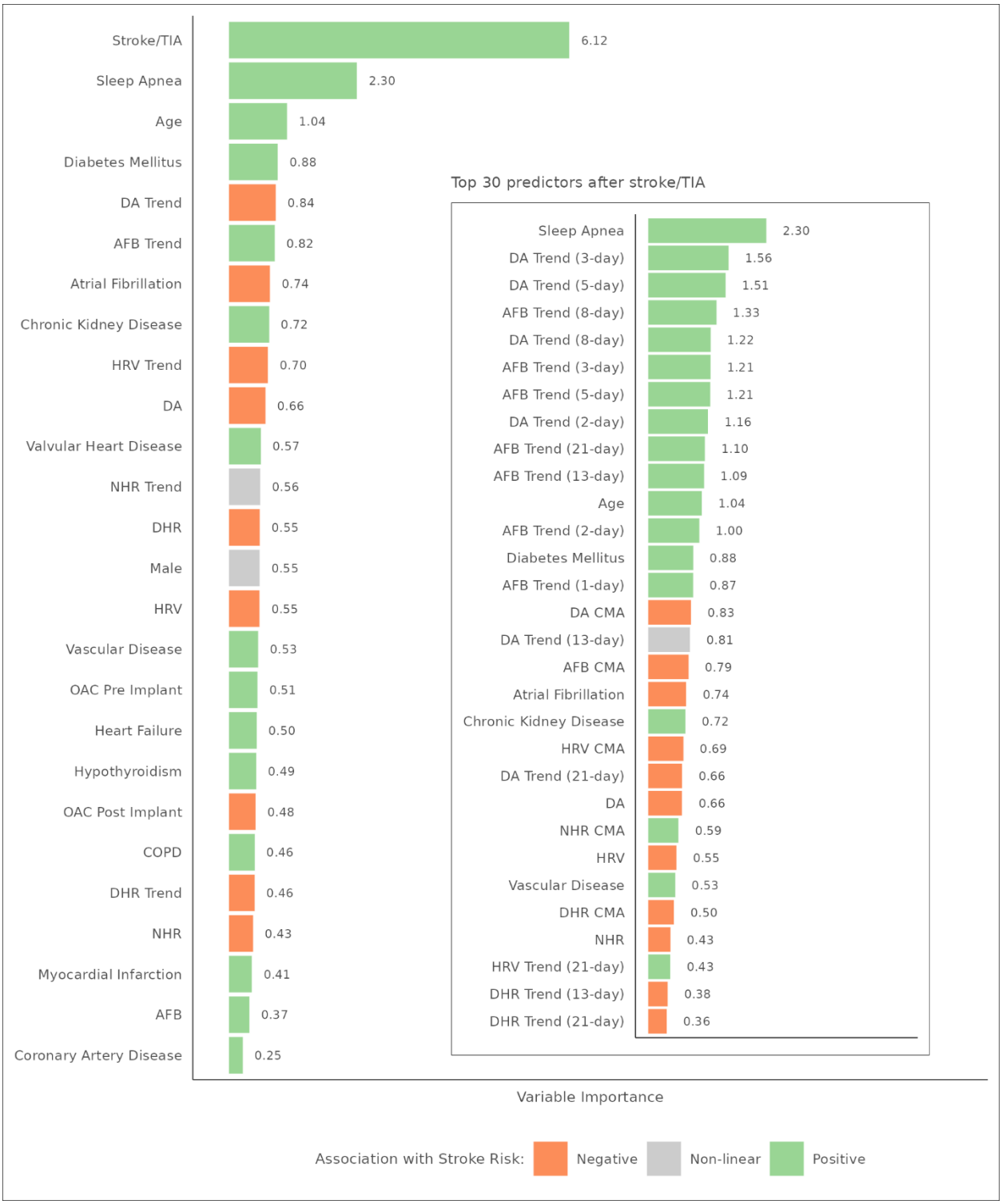
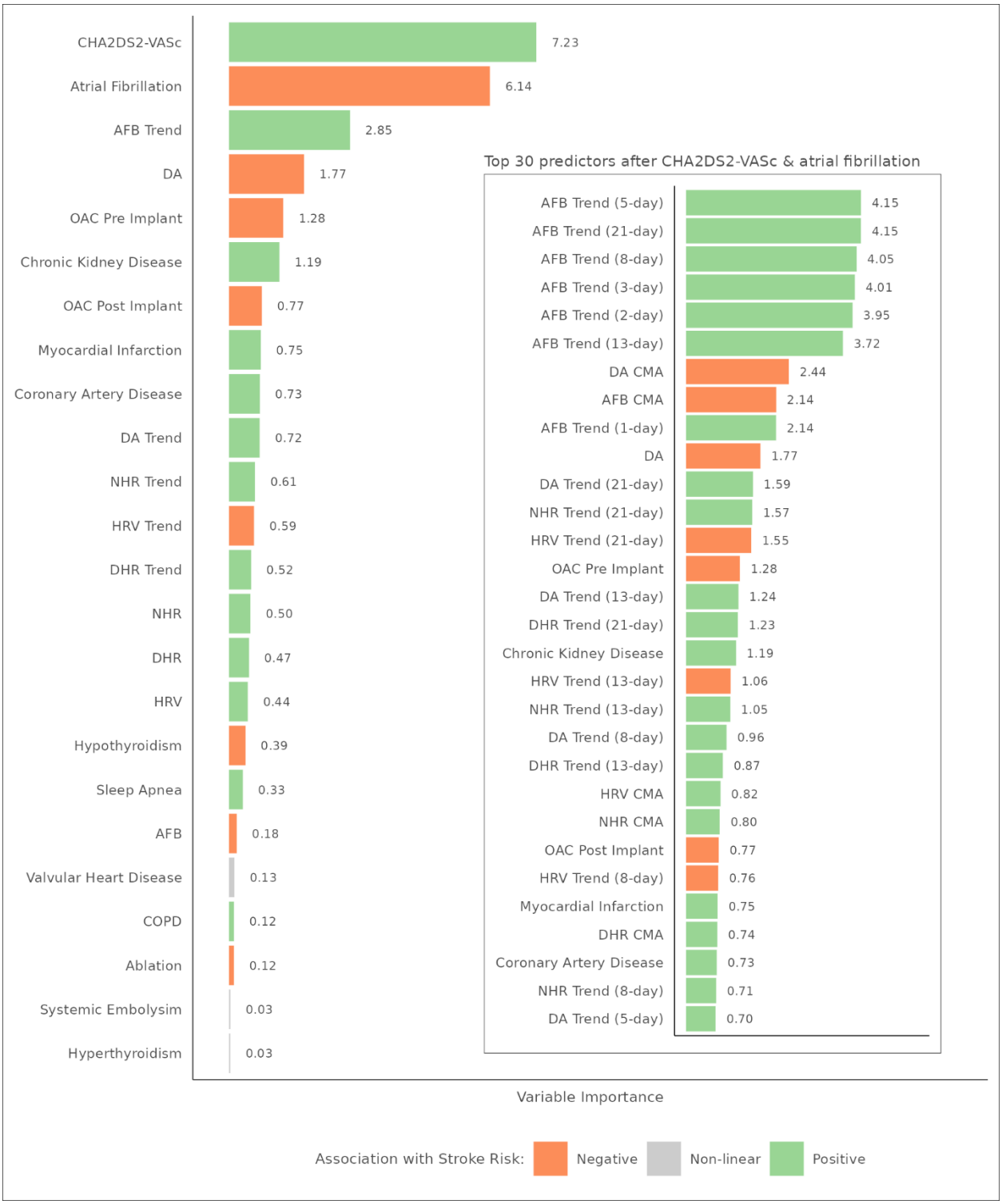

Stroke/TIA 6.12
Sleep Apnea 2.30
Age 1.04
Diabetes Mellitus 0.88
DA Trend 0.84
AFB Trend 0.82
Atrial Fibrillation 0.74
Chronic Kidney Disease 0.72
HRV Trend 0.70
DA 0.66
Valvular Heart Disease 0.57
NHR Trend 0.56
DHR 0.55
Male 0.55
HRV 0.55
Vascular Disease 0.53
OAC Pre Implant 0.51
Heart Failure 0.50
Hypothyroidism 0.49
OAC Post Implant 0.48
COPD 0.46
DHR Trend 0.46
NHR 0.43
Myocardial Infarction 0.41
AFB 0.37
Coronary Artery Disease 0.25
Top 30 predictors after stroke/TIA
Sleep Apnea 2.30
DA Trend (3-day) 1.56
DA Trend (5-day) 1.51
AFB Trend (8-day) 1.33
DA Trend (8-day) 1.22
AFB Trend (3-day) 1.21
AFB Trend (5-day) 1.21
DA Trend (2-day) 1.16
AFB Trend (21-day) 1.10
AFB Trend (13-day) 1.09
Age 1.04
AFB Trend (2-day) 1.00
Diabetes Mellitus 0.88
AFB Trend (1-day) 0.87
DA CMA 0.83
DA Trend (13-day) 0.81
AFB CMA 0.79
Atrial Fibrillation 0.74
Chronic Kidney Disease 0.72
HRV CMA 0.69
DA Trend (21-day) 0.66
DA 0.66
NHR CMA 0.59
HRV 0.55
Vascular Disease 0.53
DHR CMA 0.50
NHR 0.43
HRV Trend (21-day) 0.43
DHR Trend (13-day) 0.38
DHR Trend (21-day) 0.36
Variable Importance
Association with Stroke Risk: Negative Non-linear Positive

**Figure S4: Mean variable importance by $CHA_2DS_2$-VASc score and feature.** This figure provides a bar plot of mean variable importance, scaled as a percent of total variable importance, by $CHA_2DS_2$-VASc score and all remaining features in the analysis. For ease of presentation, device parameters show aggregate variable importance across all their respective features. The inset presents the top 30 individual features after $CHA_2DS_2$-VASc score that were selected as predictors at least 5% of the time. AFB indicates AF burden; DA, daily activity; DHR, daytime heart rate; NHR, nighttime heart rate; HRV, heart rate variability; CMA, cumulative moving average; OAC, oral anti-coagulation. All temporal trends are defined as the *p*-day SMA offset by its CMA.


CHA2DS2-VASc 7.23
Atrial Fibrillation 6.14
AFB Trend 2.85
DA 1.77
OAC Pre Implant 1.28
Chronic Kidney Disease 1.19
OAC Post Implant 0.77
Myocardial Infarction 0.75
Coronary Artery Disease 0.73
DA Trend 0.72
NHR Trend 0.61
HRV Trend 0.59
DHR Trend 0.52
NHR 0.50
DHR 0.47
HRV 0.44
Hypothyroidism 0.39
Sleep Apnea 0.33
AFB 0.18
Valvular Heart Disease 0.13
COPD 0.12
Ablation 0.12
Systemic Embolysim 0.03
Hyperthyroidism 0.03
Top 30 predictors after CHA2DS2-VASc & atrial fibrillation
AFB Trend (5-day) 4.15
AFB Trend (21-day) 4.15
AFB Trend (8-day) 4.05
AFB Trend (3-day) 4.01
AFB Trend (2-day) 3.95
AFB Trend (13-day) 3.72
DA CMA 2.44
AFB CMA 2.14
AFB Trend (1-day) 2.14
DA 1.77
DA Trend (21-day) 1.59
NHR Trend (21-day) 1.57
HRV Trend (21-day) 1.55
OAC Pre Implant 1.28
DA Trend (13-day) 1.24
DHR Trend (21-day) 1.23
Chronic Kidney Disease 1.19
HRV Trend (13-day) 1.06
NHR Trend (13-day) 1.05
DA Trend (8-day) 0.96
DHR Trend (13-day) 0.87
HRV CMA 0.82
NHR CMA 0.80
OAC Post Implant 0.77
HRV Trend (8-day) 0.76
Myocardial Infarction 0.75
DHR CMA 0.74
Coronary Artery Disease 0.73
NHR Trend (8-day) 0.71
DA Trend (5-day) 0.70
Variable Importance
Association with Stroke Risk: Negative Non-linear Positive