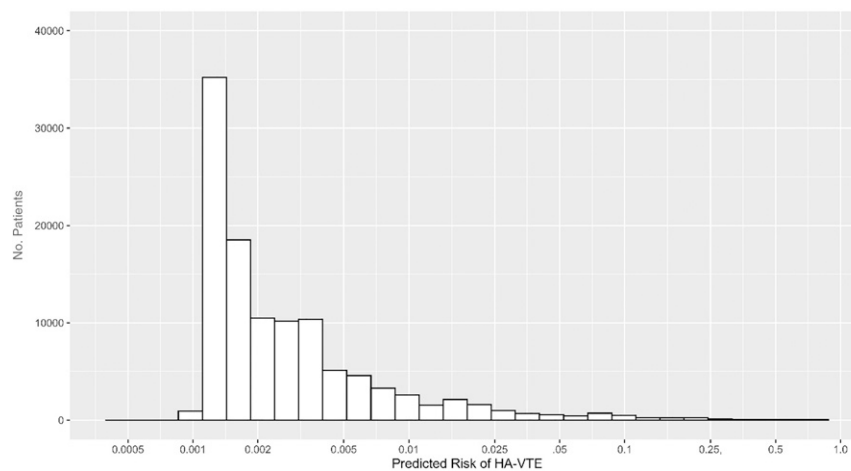


## Supplemental Information

Variable	Coefficient
Intercept	-2.537
History of thrombosis	2.156
Surgical procedure performed	.045
Cancer diagnosis	.486
Infectious disease consult	.932
Cardiology consult	1.436
Blood gas ordered	1.121
Central line present	1.583
Patient age in years	.056
MCHC (if missing, impute value of 34.0)	-.147
RDW (if missing, impute value of 14.3)	.059
Lactate (if missing, impute value of 1.3)	.079

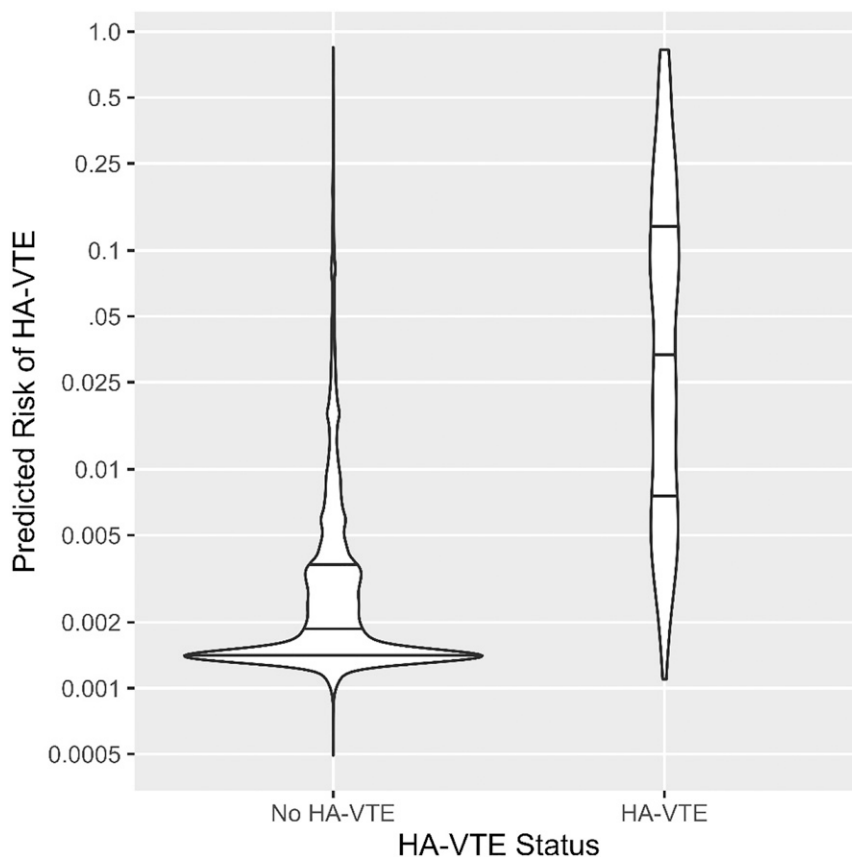
### SUPPLEMENTAL FIGURE 4

HA-VTE risk-prediction model equation. Probability of HA-VTE =  $\frac{1}{1 + 2.7183^{-z}} \times 100$  (round to 1 decimal place and display as a percentage), where  $Z = -2.537 + (2.156 \times 1 \text{ if patient has a history of thrombosis, } 0 \text{ otherwise}) + (0.045 \times 1 \text{ if surgical procedure performed during this encounter, } 0 \text{ otherwise}) + (0.486 \times 1 \text{ if patient has a diagnosis of cancer, } 0 \text{ otherwise}) + (0.932 \times 1 \text{ if infectious disease consult ordered this encounter, } 0 \text{ otherwise}) + (1.436 \times 1 \text{ if cardiology consult ordered this encounter, } 0 \text{ otherwise}) + (1.121 \times 1 \text{ if blood gas laboratory panel was ordered this encounter, } 0 \text{ otherwise}) + (1.583 \times 1 \text{ if patient has a central line, } 0 \text{ otherwise}) + (0.056 \times \text{patient age in years}) + (-0.147 \times \text{patient MCHC [if MCHC is missing, impute a value of 34.0]}) + (0.059 \times \text{patient RDW [if RDW is missing, impute a value of 14.3]}) + (0.079 \times \text{patient lactate [if lactate is missing, impute a value of 1.3]})$ .



### SUPPLEMENTAL FIGURE 5

Distribution of HA-VTE predicted risk across the derivation cohort. A visual representation of the HA-VTE predicted risk distribution across the derivation cohort. The x-axis is shown on log-transformed scale for clarity. The median overall predicted probability was 0.002 (interquartile range 0.001–0.004).



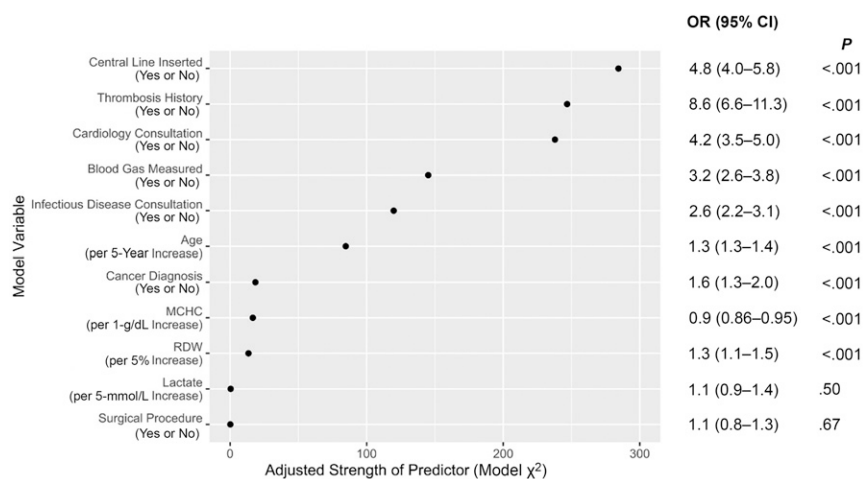
**SUPPLEMENTAL FIGURE 6**

Violin plot displaying the distribution of HA-VTE predicted risk in the derivation cohort. In the subgroup of patients who did not experience an HA-VTE, the median predicted probability was 0.002 (interquartile range 0.001–0.004). In the subgroup of patients who experienced an HA-VTE, the median predicted probability was 0.03 (interquartile range 0.007–0.136). Patients in the subgroup that experienced an HA-VTE had a significantly higher mean predicted probability (0.007 in the HA-VTE-negative group versus 0.113 in the HA-VTE-positive group; difference in means = 0.106; 95% CI for difference in means 0.094–0.118;  $P < .0001$ ).

<b>A</b>	HA-VTE Yes	HA-VTE No	Total	<b>B</b>	HA-VTE Yes	HA-VTE No	Total
Predicted risk $\geq 10\%$	242	964	1,206	Predicted risk $\geq 5\%$	370	2,350	2,720
Predicted risk $< 10\%$	573	109,573	110,146	Predicted risk $< 5\%$	445	108,187	108,632
<b>Total</b>	<b>815</b>	<b>110,537</b>	<b>111,352</b>	<b>Total</b>	<b>815</b>	<b>110,537</b>	<b>111,352</b>
Sensitivity	(242 of 815)		29.7%	Sensitivity	(370 of 815)		45.4%
Specificity		(109,573 of 110,537)	99.1%	Specificity		(108,187 of 110,537)	97.9%
Positive predictive value	(242 of 1,206)		20.1%	Positive predictive value	(370 of 2,720)		13.6%
Negative predictive value		(109,573 of 110,146)	99.5%	Negative predictive value		(108,187 of 108,632)	99.6%

**SUPPLEMENTAL FIGURE 7**

Model performance at discrete risk thresholds. Tables that provide sensitivity, specificity, and positive and negative predictive values for the HA-VTE risk-prediction model at various risk thresholds. A, The information at a risk threshold of  $\geq 10\%$ . B, The information at a risk threshold of  $\geq 5\%$ .



### SUPPLEMENTAL FIGURE 8

Summary of multivariable logistic regression model using multiple imputation for missing data in which relative importance of variables in predictive model is shown. Scores are ordered by the adjusted strength of each predictor as quantified by model  $\chi^2$  statistic. Variables used for imputation included all variables included in multivariable model as well as patient sex and additional available laboratory values (creatinine, potassium, sodium, blood urea nitrate, platelet count, glucose, hemoglobin, white blood count, and mean corpuscular volume). Model calibration statistics did not meaningfully differ between primary and imputed models (primary model concordance statistic = 0.908, Brier score = 0.007; imputation model concordance statistic = 0.904, Brier score = 0.007).

**SUPPLEMENTAL TABLE 5** ICD-9 or ICD-10 Codes Used to Define Acute VTE

Description	
ICD-10 codes	
I82.A19	Acute embolism and thrombosis of unspecified axillary vein
I82.B19	Acute embolism and thrombosis of unspecified subclavian vein
I82.C19	Acute embolism and thrombosis of unspecified internal jugular vein
I82.419	Acute embolism and thrombosis of unspecified femoral vein
I82.439	Acute embolism and thrombosis of unspecified popliteal vein
I82.4Y9	Acute embolism and thrombosis of unspecified deep veins of unspecified proximal lower extremity
I82.449	Acute embolism and thrombosis of unspecified tibial vein
I82.499	Acute embolism and thrombosis of other specified deep vein of unspecified lower extremity
I82.4Z9	Acute embolism and thrombosis of unspecified deep veins of unspecified distal lower extremity
I82.409	Acute embolism and thrombosis of unspecified deep veins of unspecified lower extremity
I82.609	Acute embolism and thrombosis of unspecified veins of unspecified upper extremity
I82.619	Acute embolism and thrombosis of superficial veins of unspecified upper extremity
I82.819	Embolism and thrombosis of superficial veins of unspecified lower extremities
I82.890	Acute embolism and thrombosis of other specified veins
I26.92	Saddle embolus of pulmonary artery without acute cor pulmonale
I26.99	Other pulmonary embolism without acute cor pulmonale
ICD-9 codes	
415.1	Pulmonary embolism and infarction
415.19	Other pulmonary embolism and infarction
453.4	Acute venous embolism and thrombosis of deep vessels of lower extremity
453.4	Acute venous embolism and thrombosis of unspecified deep vessels of the lower extremity
453.41	Acute venous embolism and thrombosis of deep vessels of proximal lower extremity
453.42	Acute venous embolism and thrombosis of deep vessels of distal lower extremity
453.6	Venous embolism and thrombosis of superficial vessels of lower extremity
453.81	Acute venous embolism and thrombosis of superficial veins of upper extremity
453.82	Acute venous embolism and thrombosis of deep veins of upper extremity
453.83	Acute venous embolism and thrombosis of upper extremity, unspecified
453.84	Acute venous embolism and thrombosis of axillary veins
453.85	Acute venous embolism and thrombosis of subclavian veins
453.86	Acute venous embolism and thrombosis of internal jugular veins
453.87	Acute venous embolism and thrombosis of other thoracic veins
453.89	Acute venous embolism and thrombosis of other specified veins

**SUPPLEMENTAL TABLE 6** ICD-9 or ICD-10 Codes Used to Define Personal History of VTE

Description	
ICD-10 codes	
Z86.718	Personal history of other venous thrombosis and embolism
ICD-9 codes	
V12.51	Personal history of venous thrombosis and embolism

**SUPPLEMENTAL TABLE 7** CPT Codes Used to Define CVC

CPT Code	Description
36560	Insertion of tunneled centrally inserted central venous access device, with subcutaneous port; <5 y of age
36570	Insertion of peripherally inserted central venous access device, with subcutaneous port; <5 y of age
36561	Insertion of tunneled centrally inserted central venous access device, with subcutaneous port, ≥5 y of age
36571	Insertion of peripherally inserted central venous access device, with subcutaneous port, ≥5 y of age
36578	Replacement, catheter only, of central venous access device, with subcutaneous port or pump, central or peripheral insertion site
36563	Insertion of tunneled centrally inserted central venous access device with subcutaneous pump
36565	Insertion of tunneled centrally inserted central venous access device, requiring 2 catheters via 2 separate venous access sites; without subcutaneous port or pump
36566	Insertion of tunneled centrally inserted central venous access device, requiring 2 catheters via 2 separate venous access sites; with subcutaneous port(s)
36580	Replacement, complete, of a nontunneled centrally inserted CVC, without subcutaneous port or pump, through same venous access
36581	Replacement, complete, of a tunneled centrally inserted CVC, without subcutaneous port or pump, through same venous access
36582	Replacement, complete, of a tunneled centrally inserted central venous access device, with subcutaneous port, through same venous access
36583	Replacement, complete, of a tunneled centrally inserted central venous access device, with subcutaneous pump, through same venous access
36584	Replacement, complete, of a peripherally inserted CVC, without subcutaneous port or pump, through same venous access
36585	Replacement, complete, of a peripherally inserted central venous access device, with subcutaneous port, through same venous access
36558	Insertion tunneled centrally inserted CVC without port or pump; ≥5 y of age
36557	Insertion of tunneled centrally inserted CVC, without subcutaneous port or pump; <5 y of age
36556	Insertion nontunneled centrally inserted venous catheter; ≥5 y of age
36555	Insertion of nontunneled centrally inserted CVC; <5 y of age
36569	Insertion peripherally inserted CVC, without subcutaneous port or pump; ≥5 y of age
36568	Insertion of peripherally inserted CVC, without subcutaneous port or pump; <5 y of age

To ensure CVCs were not missed during subsequent admissions, CPT codes for the catheter placement and replacement were linked to the dates they were placed, and then those dates were used to identify both the initial hospital encounter and subsequent hospital admission encounters.

**SUPPLEMENTAL TABLE 8** Variables Considered For Model Inclusion

	Variables Considered
1	ICU admission
2	Surgery performed
3	Cancer diagnosis
4	Infectious disease condition
5	Positive blood culture result
6	Blood gas performed
7	Sepsis diagnosis
8	Cardiology condition
9	CVC
10	Sex
11	Race and ethnicity
12	Age
13	Personal history of thrombosis
14	Sickle cell diagnosis
15	Potassium
16	Sodium
17	Creatinine
18	SUN
19	Glucose
20	Platelet count
21	Hematocrit
22	Hemoglobin
23	WBC
24	MCHC
25	RDW
26	MCV
27	Lactate
28	ANC
29	CRP
30	ESR
31	Factor VIII activity
32	D-dimer
33	PTT
34	PT
35	Height
36	Weight
37	BMI
38	Admission unit
39	Braden score
40	Immobilization
41	Mechanical ventilation
42	Pressor medications

Forty-two predictor variables were identified a priori to consider for use in the HA-VTE risk-prediction model. Six variables were eliminated from consideration because of their inability to be easily extracted from the medical record system (variables 5, 35, and 39–42). Five variables were eliminated because of concerns for reverse causation (variables 30–34). Six variables were eliminated because of collinearity concerns (variables 1, 21, 28, and 36–38). Race and ethnicity (variable 11) were not included to avoid introducing potential bias. After narrowing the list of candidate predictors, 24 variables remained. Univariate significance testing was done on these variables to arrive at our final model. Variables that did not reveal significant differences (using a criterion of  $P < .05$ ) between the HA-VTE-negative and -positive groups were removed from model consideration. As a post hoc sensitivity analysis, a full model was fit with the 24 predictor variables remaining. We removed the variables with a nonsignificant contribution to the model by using analysis of variance  $\chi^2$  criteria. The reduced model matches the final model. After review of incorrectly predicted patients, a decision was made to keep the predictor variable of patients undergoing surgery. We then tested the correlation between predicted risk in full model (24 variables) and the reduced model (11 variables) and found a high correlation in the predicted risks ( $R^2 = 0.97$ ). Because of the goal of incorporating the final model into the EMR, we determined the simplified model was justified. ANC, absolute neutrophil count; CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; MCV, mean corpuscular volume; PT, prothrombin time; PTT, partial thromboplastin time; SUN, serum urea nitrogen; WBC, white blood cell count.