

SUPPLEMENTARY DATA

Supplementary methods – Sensitivity Analysis

1. Parametric Model

The parametric model was used for the following cohorts 1) patients with suspected thrombotic thrombocytopenic purpura (TTP), 2) patients who underwent ≥ 2 therapeutic plasma exchange (TPE) procedures, and 3) after removing potential outliers (time to TPE > 5 days). This methodology was also used based on the cluster analysis for the following cohorts 1) after removing outlier clusters, and 2) after removing clusters with time to TPE 100-200 h. For all parametric models, we first checked the assumption of linearity between time to TPE and log odds of the primary composite outcome. Given the non-linear association identified for all cohorts, we visually observed potential knot placements and utilized cubic splines in the model formulation [1]. We then performed logistic regression to determine the optimal threshold for TPE initiation.

2. Nonparametric Model

Given the non-linear association identified between time to TPE and log odds of the primary outcome, we also evaluated generalized additive modeling (GAM). GAM extends traditional logistic regression by allowing for flexible, non-linear relationships between the predictor of interest (time to treatment) and the outcome. Thus, we avoided the need to select knots and the subsequent use of splines. This methodology was used in our cohort of patients with suspected TTP. Finally, we used the nonparametric model with bootstrapping ('cutpointr' package in R) for the cluster analysis after excluding clusters with time to TPE of 100-200 h [2].

Supplementary results – bootstrapping

The bootstrapping results (1000 resamples) identified a median time threshold for TPE initiation of 14.1 h (interquartile range [IQR] 13.5 – 25.4 h, see Supplementary Figure 1).

Supplementary results – clustering analysis

Supplementary Table 1. Clustering based on time to TPE initiation							
Variable	Cluster #1 (n = 74)	Cluster #2 (n = 33)	Cluster #3 (n = 21)	Cluster #4 (n = 11)	Cluster #5 (n = 6)	Cluster #6 (n = 3)	Suspected TTP (n = 148)
Time to TPE Initiation							
Time to TPE (h)							
Mean (SD)	9.3 (5.6)	37.6 (10.3)	90.6 (21.6)	194.4 (24.5)	310.0 (46.6)	534.7 (77.0)	63.8 (101.6)
Median	7.4	40.2	88.9	195.7	304.3	560.5	22.6
Range	(0.6-21.6)	(23.5-53.7)	(66.1-131.8)	(162.9-234.3)	(261.2-375.6)	(448.2-595.5)	(0.6-595.5)
Demographics							
Age (years)							
Mean (SD)	48.1 (16.6)	54.1 (18.4)	51.5 (22.7)	43.7 (21.1)	55.8 (15.8)	61.3 (12.5)	50.2 (18.2)
Median	47.5	51.0	51.0	41.0	57.5	61.0	50.0
Range	(18.0-82.0)	(12.0-85.0)	(13.0-87.0)	(7.0-76.0)	(35.0-73.0)	(49.0-74.0)	(7.0-87.0)
Gender							
Female	56 (75.7%)	23 (69.7%)	13 (61.9%)	8 (72.7%)	3 (50.0%)	1 (33.3%)	104 (70.3%)
Male	18 (24.3%)	10 (30.3%)	8 (38.1%)	3 (27.3%)	3 (50.0%)	2 (66.7%)	44 (29.7%)
Race							
White	43 (58.1%)	19 (57.6%)	17 (81.0%)	8 (72.7%)	6 (100.0%)	3 (100.0%)	96 (64.9%)
Black or Afro-American	22 (29.7%)	7 (21.2%)	2 (9.5%)	1 (9.1%)	0 (0.0%)	0 (0.0%)	32 (21.6%)
Asian	1 (1.4%)	2 (6.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (2.0%)
Other	2 (2.7%)	3 (9.1%)	1 (4.8%)	1 (9.1%)	0 (0.0%)	0 (0.0%)	7 (4.7%)
Not Reported	6 (8.1%)	2 (6.1%)	1 (4.8%)	1 (9.1%)	0 (0.0%)	0 (0.0%)	10 (6.8%)
Ethnicity							
Hispanic	2 (2.7%)	2 (6.1%)	1 (4.8%)	1 (9.1%)	1 (16.7%)	0 (0.0%)	7 (4.7%)
Non-Hispanic	66 (89.2%)	29 (87.9%)	19 (90.5%)	9 (81.8%)	5 (83.3%)	3 (100.0%)	131 (88.5%)
Not Specified	6 (8.1%)	2 (6.1%)	1 (4.8%)	1 (9.1%)	0 (0.0%)	0 (0.0%)	10 (6.8%)
Comorbidities							
Diabetes	17 (23.0%)	7 (21.2%)	5 (23.8%)	1 (9.1%)	0 (0.0%)	3 (100.0%)	33 (22.3%)
Heart Failure	5 (6.8%)	4 (12.1%)	4 (19.0%)	3 (27.3%)	0 (0.0%)	2 (66.7%)	18 (12.2%)
Renal Disease	39 (52.7%)	26 (78.8%)	16 (76.2%)	9 (81.8%)	5 (83.3%)	3 (100.0%)	98 (66.2%)
Hepatic Disease	4 (5.4%)	3 (9.1%)	3 (14.3%)	4 (36.4%)	1 (16.7%)	2 (66.7%)	17 (11.5%)
Stroke	6 (8.1%)	6 (18.2%)	4 (19.0%)	2 (18.2%)	0 (0.0%)	1 (33.3%)	19 (12.8%)
Transient Ischemic Attack	0 (0.0%)	0 (0.0%)	2 (9.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (1.4%)
Venous Thrombosis	6 (8.1%)	10 (30.3%)	2 (9.5%)	2 (18.2%)	3 (50.0%)	2 (66.7%)	25 (16.9%)
Pulmonary Embolism	4 (5.4%)	1 (3.0%)	1 (4.8%)	0 (0.0%)	1 (16.7%)	0 (0.0%)	7 (4.7%)

Immune Thrombocytopenia	8 (10.8%)	1 (3.0%)	2 (9.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	11 (7.4%)
Evans Syndrome	0 (0.0%)	0 (0.0%)	1 (4.8%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.7%)
SLE	2 (2.7%)	1 (3.0%)	1 (4.8%)	1 (9.1%)	0 (0.0%)	1 (33.3%)	6 (4.1%)
APS	4 (5.4%)	2 (6.1%)	3 (14.3%)	1 (9.1%)	0 (0.0%)	1 (33.3%)	11 (7.4%)
Admission Labs							
Hemoglobin							
Mean (SD)	9.4 (2.2)	9.8 (2.5)	10.0 (2.1)	9.9 (2.2)	9.3 (1.2)	12.0 (3.1)	9.7 (2.3)
Median	9.3	9.3	10.0	10.2	8.8	12.4	9.4
Range	(4.7-16.4)	(4.8-15.5)	(6.4-14.0)	(7.1-15.3)	(7.9-11.3)	(8.8-14.9)	(4.7-16.4)
Platelets							
Mean (SD)	36.7 (56.8)	70.5 (85.5)	108.5 (87.6)	120.1 (86.1)	174.7 (160.0)	162.7 (71.9)	68.8 (85.2)
Median	19.0	42.5	82.0	119.0	113.0	171.0	36.0
Range	(4.0-333.0)	(5.0-380.0)	(10.0-305.0)	(13.0-273.0)	(34.0-464.0)	(87.0-230.0)	(4.0-464.0)
Lactate Dehydrogenase							
Mean (SD)	1194.6 (951.2)	1043.6 (950.4)	792.3 (641.7)	1189.1 (952.0)	601.8 (383.2)	343.7 (57.0)	1062.3 (898.7)
Median	846.5	700.5	610.0	577.0	533.0	372.0	730.0
Range	(207.0-5002.0)	(126.0-3797.0)	(161.0-2864.0)	(307.0-2797.0)	(235.0-1235.0)	(278.0-381.0)	(126.0-5002.0)
Creatinine							
Mean (SD)	2.0 (2.1)	2.2 (1.2)	1.9 (1.4)	2.8 (2.5)	1.8 (1.2)	1.8 (1.2)	2.1 (1.8)
Median	1.2	2.0	1.2	1.3	1.5	1.2	1.4
Range	(0.6-14.2)	(0.5-5.6)	(0.7-5.7)	(0.5-7.3)	(0.8-4.2)	(1.0-3.1)	(0.5-14.2)
Outcomes							
Composite outcome	38 (51.4%)	24 (72.7%)	14 (66.7%)	6 (54.5%)	5 (83.3%)	2 (66.7%)	89 (60.1%)
Time to platelet recovery (d)							
Mean (SD)	5.6 (4.0)	11.5 (13.2)	11.1 (10.5)	7.1 (1.3)	16.9 (N/A)	N/A	7.6 (8.0)
Median	4.6	4.6	7.1	7.1	16.9	N/A	4.6
Range	(0.3-26.3)	(1.1-39.5)	(2.9-32.9)	(6.2-8.0)	(16.9-16.9)	N/A	(0.3-39.5)
Refractory TTP	9 (18.0%)	6 (35.3%)	5 (41.7%)	2 (28.6%)	2 (100.0%)	1 (100.0%)	25 (28.1%)
TTP relapse	6 (8.1%)	2 (6.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	8 (5.4%)
TTP exacerbation	13 (17.6%)	2 (6.1%)	3 (14.3%)	0 (0.0%)	1 (16.7%)	0 (0.0%)	19 (12.8%)
APS: antiphospholipid syndrome; SD: Standard deviation; SLE: Systemic Lupus Erythematosus; N/A: Not applicable; TTP: Thrombotic thrombocytopenic purpura							

Cluster #1: “Prompt TPE initiation with the best outcomes”

This cluster consisted of younger (48.1 ± 16 years old) and predominantly female (75.7%) patients. This cluster had the shortest mean time to TPE initiation (9.3 ± 5.6 h). Additionally, this cluster had the best rates of the primary composite outcome (51.4%). Finally, this cluster had the shortest time to platelet recovery (5.6 ± 4.0 days) and lowest rate of refractory TTP (18.0%).

Cluster #2: “Rapid TPE initiation with worse outcomes”

This cluster consisted of older (54.1 ± 18.4 years old) and predominantly female (69.7%) patients. This cluster had the second shortest mean time to TPE initiation (37.6 ± 10.3 h). Despite rapid TPE initiation, patients from this cluster had the second highest rate of the composite outcome (72.7%). Additionally, these patients had second longest mean time to platelet recovery (11.5 ± 13.2 days). Finally, refractory TTP occurred in 35.3% of the patients.

Cluster #3: “Small delay in TPE initiation with worse outcomes”

This cluster consisted of older (51.5 ± 22.7 years old) and predominantly female (61.9%) patients. Mean time to TPE initiation was 90.6 ± 21.6 h, which is higher than the average for the overall cohort. Patients from this cluster had worse outcomes: composite outcome (66.7%), time to platelet recovery (11.1 ± 10.5 days) and refractory TTP (41.7%).

Cluster #4 “Long delay in TPE initiation with better outcomes”

This cluster consisted of younger (43.7 ± 21.1 years old) and predominantly female (72.7%) patients. Mean time to TPE was 194.4 ± 24.5 h. Despite the long delay for TPE initiation, patients from this cohort had the second lowest rate of the composite outcome (54.5%) and refractory TTP (28.6%). Additionally, time to platelet recovery was 7.1 ± 1.3 days (the second shortest mean time).

Cluster #5: “Huge delay in TPE initiation with the worst outcomes”

This cluster consisted of older patients (55.8 ± 15.8 years old) and had 50% of males. A huge delay in TPE initiation occurred in this cluster – mean time was 310.0 ± 46.6 h. This cluster had the worst outcomes rates: composite outcome (83.3%) and refractory TTP (100%). Additionally, this cluster had the longest time to platelet recovery (16.9 days).

Cluster #6: “Extreme delay in TPE initiation with worse outcomes”

This cluster consisted of older (61.3 ± 12.5 years old) and predominantly male (66.7%) patients. This cluster had the longest mean time to TPE initiation (534.7 ± 77.0 h). Despite being the cluster with the longest time to TPE initiation, the composite outcome occurred in only 66.7% of

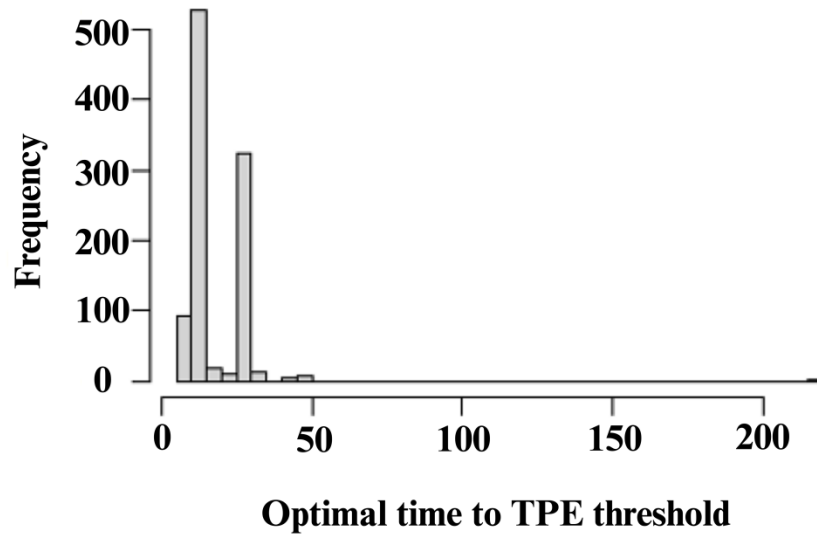
patients, which is better than cluster #2 and #5. Due to the low number of patients and missing lab data, mean time to platelet recovery was not available. Refractory TTP occurred in 100% of the patients.

References

- [1] Gauthier J, Wu QV, Gooley TA. Cubic splines to model relationships between continuous variables and outcomes: a guide for clinicians. *Bone Marrow Transplant* 2020;55:675–80. <https://doi.org/10.1038/s41409-019-0679-x>.
- [2] Thiele C, Hirschfeld G. **cutpointr**: Improved Estimation and Validation of Optimal Cutpoints in R. *J Stat Soft* 2021;98. <https://doi.org/10.18637/jss.v098.i11>.

Figure Legend

Supplementary Figure 1: Optimal time to therapeutic plasma exchange threshold identified by bootstrapping (1000 resamples). Median time to therapeutic plasma exchange threshold identified of 14.1 h (IQR 13.5 – 25.4 h)



TPE: Therapeutic plasma exchange.

Appendix

Table 1. ICD and CPT Codes			
Variables	ICD-9 Codes	ICD-10 Codes	CPT Code
Therapeutic Plasma Exchange	99.71	6A550Z3, 6A551Z3	36514
Bleeding			
Gastrointestinal Bleeding	455.8, 456.0, 456.20 456.8, 530.21, 530.7, 530.82, 531.0x, 531.2x, 531.4x, 531.6x, 532.0x, 532.2x, 532.4x, 532.6x, 533.0x, 533.2x, 533.4x, 533.6x, 534.0x, 534.2x, 534.4x, 534.6x, 535.01, 535.11, 535.21, 535.31, 535.41, 535.51, 535.61, 535.71, 537.83, 537.84, 562.02, 562.03, 562.12, 562.13, 569.3, 569.85, 577.8, 578.x, 784.8, 569.86	I85.01, I85.11, K20.81, K22.11, K25.2, K25.4, K25.6, K26.0, K26.2, K26.4, K26.6, K27.0, K27.2, K27.4, K27.6, K28.0, K28.2, K28.4, K28.6, K29.01, K29.21, K29.31, K29.41, K29.51, K29.61, K29.71, K29.81, K29.91, K31.811, K31.82, K50.011, K50.111, K50.811, K50.911, K51.011, K51.211, K51.311, K51.411, K51.511, K51.811, K51.911, K55.21, K57.01, K57.11, K57.13, K57.21, K57.31, K57.33, K57.41, K57.51, K57.53, K57.81, K57.91, K57.93, K62.5, K92.0, K92.1, K92.2, D78.21, D78.22, K22.6, K25.0, K20.91, K21.01, K91.840, K91.841	44.43
Intracranial Haemorrhage	430, 431, 432.0, 432.1, 432.9, 852.0x, 852.2x, 852.4x, 853.0x, 853.1x	I60, I60.0, I60.00, I60.01, I60.02, I60.1, I60.10, I60.11, I60.12, I60.2, I60.3, I60.30, I60.31, I60.32, I60.4, I60.5, I60.50, I60.51, I60.52, I60.6, I60.7, I60.8, I60.9, I61, I61.0, I61.1, I61.2, I61.3, I61.4, I61.5, I61.6, I61.8, I61.9, I62, I62.0, I62.00, I62.01, I62.02, I62.03, I62.1, I62.9, I60.20, I60.21, I60.22, S06.4X0A, S06.4X1A, S06.4X2A, S06.4X3A, S06.4X4A, S06.4X5A, S06.4X6A, S06.4X7A, S06.4X8A, S06.4X9A, G97.51, G97.52	-
Genitourinary Haemorrhage	580.9, 596.7, 596.8, 596.7x, 599.7x 602.1x, 620.1, 621.4, 626.2, 626.5, 626.7, 626.8, 626.9	R31.0, R31.9, N42.1, N93.8, N93.9, N95.0, N99.820, N99.821	-
Pulmonary Haemorrhage	786.3x	R04.2, R04.89, R04.9, J95.830, J95.831	-
Other Haemorrhage	285.1, 360.43, 362.43, 362.81, 363.61, 363.62, 363.72, 364.41, 372.72, 374.81, 376.32, 377.42, 379.23, 423.0x, 459.0, 568.81, 719.1x, 784.7, 784.8, 958.2, 997.02, 998.11, 729.92	H05.23, H05.231, H05.232, H05.233, H21.0, H21.00, H21.01, H21.02, H21.03, H31.3, H31.30, H31.301, H31.302, H31.303, H31.309, H31.31, H31.311, H31.312, H31.313, H31.319, H31.31, H31.311, H31.312, H31.313, H31.319, H31.41, H31.411, H31.412, H31.413, H31.419, H35.6, H35.60, H35.61, H35.62, H35.63, H35.73, H35.731, H35.732, H35.733, H35.739, H43.1, H43.10, H43.11, H43.12, H43.13, H44.81, H44.811, H44.812, H44.813, H44.819, H47.02, H47.021, H47.022, H47.023, H47.029, H61.12, H61.121, H61.122, H61.123, H61.129, I31.2, K66.1, M25.00, M25.01, M25.011, M25.012, M25.019, M25.02, M25.021, M25.022, M25.029, M25.03, M25.031, M25.032, M25.039, M25.04, M25.041, M25.042, M25.049, M25.05, M25.051, M25.052, M25.059, M25.06, M25.061, M25.062, M25.069, M25.07, M25.071, M25.072, M25.073, M25.074, M25.075, M25.076, M25.08, M79.81, R04.0,	99.04

		R04.1, R23.3, R58, H05.239, H59.311, H59.312, H59.313, H59.319, H59.321, H59.322, H59.323, H59.329, H95.41, H95.42, I97.610, I97.611, I97.618, I97.62, L76.21, L76.22, M96.830, M96.831	
Thrombosis			
Arterial thrombosis	Myocardial Infarction 410.0, 410.00, 410.01, 410.02, 410.10, 410.11, 410.12, 410.20, 410.21, 410.22, 410.30, 410.31, 410.32, 410.40, 410.41, 410.42, 410.50, 410.51, 410.52, 410.60, 410.61, 410.62, 410.70, 410.71, 410.72, 410.80, 410.81, 410.82, 410.9, 410.91, 410.92, 410.1, 410.2, 410.3, 410.4, 410.5, 410.6, 410.7, 410.8, 410.9, 411.81, 411.0 Ischemic Stroke 433.01, 433.11, 433.21, 433.31, 433.81, 433.91, 434.01, 434.1, 434.10, 434.11, 434.90, 434.91, 437.1 Amputation // Extremities 444.2, 444.21, 444.22, 445.01, 445.02, 84.0, 84.00, 84.01, 84.02, 84.03, 84.04, 84.05, 84.06, 84.07, 84.08, 84.09, 84.1, 84.10, 84.11, 84.12, 84.13, 84.14, 84.15, 84.16, 84.17, 84.18, 84.19, Others 444, 444.0, 444.01, 444.09, 444.1, 444.8, 444.81, 444.89, 444.9, 557.0, 557.1, 557.9, 445.81, 445.89	Myocardial Infarction I21.xx, I22.xx, I23.xx, I24.9. Ischemic Stroke I63.xx, G46.xx. Amputation // Extremities 0Y6H0Z3, 0Y6J0Z3, 0Y6H0Z1, 0Y6H0Z2, 0Y6H0Z3, 0Y6J0Z1, 0Y6J0Z2, 0Y6J0Z3, 0Y6F0ZZ, 0Y6G0ZZ, 0Y6C0Z1, 0Y6C0Z2, 0Y6C0Z3, 0Y6D0Z1, 0Y6D0Z2, 0Y6D0Z3, 0Y670ZZ, 0Y680ZZ, 0Y620ZZ, 0Y630ZZ, 0Y640ZZ, 0Y6M0Z0, 0Y6N0Z0, 0Y6P0Zx, 0Y6Q0Zx, 0Y6R0Zx, 0Y6S0Zx, 0Y6U0Zx, "0Y6V0Zx, 0Y6W0Zx, 0Y6X0Zx, 0Y6Y0Zx, 0Y6M0Zx, 0Y6N0Zx, 0Y6T0Zx, I74.2, I74.3, I74.4. Others I74.0, I74.01, I74.09, I74.1, I74.10, I74.11, I74.19, I74.5, I74.8, I74.9, K55.01, K55.011, K55.012, K55.019, K55.02, K55.021, K55.022, K55.029, K55.03, K55.031, K55.032, K55.039, K55.04, K55.041, K55.042, K55.049, K55.05, K55.051, K55.052, K55.059, K55.06, K55.061, K55.062, K55.069, H34.0, H34.00, H34.01, H34.02, H34.03, H34.1, H34.10, H34.11, H34.12, H34.13, H34.2, H34.21, H34.211, H34.212, H34.213, H34.219, H34.23, H34.231, H34.232, H34.233, H34.239	CPT-27290, CPT-27590, CPT-27591, CPT-27592, CPT-27594, CPT-27596, CPT-27880, CPT-27881, CPT-27882, CPT-27884, CPT-27886, CPT-27888, CPT-28800, CPT-28805, CPT-28810, CPT-28820, CPT-28825
Venous Thrombosis	Lower Extremities 451.0, 451.11, 451.19, 451.2, 453.40, 453.41, 453.42, 453.50, 453.51, 453.52, 453.6. Upper Extremities 451.82, 451.83, 451.84, 453.71, 453.72, 453.73, 453.81, 453.82, 453.83. Pulmonary Embolism 415.1, 415.11, 415.13, 415.19 Other VTE 451.81, 451.89, 451.9, 452, 453.0, 453.1, 453.2, 453.3, 453.74, 453.75, 453.76, 453.77, 453.79, 453.84, 453.85, 453.86, 453.87, 453.89, 453.9,	Lower Extremities I82.4, I82.40, I82.401, I82.402, I82.403, I82.409, I82.411, I82.412, I82.413, I82.419, I82.42, I82.421, I82.422, I82.423, I82.429, I82.43, I82.431, I82.432, I82.433, I82.439, I82.44, I82.441, I82.442, I82.443, I82.449, I82.45, I82.451, I82.452, I82.453, I82.459, I82.46, I82.461, I82.462, I82.463, I82.469, I82.49, I82.491, I82.492, I82.493, I82.499, I82.4Y, I82.4Y1, I82.4Y2, I82.4Y3, I82.4Y9, I82.4Z, I82.4Z1, I82.4Z2, I82.4Z3, I82.4Z9, I82.501, I82.502, I82.503, I82.509, I82.511, I82.512, I82.513, I82.519, I82.521, I82.522, I82.523, I82.529, I82.531, I82.532, I82.533, I82.539, I82.541, I82.542, I82.543, I82.549, I82.551, I82.552, I82.553, I82.559, I82.561, I82.562, I82.563, I82.569, I82.591, I82.592, I82.593, I82.599, I82.5Y1, I82.5Y2, I82.5Y3,	-

	437.6, 325, 671.30, 671.31, 671.33, 671.40, 671.42, 671.44, 671.90, 671.91, 671.92, 671.93, 671.94, V12.51, V12.52	I82.5Y9, I82.5Z1, I82.5Z2, I82.5Z3, I82.5Z9, I82.811, I82.812, I82.813, I82.819. Upper Extremities I82.6, I82.60, I82.601, I82.602, I82.603, I82.609, I82.61, I82.611, I82.612, I82.613, I82.619, I82.62, I82.621, I82.622, I82.623, I82.629, I82.7, I82.70, I82.701, I82.701, I82.702, I82.703, I82.709, I82.711, I82.712, I82.713, I82.719, I82.721, I82.722, I82.723, I82.729. Pulmonary Embolism I26, I26.0, I26.01, I26.02, I26.09, I26.9, I26.92, I26.93, I26.94, I26.99. Other VTE I81, I82.0, I82.1, I82.2, I82.21, I82.210, I82.21, I82.22, I82.220, I82.221, I82.29, I82.290, I82.291, I82.3, I82.A, I82.A1, I82.A11, I82.A12, I82.A13, I82.A19, I82.A21, I82.A22, I82.A23, I82.A29, I82.B, I82.B11, I82.B12, I82.B13, I82.B19, I82.B2, I82.B21, I82.B22, I82.B23, I82.B29, I82.C, I82.C1, I82.C11, I82.C12, I82.C13, I82.C19, I82.C2, I82.C21, I82.C22, I82.C23, I82.C29, I82.8, I82.89, I82.890, I82.891, I82.9, I82.90, I82.91	
Comorbidities			
Diabetes	294.xx, 250.xx	E08.xxxx, E09.xxxx, E10.xxxx, E11.xxxx, E13.xxxx	-
Heart Failure	398.91, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.xx	I09.81, I11.0, I13.0, I13.2, I50.xxx	-
Renal Disease	580.0 580.4 580.81 580.89 580.9, 585.1, 581.0, 581.1, 581.2, 581.3, 581.81, 581.89, 581.9, 582.0, 582.1, 582.2, 582.4, 582.81, 582.89, 582.9, 583.0, 583.1, 583.2, 583.4, 583.6, 583.7, 583.81, 583.89, 583.9, 587, 584.5, 584.6, 584.7, 584.8, 584.9, 586, 585, 585.1, 585.2, 585.3, 585.4, 585.5, 585.6, 585.9, V42.0, V45.1, V45.11, V45.12, V56.0, V56.1, V56.2, V56.31, V56.32, V56.8, PR39.95, 403.01, 403.11, 403.91, 404.02, 404.03, 404.12, 404.13, 404.92, 404.93.	N00.xx, N01.xx, N02.xx, N03.xx, N04.xx, N05.xx, N06.xx, N07.xx, N08.xx, N11.xx, N12.xx, N14.xx, N16.xx, N13.721, N13.722, N13.729, N13.731, N13.732, N13.739, N17.xx, N18.xx, N19.xx, 5A1D70Z, 5A1D80Z, 5A1D90Z, 5A1D00Z, 5A1D60, 3E1M39Z	-
Hepatic Disease	570, 571.0, 571.1, 571.2, 571.3, 571.40, 571.41, 571.42, 571.49, 571.5, 571.6, 571.8, 571.9, 572.0, 572.1, 572.2, 572.3, 572.4, 572.8, 573.0, 573.4, 573.5, 573.8, 573.9, 789.1, V42.7, 070.0, 070.1, 070.2, 070.20, 070.21, 070.22, 070.23, 070.3, 070.31, 070.32, 070.33, 070.4, 070.41, 070.42, 070.43, 070.44, 070.49, 070.5, 070.51, 070.52, 070.53, 070.54, 070.59, 070.6, 070.70, 070.71,	K70.0, K70.10, K70.11, K70.2, K70.30, K70.31, K70.40, K70.41, K70.9, K71.0, K71.10, K71.11, K71.2, K71.3, K71.4, K71.50, K71.51, K71.6, K71.7, K71.8, K71.9, K72.00, K72.01, K72.10, K72.11, K72.90, K72.91, K73.0, K73.1, K73.2, K73.8, K73.9, K74.00, K74.01, K74.02, K74.1, K74.2, K74.3, K74.4, K74.5, K74.60, K74.69, K75.0, K75.2, K75.3, K75.4, K75.81, K75.89, K75.9, K76.0, K76.1, K76.2, K76.3, K76.4, K76.5,	-

	070.9, 072.71, 571.41, 571.42, 571.49, 573.1, 573.2, 573.3, 456.0, 456.1, 456.20, 456.21, 070.30 and 571.40	K76.6, K76.7, K76.81, K76.89, K76.89, K77, I85.00, I85.01, I85.10, I85.11	
Stroke	433.01, 433.11, 433.21, 433.31, 433.81, 433.91, 434.01, 434.1, 434.10, 434.11, 434.90, 434.91, 437.1	I63.xx, G46.xx.	-
Transient Ischemic Attack	435.0, 435.1, 435.2, 435.3, 435.8, 435.9	G45.0x, G45.1x, G45.2x, G45.3, G45.4x, G45.8x, G45.9x	-
Antiphospholipid syndrome	289.81	D68.61	-
Immune thrombocytopenia	287.31	D69.3	-
Evans syndrome	287.32 OR BOTH 287.31 + 283.0	D69.41 OR BOTH D69.3 + at least one of the following: D59.0, D59.1, D59.10, D59.11, D59.12, D59.13, D59.19	-
Systemic lupus erythematosus	710.0	M32.xx	-
Thrombotic microangiopathy	446.6	M31.1xx	-
ICD = International classification of disease codes; CPT = Current procedural terminology			

