

SUPPLEMENTAL MATERIAL

Table S1. ICD-10-CM and ICD-10 PCS codes used to identify patient characteristics and treatment.

Body mass index	
Underweight	Z681
Morbid obesity	Z684
NIH Stroke Scale	
NIHSS score 0-9	R2970
NIHSS score 10-19	R2971
NIHSS score 20-29	R2972
NIHSS score 30-39	R2973
NIHSS score 40-42	R2974
Stroke Location	
Precerebral artery - unspecified	I6300; I6310; I6320
Cerebral artery - unspecified	I6330; I6340; I6350
Carotid artery	I6303; I6313; I6323
Anterior cerebral artery	I6332; I6342; I6352
Middle cerebral artery	I6331; I6341; I6351
Posterior cerebral artery	I6333; I6343; I6353
Vertebral artery	I6301; I6311; I6321
Cerebellar artery	I6334; I6344; I6354
Basilar artery	I6302; I6312; I6322
Prior cardiac surgery or procedure	
PCI	Z955, Z9861
CABG	Z951
Heart valve surgery	Z95.2; Z95.3; Z95.4
Functional status	
Wheel-chair	Z993
Supplemental oxygen	Z9981
Dependent on provider	Z74
COVID-19	U071
Dialysis	Z992
Stroke Outcomes	
motor deficit (monoplegia, hemiplegia, other paralytic syndrome following CVA)	I6933; I6934; I6935; I6936; G81*; G82; G833; G835; G838
Endovascular thrombectomy	03CG3ZZ
Thrombolytic therapy	3E03

Table S2. 30-day Mortality.

	Unadjusted		Patient Characteristics		Patient and Hospital Characteristics	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Race						
Non-Hispanic White	reference		reference		reference	
Non-Hispanic Black	0.83 (0.8 ,0.85)	0.000	0.7 (0.69 ,0.72)	0.000	0.71 (0.69 ,0.72)	0.000
Hispanic	0.95 (0.92 ,0.98)	0.002	0.91 (0.88 ,0.95)	0.000	0.89 (0.87 ,0.92)	0.000
Age						
65-69	reference		reference		reference	
70-74	1.07 (1.05 ,1.1)	0.000	1.16 (1.13 ,1.19)	0.000	1.16 (1.13 ,1.19)	0.000
75-79	1.34 (1.31 ,1.37)	0.000	1.41 (1.38 ,1.44)	0.000	1.41 (1.38 ,1.45)	0.000
80-84	1.85 (1.81 ,1.89)	0.000	1.92 (1.88 ,1.97)	0.000	1.93 (1.89 ,1.98)	0.000
85-89	2.75 (2.69 ,2.81)	0.000	2.82 (2.75 ,2.89)	0.000	2.85 (2.78 ,2.92)	0.000
90-94	4.25 (4.15 ,4.35)	0.000	4.32 (4.2 ,4.43)	0.000	4.39 (4.28 ,4.51)	0.000
95-	6.76 (6.56 ,6.95)	0.000	6.83 (6.6 ,7.06)	0.000	6.98 (6.76 ,7.22)	0.000
Hospital Covid-19 burden						
Before Covid-19	reference		reference		reference	
0.0-2.0%	1.21 (1.15 ,1.27)	0.00	1.2 (1.14 ,1.27)	0.000	1.2 (1.14 ,1.27)	0.000
2.1-10.0%	1.3 (1.22 ,1.37)	0.00	1.23 (1.15 ,1.32)	0.000	1.24 (1.16 ,1.32)	0.000
10.1-20.0%	1.36 (1.27 ,1.45)	0.00	1.34 (1.25 ,1.45)	0.000	1.32 (1.23 ,1.43)	0.000
20.1-30.0%	1.32 (1.21 ,1.45)	0.00	1.32 (1.19 ,1.46)	0.000	1.32 (1.2 ,1.46)	0.000
30.1%-	1.57 (1.41 ,1.75)	0.00	1.51 (1.34 ,1.69)	0.000	1.52 (1.35 ,1.71)	0.000
Sex						
Male			reference		reference	
Female			0.97 (0.96 ,0.98)	0.000	0.97 (0.96 ,0.98)	0.000
Urgency						
Urgent			0.89 (0.86 ,0.92)	0.000	0.88 (0.86 ,0.91)	0.000
Emergent			reference		reference	
Admission source						
Community			reference		reference	
Hospital			1.37 (1.33 ,1.41)	0.000	1.41 (1.37 ,1.46)	0.000
SNF/Nursing Home			2.08 (2.01 ,2.15)	0.000	2.14 (2.07 ,2.22)	0.000
Other			1.41 (1.34 ,1.5)	0.000	1.45 (1.37 ,1.53)	0.000
Dual-eligible			0.87 (0.86 ,0.89)	0.000	0.87 (0.85 ,0.88)	0.000
Medicare Advantage			0.98 (0.97 ,1)	0.000	1 (0.98 ,1.01)	0.78
Body Mass Index						
Underweight			2 (1.93 ,2.07)	0.000	2.01 (1.94 ,2.09)	0.000
Morbid obesity			0.89 (0.85 ,0.93)	0.000	0.89 (0.85 ,0.93)	0.000
NIH Stroke Scale Score						
0-9			reference		reference	
10-19			4.17 (4.06 ,4.28)	0.000	4.16 (4.05 ,4.27)	0.000
20-29			12.5 (12 ,12.9)	0.000	12.5 (12 ,12.9)	0.000
30-			30.7 (28.6 ,32.9)	0.000	30.5 (28.5 ,32.7)	0.000
missing			2.93 (2.85 ,3.01)	0.000	2.87 (2.79 ,2.94)	0.000
Time elapsed from prior stroke						
No prior stroke			reference		reference	
<= 30 days			1.48 (1.43 ,1.54)	0.000	1.5 (1.44 ,1.55)	0.000
31-60 days			1.38 (1.31 ,1.47)	0.000	1.39 (1.31 ,1.47)	0.000
61-90 days			1.17 (1.09 ,1.27)	0.000	1.18 (1.09 ,1.27)	0.000
91-180 days			1.09 (1.03 ,1.15)	0.003	1.09 (1.03 ,1.15)	0.002
181-360 days			1.03 (0.99 ,1.08)	0.15	1.03 (0.99 ,1.08)	0.15
Stroke location						
Pre-cerebral, unspecified			1.23 (1.13 ,1.33)	0.000	1.24 (1.14 ,1.34)	0.000
Cerebral, unspecified			1.11 (1.08 ,1.15)	0.000	1.13 (1.09 ,1.16)	0.000
Carotid			1.39 (1.34 ,1.44)	0.000	1.41 (1.36 ,1.46)	0.000
Anterior cerebral			1.34 (1.27 ,1.42)	0.000	1.36 (1.28 ,1.43)	0.000
Middle cerebral			2.13 (2.08 ,2.17)	0.000	2.17 (2.12 ,2.21)	0.000
Posterior			1.28 (1.24 ,1.33)	0.000	1.3 (1.26 ,1.35)	0.000
Vertebral			1.44 (1.35 ,1.54)	0.000	1.47 (1.38 ,1.57)	0.000
Cerebellar			1.38 (1.32 ,1.44)	0.000	1.4 (1.34 ,1.46)	0.000
Basilar			3.96 (3.75 ,4.18)	0.000	4.05 (3.84 ,4.27)	0.000
Other			reference		reference	

	Unadjusted		Patient Characteristics		Patient and Hospital Characteristics	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Prior procedures						
PCI			0.76 (0.74 ,0.78)	0.000	0.76 (0.74 ,0.78)	0.000
CABG			0.98 (0.96 ,1.01)	0.17	0.98 (0.95 ,1)	0.06
Heart valve surgery			0.81 (0.78 ,0.85)	0.000	0.83 (0.79 ,0.86)	0.000
Functional Status						
Wheel-chair			1.56 (1.48 ,1.64)	0.000	1.58 (1.5 ,1.67)	0.000
Supplemental oxygen			1.21 (1.16 ,1.27)	0.000	1.2 (1.15 ,1.26)	0.000
Dependent on provider			2.14 (2 ,2.29)	0.000	2.11 (1.97 ,2.26)	0.000
Dialysis			2.46 (2.33 ,2.6)	0.000	2.47 (2.34 ,2.61)	0.000
COVID			1.95 (1.74 ,2.19)	0.000	1.96 (1.75 ,2.19)	0.000
Elixhauser comorbidities						
Congestive heart failure			1.5 (1.48 ,1.53)	0.000	1.51 (1.48 ,1.54)	0.000
Cardiac arrhythmias			1.31 (1.29 ,1.33)	0.000	1.32 (1.3 ,1.34)	0.000
Valvular heart disease			0.73 (0.72 ,0.75)	0.000	0.74 (0.72 ,0.76)	0.000
Pulmonary circulation			1.17 (1.14 ,1.2)	0.000	1.17 (1.14 ,1.21)	0.000
Peripheral vascular disorder			0.96 (0.94 ,0.98)	0.000	0.97 (0.95 ,1)	0.03
Hypertension, uncomplicated			0.72 (0.7 ,0.74)	0.000	0.72 (0.71 ,0.74)	0.000
Hypertension, complicated			0.74 (0.72 ,0.76)	0.000	0.73 (0.71 ,0.76)	0.000
Chronic pulmonary disease			1.12 (1.1 ,1.14)	0.000	1.12 (1.1 ,1.14)	0.000
Diabetes, uncomplicated			1.07 (1.05 ,1.09)	0.000	1.07 (1.05 ,1.09)	0.000
Diabetes, complicated			1.09 (1.07 ,1.11)	0.000	1.09 (1.07 ,1.11)	0.000
Hypothyroidism			0.89 (0.88 ,0.91)	0.000	0.89 (0.88 ,0.9)	0.000
Renal failure			1.12 (1.09 ,1.14)	0.000	1.12 (1.1 ,1.15)	0.000
Liver disease			1.51 (1.44 ,1.58)	0.000	1.52 (1.45 ,1.59)	0.000
Peptic ulcer disease			0.89 (0.82 ,0.97)	0.005	0.89 (0.82 ,0.97)	0.01
AIDS/HIV			1.22 (0.93 ,1.59)	0.16	1.25 (0.95 ,1.63)	0.11
Lymphoma			1.32 (1.23 ,1.42)	0.000	1.34 (1.25 ,1.44)	0.000
Metastatic cancer			3.99 (3.83 ,4.16)	0.000	4.06 (3.9 ,4.24)	0.000
Solid tumor			1.92 (1.86 ,1.98)	0.000	1.93 (1.87 ,2)	0.000
Rheumatoid arthritis			0.97 (0.93 ,1)	0.07	0.97 (0.94 ,1.01)	0.14
Coagulopathy			1.41 (1.37 ,1.45)	0.000	1.43 (1.39 ,1.47)	0.000
Fluid and electrolyte disorder			1.62 (1.59 ,1.64)	0.000	1.61 (1.59 ,1.64)	0.000
Anemia, blood loss			0.98 (0.9 ,1.08)	0.72	0.98 (0.9 ,1.08)	0.72
Anemia, deficiency			0.91 (0.88 ,0.94)	0.000	0.91 (0.88 ,0.94)	0.000
Alcohol abuse			0.99 (0.95 ,1.04)	0.75	1 (0.96 ,1.04)	0.86
Drug abuse			0.9 (0.84 ,0.96)	0.002	0.9 (0.84 ,0.96)	0.002
Psychoses			1.27 (1.18 ,1.36)	0.000	1.28 (1.19 ,1.37)	0.000
Depression			0.89 (0.87 ,0.91)	0.000	0.9 (0.88 ,0.92)	0.000
Volume of stroke hospitalizations						
<50					reference	
50-249					0.86 (0.79 ,0.95)	0.002
250-749					0.84 (0.76 ,0.92)	0.000
750-					0.84 (0.76 ,0.92)	0.000

	Unadjusted		Patient Characteristics		Patient and Hospital Characteristics	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Proportion of minority patients (stroke)						
<5%					reference	
5.0-9.9%					0.98 (0.94 ,1.02)	0.27
10.0-24.9					0.98 (0.94 ,1.02)	0.22
25.0-49.9%					0.97 (0.93 ,1.02)	0.26
50.0%-					0.94 (0.88 ,1)	0.06
Disproportionate share percentage (DSH)						
0-9.9%					reference	
10.0-24.9%					1.07 (1.01 ,1.13)	0.02
25.0-49.9%					1.12 (1.06 ,1.18)	0.000
50.0%-					1.24 (1.15 ,1.33)	0.000
Resident-to-bed ratio						
0					reference	
>0-0.10					0.97 (0.94 ,1)	0.04
0.11-0.20					0.99 (0.95 ,1.04)	0.76
0.21-0.40					0.94 (0.89 ,0.98)	0.01
0.41-					0.93 (0.88 ,0.98)	0.004
Rurality						
Rural hospital					reference	
Large urban hospital					0.82 (0.78 ,0.85)	0.000
Other urban hospital					0.88 (0.85 ,0.92)	0.000
Region						
New England					reference	
Middle Atlantic					1.02 (0.96 ,1.08)	0.48
South Atlantic					1.13 (1.07 ,1.2)	0.000
East North Central					1.06 (1.01 ,1.12)	0.03
East South Central					1.24 (1.17 ,1.32)	0.000
West North Central					1.02 (0.96 ,1.09)	0.51
West South Central					1.14 (1.07 ,1.21)	0.000
Mountain					1.11 (1.04 ,1.18)	0.001
Pacific					1.03 (0.97 ,1.1)	0.37
Puerto Rico					1.56 (1.36 ,1.78)	0.000
Time	0.999 (0.998 ,0.999)	0.000	0.999 (0.998 ,1)	0.01	0.999 (0.998 ,0.999)	0.000
Admission month						
January	reference		reference		reference	
February	1 (0.97 ,1.02)	0.74	1 (0.97 ,1.03)	0.97	1 (0.97 ,1.03)	0.94
March	0.94 (0.91 ,0.97)	0.000	0.94 (0.91 ,0.97)	0.000	0.94 (0.91 ,0.97)	0.000
April	0.94 (0.91 ,0.97)	0.000	0.94 (0.91 ,0.97)	0.000	0.94 (0.91 ,0.97)	0.000
May	0.92 (0.89 ,0.95)	0.000	0.92 (0.89 ,0.95)	0.000	0.92 (0.89 ,0.95)	0.000
June	0.92 (0.89 ,0.94)	0.000	0.92 (0.89 ,0.94)	0.000	0.92 (0.89 ,0.95)	0.000
July	0.91 (0.88 ,0.93)	0.000	0.9 (0.87 ,0.93)	0.000	0.9 (0.87 ,0.93)	0.000
August	0.93 (0.9 ,0.96)	0.000	0.92 (0.89 ,0.95)	0.000	0.92 (0.89 ,0.95)	0.000
September	0.96 (0.93 ,0.99)	0.01	0.96 (0.93 ,0.99)	0.02	0.96 (0.93 ,0.99)	0.02
October	1.01 (0.98 ,1.04)	0.60	1.01 (0.97 ,1.04)	0.70	1.01 (0.98 ,1.04)	0.62
November	1.02 (0.99 ,1.05)	0.11	1.01 (0.98 ,1.05)	0.42	1.02 (0.98 ,1.05)	0.36
December	1.03 (0.99 ,1.06)	0.11	1.06 (1.03 ,1.1)	0.000	1.07 (1.03 ,1.1)	0.000
COVID-19 month						
Before Covid-19	reference		reference		reference	
March-April	1 (0.93 ,1.07)	0.91	0.99 (0.92 ,1.06)	0.726	0.99 (0.92 ,1.06)	0.74
May	0.94 (0.88 ,1)	0.06	0.94 (0.87 ,1.01)	0.09	0.94 (0.87 ,1.01)	0.10
June	0.92 (0.86 ,0.98)	0.01	0.93 (0.87 ,1.01)	0.08	0.93 (0.87 ,1.01)	0.07
July	0.94 (0.87 ,1)	0.06	0.94 (0.87 ,1.01)	0.10	0.94 (0.87 ,1.01)	0.11
August	0.92 (0.86 ,0.99)	0.02	0.94 (0.87 ,1.01)	0.10	0.94 (0.87 ,1.01)	0.11
September	0.88 (0.83 ,0.95)	0.001	0.9 (0.83 ,0.97)	0.01	0.9 (0.84 ,0.97)	0.01
October	0.83 (0.78 ,0.89)	0.000	0.84 (0.78 ,0.91)	0.000	0.84 (0.78 ,0.91)	0.000
November	0.91 (0.85 ,0.98)	0.01	0.9 (0.84 ,0.98)	0.02	0.91 (0.84 ,0.99)	0.02

Figure S1. Flow diagram describing the selection of cases in the analytic cohort.

