

Supplementary Table 1. List of ICD-9-CM codes used for data extraction, 2010-2015, NRD.

	ICD-9-CM code	Description
Asymptomatic carotid artery stenosis	433.10	Occlusion and stenosis of carotid artery without mention of cerebral infarction
	433.30	Occlusion and stenosis of multiple and bilateral precerebral arteries without mention of cerebral infarction
Symptomatic carotid artery stenosis	433.11, 433.31, 433.81, 433.91	Occlusion and stenosis of carotid and precerebral arteries with cerebral infarction
	434.01, 434.11, 434.91	Cerebral thrombosis, embolism, or artery occlusion with cerebral infarction
	435.8-435.9	Transient cerebral ischemia
	437.1	Other generalized ischemic cerebrovascular disease
	362.34, 362.84, 368.12	Transient retinal arterial occlusion, retinal ischemia, or transient visual loss
Carotid endarterectomy	38.12	Endarterectomy, other vessels of head and neck
Carotid artery stenting	39.90	Insertion of non-drug-eluting peripheral (non-coronary) vessel stent(s)
	00.63	Percutaneous insertion of carotid artery stent(s)
Complications or adverse events	410, 410.0-410.9, 410.00-410.92, 997.1	Cardiac events
	415, 415.0, 415.1, 415.11, 415.19	Pulmonary embolization
	453.2, 453.4, 453.41, 453.42, 453.8, 453.81-453.89, 483.9	Deep vein thrombosis
	451, 451.0-451.9, 451.11-451.89	Phlebitis & thrombophlebitis
	518.4, 518.5, 518.51-518.53, 518.81	Acute respiratory failure
	584, 584.5-584.9	Acute renal failure
	780.3, 780.31, 780.39	Seizure
	997.02	Iatrogenic cerebrovascular infarction or hemorrhage
	998.1, 998.11, 998.12	Hematoma/Hemorrhage

Supplementary Table 2. Comparison of baseline characteristics of patients treated for symptomatic and asymptomatic carotid stenosis, 2010-2015.

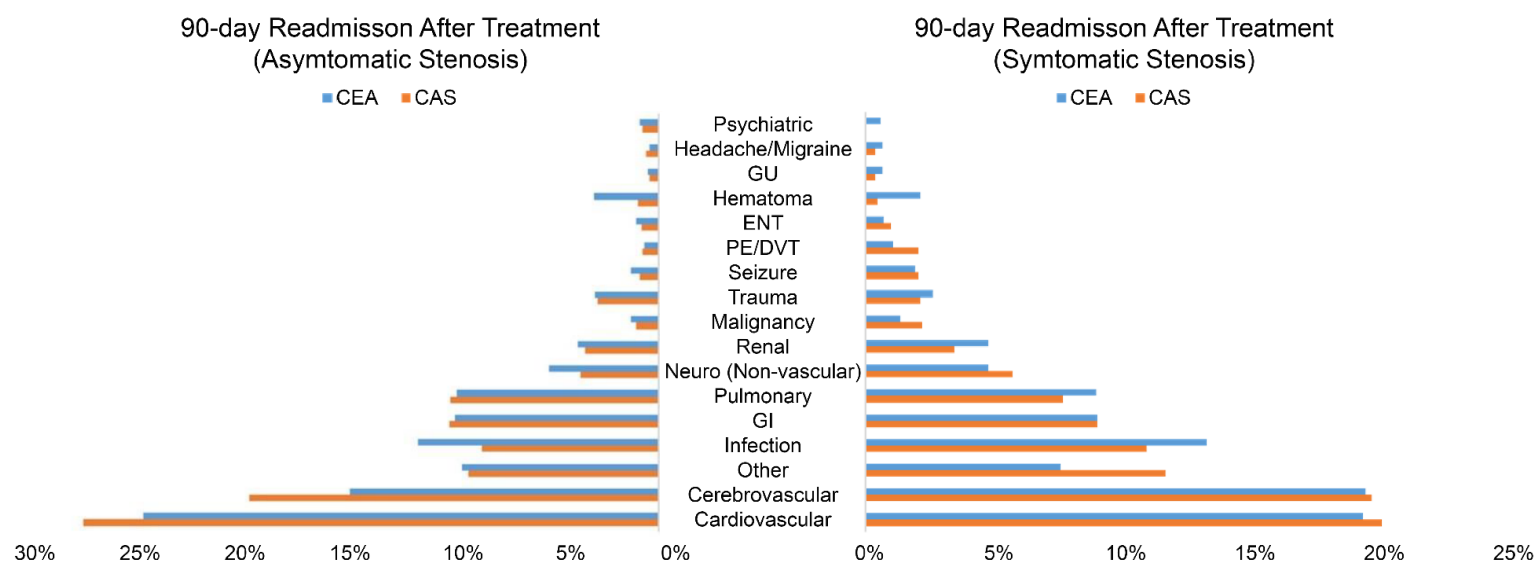
Factors	Asymptomatic carotid stenosis (n=522040)			Symptomatic carotid stenosis (n=55485)		
	CEA (n=460811)	CAS (n=61229)	p-value	CEA (n=44766)	CAS (n=10719)	p-value
	No. of events (%)	No. of events (%)		No. of events (%)	No. of events (%)	
Age Groups			< 0.001			< 0.001
<65 years	104008 (22.6)	14685 (24.0)		13582 (30.3)	3611 (33.7)	
65-79 years	265169 (57.5)	34334 (56.1)		22261 (49.7)	4937 (46.1)	
≥80 years	91634 (19.9)	12210 (19.9)		8922 (19.9)	2171 (20.3)	
Sex			< 0.001			0.007
Female	193147 (41.9)	23738 (38.8)		16936 (37.8)	3905 (36.4)	
Male	267664 (58.1)	37491 (61.2)		27830 (62.2)	6814 (63.6)	
Median household income			< 0.001			< 0.001
1 st quartile	131059 (28.9)	18737 (31.0)		12349 (28.0)	3145 (30.0)	
2 nd quartile	128439 (28.3)	17684 (29.3)		11897 (27.0)	2917 (27.8)	
3 rd quartile	110238 (24.3)	14246 (23.6)		11023 (25.0)	2641 (25.2)	
4 th quartile	83817 (18.5)	9690 (16.1)		8760 (19.9)	1796 (17.1)	
Insurance			< 0.001			< 0.001
Medicare	347947 (75.7)	46698 (76.5)		30572 (68.4)	7063 (66.0)	
Medicaid	14532 (3.2)	2435 (4.0)		2318 (5.2)	773 (7.2)	
Private	84287 (18.3)	9587 (15.7)		9170 (20.5)	2128 (19.9)	
Self-pay/No charge/Other	13057 (2.8)	2287 (3.7)		2615 (5.9)	733 (6.9)	
Hospital size			< 0.001			< 0.001
Small	50479 (11.0)	4321 (7.1)		3700 (8.3)	447 (4.2)	
Medium	101797 (22.1)	11695 (19.1)		9860 (22.0)	1761 (16.4)	
Large	308535 (67.0)	45213 (73.8)		31206 (69.7)	8510 (79.4)	
Hospital Ownership Status			< 0.001			< 0.001
Government, nonfederal	46270 (10.0)	6777 (11.1)		4744 (10.6)	1426 (13.3)	
Private, not-profit	339265 (73.6)	45323 (74.0)		33634 (75.1)	7761 (72.4)	
Private, invest-own	75277 (16.3)	9129 (14.9)		6388 (14.3)	1532 (14.3)	
Hospital City Status			< 0.001			< 0.001
Large City (>1ml)	202490 (43.9)	30613 (50.0)		21592 (48.2)	6886 (64.2)	
Small City (<1ml)	258321 (56.1)	30616 (50.0)		23174 (51.8)	3833 (35.8)	
Hospital Teaching Status			< 0.001			< 0.001
Non-teaching	217122 (47.1)	23255 (38.0)		17951 (40.1)	3050 (28.5)	
Teaching	243689 (52.9)	37975 (62.0)		26815 (59.9)	7669 (71.5)	
APR-DRG Mortality Risk			< 0.001			< 0.001
Minor	306297 (66.5)	35571 (58.1)		10363 (23.1)	1231 (11.5)	
Moderate	126012 (27.3)	20071 (32.8)		27210 (60.8)	6050 (56.4)	
Major	23130 (5.0)	4609 (7.5)		5655 (12.6)	2093 (19.5)	
Extreme	5372 (1.2)	979 (1.6)		1537 (3.4)	1346 (12.6)	
APR-DRG Severity			< 0.001			< 0.001
Minor	271063 (58.8)	30832 (50.4)		8209 (18.3)	970 (9.0)	
Moderate	157018 (34.1)	24458 (39.9)		13439 (30.0)	2211 (20.6)	
Major	27685 (6.0)	5208 (8.5)		21597 (48.2)	6207 (57.9)	
Extreme	5046 (1.1)	731 (1.2)		1520 (3.4)	1331 (12.4)	
Comorbidity			< 0.001			< 0.001
Score (Mean ± SD)	2.33 ± 1.50	2.42 ± 1.57		2.64 ± 1.69	3.13 ± 1.87	

Supplementary Table 3. Comparison of baseline characteristics of patients treated for asymptomatic carotid stenosis after matching, 2010-2015.

Factors	Asymptomatic carotid stenosis or occlusion (30-day)			Asymptomatic carotid stenosis or occlusion (90-day)		
	CEA (n=19900)	CAS (n=19900)	p-value	CEA (n=17116)	CAS (n=17116)	p-value
	No. of events (%)	No. of events (%)		No. of events (%)	No. of events (%)	
Age Groups			0.91			0.61
<65 years	4314 (21.7)	4349 (21.9)		3678 (21.5)	3746 (21.9)	
65-79 years	11505 (57.8)	11480 (57.7)		9912 (57.9)	9831 (57.4)	
≥80 years	4081 (20.5)	4071 (20.5)		3526 (20.6)	3539 (20.7)	
Sex			0.88			0.70
Female	7798 (39.2)	7783 (39.1)		6685 (39.1)	6720 (39.3)	
Male	12102 (60.8)	12117 (60.9)		10431 (60.9)	10396 (60.7)	
Median household income			0.69			0.73
1 st quartile	6129 (30.8)	6114 (30.7)		5258 (30.7)	5199 (30.4)	
2 nd quartile	5386 (27.1)	5298 (26.6)		4640 (27.1)	4598 (26.9)	
3 rd quartile	4750 (23.9)	4789 (24.1)		4119 (24.1)	4159 (24.3)	
4 th quartile	3635 (18.3)	3699 (18.6)		3099 (18.1)	3160 (18.5)	
Insurance			0.17			0.13
Medicare	15756 (79.2)	15665 (78.7)		13531 (79.1)	13450 (78.5)	
Medicaid	636 (3.2)	655 (3.3)		552 (3.2)	599 (3.5)	
Private	3014 (15.1)	3017 (15.2)		2598 (15.2)	2576 (15.1)	
Self-pay/No charge/Other	494 (2.5)	563 (2.8)		435 (2.5)	491 (2.9)	
Hospital size			0.95			0.68
Small	1168 (5.9)	1183 (5.9)		1043 (6.1)	1074 (6.3)	
Medium	4110 (20.7)	4100 (20.6)		3675 (21.5)	3627 (21.2)	
Large	14622 (73.5)	14617 (73.5)		12398 (72.4)	12415 (72.5)	
Hospital Ownership Status			0.47			0.21
Government, nonfederal	2374 (11.9)	2389 (12.0)		2018 (11.8)	2091 (12.2)	
Private, not-profit	14432 (72.5)	14333 (72.0)		12374 (72.3)	12229 (71.4)	
Private, invest-own	3094 (15.5)	3178 (16.0)		2724 (15.9)	2796 (16.3)	
Hospital City Status			0.97			0.77
Large City (>1ml)	10427 (52.4)	10431 (52.4)		8959 (52.3)	8932 (52.2)	
Small City (<1ml)	9473 (47.6)	9469 (47.6)		8157 (47.7)	8184 (47.8)	
Hospital Teaching Status			>0.99			0.87
Non-teaching	7933 (39.9)	7933 (39.9)		6738 (39.4)	6723 (39.3)	
Teaching	11967 (60.1)	11967 (60.1)		10378 (60.6)	10393 (60.7)	
APR-DRG Mortality Risk			0.66			0.55
Minor	12119 (60.9)	12049 (60.5)		10329 (60.3)	10285 (60.1)	
Moderate	6556 (32.9)	6567 (33.0)		5710 (33.4)	5690 (33.2)	
Major	1125 (5.7)	1179 (5.9)		977 (5.7)	1040 (6.1)	
Extreme	100 (0.5)	105 (0.5)		100 (0.6)	101 (0.6)	
APR-DRG Severity			0.78			0.18
Minor	10698 (53.8)	10633 (53.4)		9241 (54.0)	9074 (53.0)	
Moderate	7905 (39.7)	7942 (39.9)		6735 (39.3)	6838 (40.0)	
Major	1209 (6.1)	1244 (6.3)		1055 (6.2)	1126 (6.6)	
Extreme	88 (0.4)	81 (0.4)		85 (0.5)	78 (0.5)	
Comorbidity			0.50			0.29
Score (Mean ± SD)	2.36 ± 1.48	2.37 ± 1.50		2.37 ± 1.50	2.39 ± 1.52	

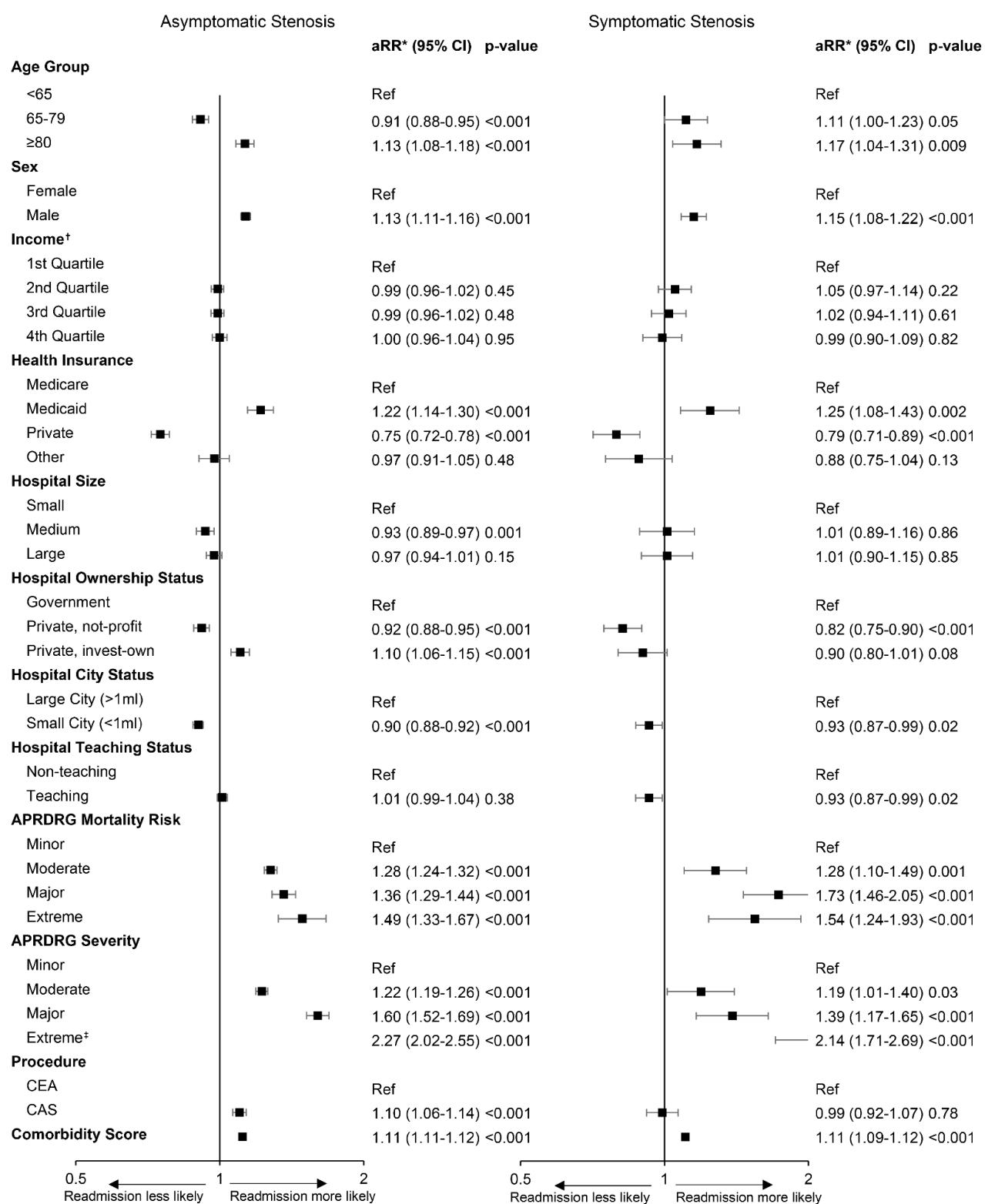
Supplementary Table 4. Comparison of baseline characteristics of patients treated for symptomatic carotid stenosis after matching, 2010-2015.

Factors	Symptomatic carotid stenosis or occlusion (30-day)			Symptomatic carotid stenosis or occlusion (90-day)		
	CEA (n=3617)	CAS (n=3617)	p-value	CEA (n=3054)	CAS (n=3054)	p-value
	No. of events (%)	No. of events (%)		No. of events (%)	No. of events (%)	
Age Groups			0.56			0.36
<65 years	1152 (31.8)	1194 (33.0)		950 (31.1)	1002 (32.8)	
65-79 years	1735 (48.0)	1698 (46.9)		1478 (48.4)	1440 (47.2)	
≥80 years	730 (20.2)	725 (20.0)		626 (20.5)	612 (20.0)	
Sex			0.43			0.59
Female	1285 (35.5)	1317 (36.4)		1091 (35.7)	1111 (36.4)	
Male	2332 (64.5)	2300 (63.6)		1963 (64.3)	1943 (63.6)	
Median household income			>0.99			0.90
1 st quartile	1019 (28.2)	1013 (28.0)		885 (29.0)	870 (28.5)	
2 nd quartile	973 (26.9)	974 (26.9)		812 (26.6)	815 (26.7)	
3 rd quartile	923 (25.5)	921 (25.4)		761 (24.9)	784 (25.7)	
4 th quartile	702 (19.4)	709 (19.6)		596 (19.5)	585 (19.2)	
Insurance			0.59			0.63
Medicare	2422 (67)	2395 (66.2)		2062 (67.5)	2017 (66.0)	
Medicaid	245 (6.8)	260 (7.2)		209 (6.8)	227 (7.4)	
Private	724 (20.0)	712 (19.7)		590 (19.3)	613 (20.1)	
Self-pay/No charge/Other	226 (6.2)	250 (6.9)		193 (6.3)	197 (6.5)	
Hospital size			0.52			0.89
Small	159 (4.4)	172 (4.8)		155 (5.1)	147 (4.8)	
Medium	564 (15.6)	589 (16.3)		504 (16.5)	507 (16.6)	
Large	2894 (80.0)	2856 (79.0)		2395 (78.4)	2400 (78.6)	
Hospital Ownership Status			0.70			0.55
Government, nonfederal	503 (13.9)	515 (14.2)		393 (12.9)	419 (13.7)	
Private, not-profit	2602 (71.9)	2570 (71.1)		2222 (72.8)	2187 (71.6)	
Private, invest-own	512 (14.2)	532 (14.7)		439 (14.4)	448 (14.7)	
Hospital City Status			0.53			0.61
Large City (>1ml)	2287 (63.2)	2313 (63.9)		1932 (63.3)	1951 (63.9)	
Small City (<1ml)	1330 (36.8)	1304 (36.1)		1122 (36.7)	1103 (36.1)	
Hospital Teaching Status			0.60			0.47
Non-teaching	1047 (28.9)	1027 (28.4)		829 (27.1)	854 (28.0)	
Teaching	2570 (71.0)	2590 (71.6)		2225 (72.9)	2200 (72.0)	
APR-DRG Mortality Risk			0.67			0.92
Minor	482 (13.3)	456 (12.6)		380 (12.4)	377 (12.3)	
Moderate	2121 (58.6)	2146 (59.3)		1797 (58.8)	1798 (58.9)	
Major	685 (18.9)	703 (19.4)		586 (19.2)	601 (19.7)	
Extreme	329 (9.1)	312 (8.6)		291 (9.5)	278 (9.1)	
APR-DRG Severity			0.60			0.47
Minor	389 (10.8)	371 (10.3)		288 (9.4)	316 (10.3)	
Moderate	782 (21.6)	800 (22.1)		696 (22.8)	667 (21.8)	
Major	2116 (58.5)	2142 (59.2)		1780 (58.3)	1798 (58.9)	
Extreme	330 (9.1)	304 (8.4)		290 (9.5)	273 (8.9)	
Comorbidity			0.53			0.63
Score (Mean ± SD)	3.09 ± 1.85	3.06 ± 1.82		3.09 ± 1.81	3.07 ± 1.81	



Supplementary Figure 1. Grouped categories tabulating proportion of causes of readmission for asymptomatic stenosis (left) and symptomatic stenosis (right).

CAS = carotid artery stenting; CEA = carotid endarterectomy; DVT = deep vein thrombosis; ENT = ear, nose, and throat; GI = gastrointestinal; GU = genitourinary; PE = pulmonary embolism.



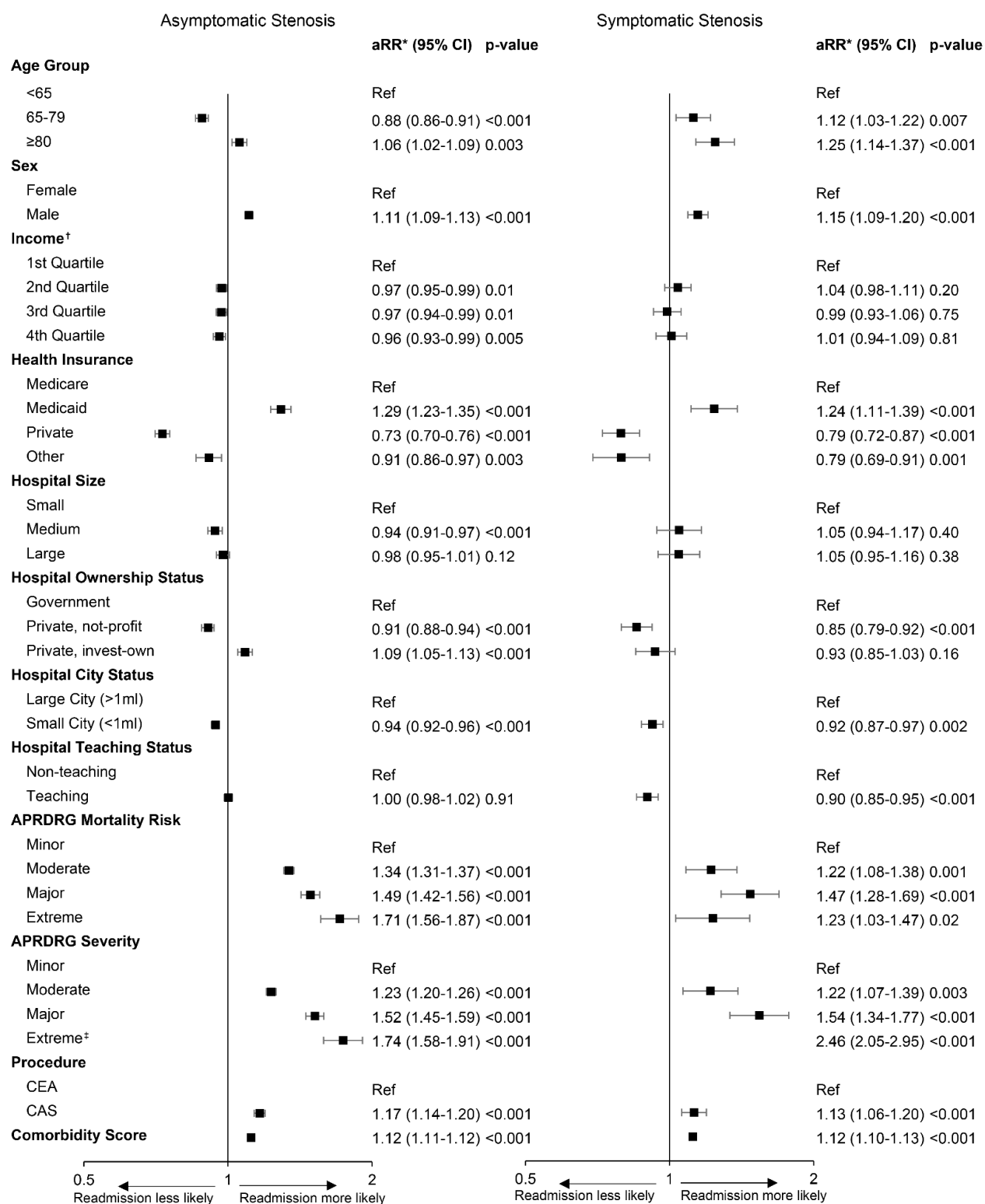
Supplementary Figure 2. 30-day readmission in asymptomatic and symptomatic patients after CEA or CAS.

APR-DRG = All Patients Refined Diagnosis Related Groups; aRR = adjusted risk ratio; CAS = carotid artery stenting; CEA = carotid endarterectomy; CI = confidence interval; ECI = Elixhauser comorbidity index; Ref = reference.

* Risk ratios were adjusted for age, sex, race, household income, health insurance, hospital characteristics (type, region, size), APR-DRG severity and mortality and comorbidity indices, and type of procedure.

† Median household income for patient's ZIP Code, from lowest (1st) to highest (4th) quartile.

‡The marker for APR-DRG severity (extreme) exceeded the routine discharge scale.



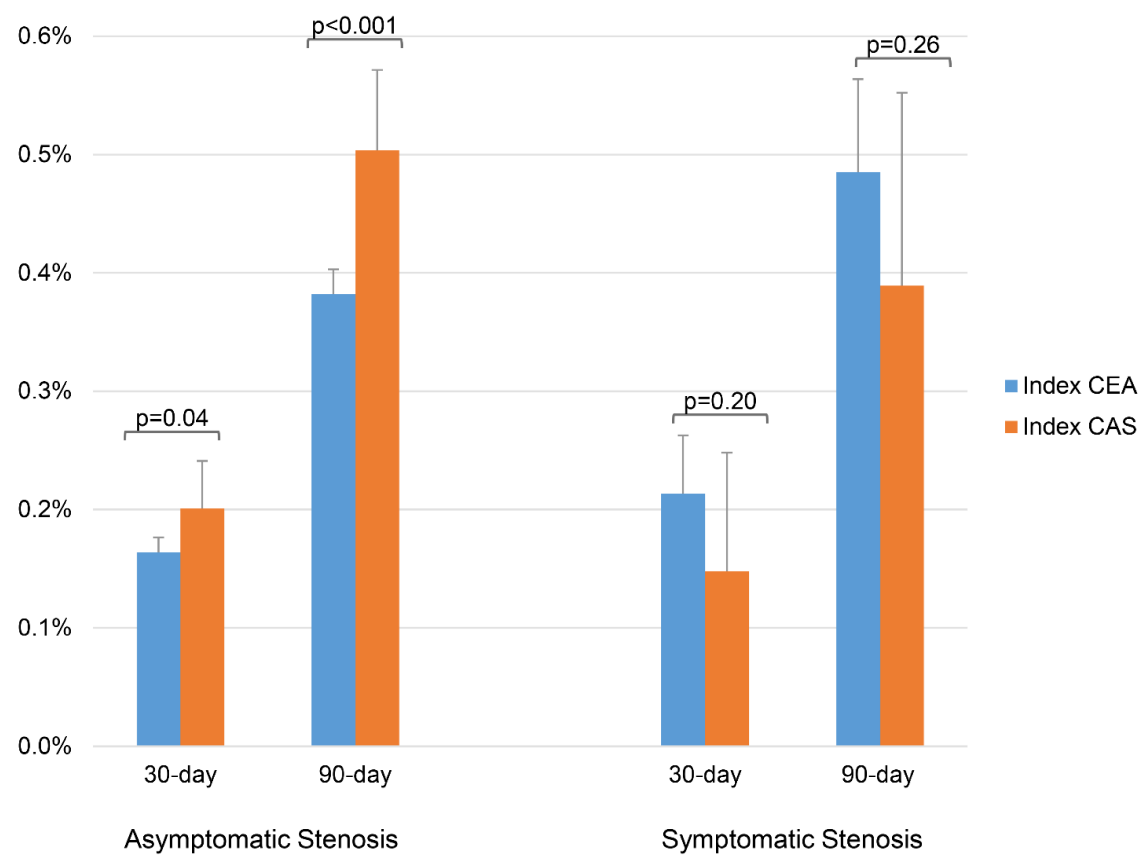
Supplementary Figure 3. 90-day readmission in asymptomatic and symptomatic patients after CEA or CAS.

APR-DRG = All Patients Refined Diagnosis Related Groups; aRR = adjusted risk ratio; CAS = carotid artery stenting; CEA = carotid endarterectomy; CI = confidence interval; ECI = Elixhauser comorbidity index; Ref = reference.

* Risk ratios were adjusted for age, sex, race, household income, health insurance, hospital characteristics (type, region, size), APR-DRG severity and mortality and comorbidity indices, and type of procedure.

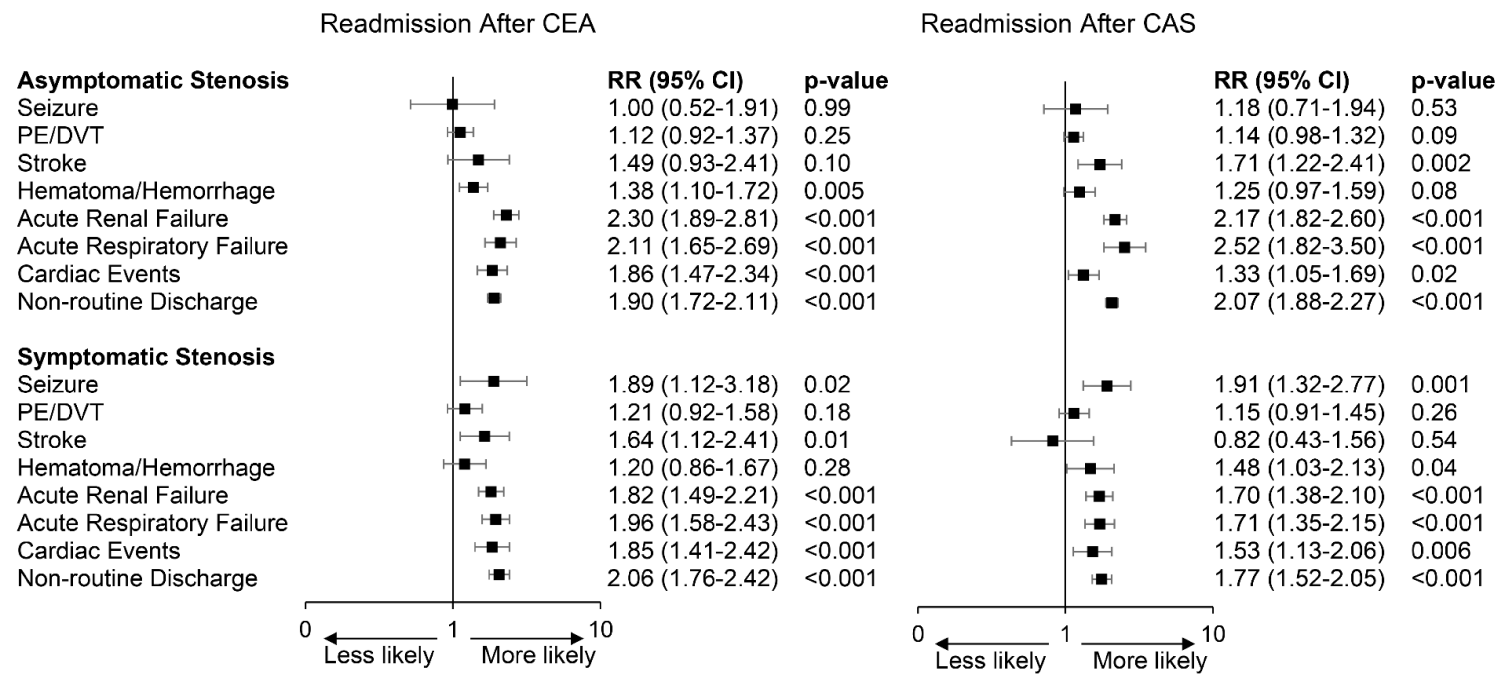
† Median household income for patient's ZIP Code, from lowest (1st) to highest (4th) quartile.

‡The marker for APR-DRG severity (extreme) exceeded the routine discharge scale.



Supplementary Figure 4. Unplanned carotid revascularization after index CEA or CAS.

CAS = carotid artery stenting; CEA = carotid endarterectomy.



Supplementary Figure 5. Postoperative adverse events or outcome at initial carotid revascularization and risk ratio of 90-day readmission.

CAS = carotid artery stenting; CEA = carotid endarterectomy; CI = confidence interval, DVT = deep vein thrombosis; PE = pulmonary embolism; RR = risk ratio.