

SUPPLEMENTAL MATERIAL

Table S1. Distribution of the evidence-based interventions and model analysis results for ischemic stroke treatment based on mRS at 3 months including multiple imputation.

Evidence-based interventions	mRS 0-2 (N=5112)	mRS 3-6 (N=3271)	Total (N=8383)	Unadjusted		Model 3+MI	
				OR (95%CI)	P value	OR (95%CI)	P value
Reperfusion therapy (n=3093)	591 (34.2%)	460 (33.7%)	1051 (34.0%)	1.06 (0.91,1.25)	0.454	1.37 (1.13,1.67)	0.002
ASU admission	2633 (51.5%)	2090 (63.9%)	4723 (56.3%)	0.77 (0.65,0.91)	0.003	1.10 (0.88,1.38)	0.396
Antihypertensives	2771 (54.2%)	1954 (59.7%)	4725 (56.4%)	0.89 (0.81,0.98)	0.023	1.08 (0.95,1.23)	0.237
Antiplatelet therapy	4975 (97.3%)	3088 (94.4%)	8063 (96.2%)	1.98 (1.56,2.50)	<0.001	1.49 (1.12,1.99)	0.006
Statin therapy	4390 (85.9%)	2570 (78.6%)	6960 (83.0%)	1.64 (1.45,1.87)	<0.001	1.22 (1.05,1.42)	0.010
Anticoagulation in AF (n=1203)	259 (49.7%)	315 (46.2%)	574 (47.7%)	1.14 (0.89,1.45)	0.293		
Swallow assessment	3916 (76.6%)	2363 (72.2%)	6279 (74.9%)	1.47 (1.30,1.67)	<0.001	1.26 (1.08,1.46)	0.002
Physiotherapy in disabled patients (n=3073)	645 (72.5%)	1549 (71.0%)	2194 (71.4%)	1.20 (0.96,1.50)	0.102	1.41 (1.06,1.88)	0.018
Optimal stroke care	770 (15.1%)	459 (14.0%)	1229 (14.7%)	1.45 (1.26,1.67)	<0.001	1.36 (1.15,1.61)	<0.001
Optimal stroke care (without reperfusion/anticoagulation)	1146 (22.4%)	795 (24.3%)	1941 (23.2%)	1.21 (1.07,1.37)	0.002	1.25 (1.08,1.45)	0.004

mRS: modified Rankin scale, MI: multiple imputation, ASU: acute stroke unit, AF: atrial fibrillation

Table S2. Distribution of the evidence-based interventions and model analysis results for ischemic stroke treatment based on mortality at 3 months.

Evidence-based interventions	Alive (N=8619)	Dead (N=652)	Total (N=9271)	Unadjusted		Model 1		Model 2		Model 3	
				OR (95%CI)	P value	OR (95%CI)	P value	OR (95%CI)	P value	OR (95%CI)	P value
Reperfusion therapy (n=3509)	1110 (34.9%)	98 (29.7%)	1208 (34.4%)	1.27 (0.98,1.64)	0.069	1.05 (0.80,1.39)	0.711	1.69 (1.24,2.31)	<0.001	1.72 (1.26,2.35)	<0.001
ASU admission	4985 (57.8%)	469 (71.9%)	5454 (58.8%)	0.70 (0.53,0.93)	0.013	1.40 (0.98,2.00)	0.062	1.58 (1.11,2.25)	0.011	1.69 (1.17,2.43)	0.005
Antihypertensive therapy	4891 (56.7%)	376 (57.7%)	5267 (56.8%)	1.15 (0.97,1.36)	0.111	1.42 (1.18,1.70)	<0.001	1.38 (1.10,1.72)	0.004	1.38 (1.11,1.72)	0.004
Antiplatelet therapy	8342 (96.8%)	586 (89.9%)	8928 (96.3%)	3.06 (2.27,4.12)	<0.001	3.13 (2.29,4.29)	<0.001	1.99 (1.37,2.88)	<0.001	1.98 (1.37,2.87)	<0.001
Statin therapy	7255 (84.2%)	410 (62.9%)	7665 (82.7%)	3.17 (2.64,3.81)	<0.001	2.72 (2.24,3.30)	<0.001	2.11 (1.70,2.62)	<0.001	2.12 (1.70,2.64)	<0.001
Anticoagulation in AF (n=1354) †	560 (49.5%)	92 (41.3%)	652 (48.2%)	1.35 (1.00,1.83)	0.053	-	-	-	<0.001	-	<0.001
Swallow assessment	6582 (76.4%)	403 (61.8%)	6985 (75.3%)	2.39 (1.96,2.90)	<0.001	2.25 (1.84,2.74)	<0.001	1.92 (1.54,2.39)	<0.001	1.94 (1.55,2.42)	<0.001
Physiotherapy in disabled patients (n=3443)	2145 (74.2%)	391 (70.7%)	2536 (73.7%)	1.52 (1.18,1.95)	0.001	2.67 (1.98,3.60)	<0.001	2.29 (1.67,3.13)	<0.001	2.22 (1.60,3.07)	<0.001
Optimal stroke care	1368 (15.9%)	59 (9.0%)	1427 (15.4%)	2.43 (1.83,3.23)	<0.001	2.45 (1.83,3.27)	<0.001	2.16 (1.57,2.97)	<0.001	2.23 (1.62,3.09)	<0.001
Optimal stroke care (without reperfusion/anticoagulation)	2137 (24.8%)	132 (20.2%)	2269 (24.5%)	1.83 (1.47,2.26)	<0.001	2.10 (1.68,2.62)	<0.001	1.88 (1.47,2.41)	<0.001	1.94 (1.51,2.49)	<0.001
Optimal stroke care (only survivors >7 days) (n=9153)	1368 (15.9%)	54 (10.1%)	1422 (15.5%)	2.09 (1.55,2.82)	<0.001	2.13 (1.57,2.89)	<0.001	1.92 (1.38,2.67)	<0.001	1.95 (1.40,2.73)	<0.001

ASU: acute stroke unit, AF: atrial fibrillation

Un-adjusted: hierarchical mixed logistic regression model, the link function is logit with fixed period, fixed head position effect, random cluster, and random cluster-period effects.

Model 1: Adjusted for country, prestroke mRS score, age and sex.

Model 2: Further adjusted for baseline NIHSS score, and previous history of stroke, heart disease, or diabetes, history of hypertension, and time from stroke onset to intervention.

Model 3: Further adjusted for # of stroke patients admitted annually, multi-discipline team available, academic hospital, local special pathway or service organization for stroke care, endovascular therapies available for stroke patients.

†Results not shown because the models did not converge based on low numbers.

Table S3. Evidence-based interventions for ischemic stroke treatment and optimal treatment stratified by region.

Evidence-based interventions	Australia and UK	China and	India and Sri	South America	Total	P value
	(N=3850)	Taiwan (N=4178)	Lanka (N=658)			
Reperfusion therapy	810 (37.7%)	215 (25.3%)	56 (29.9%)	142 (37.6%)	1223 (34.3%)	<0.001
ASU admission	3785 (98.3%)	855 (20.5%)	560 (85.1%)	336 (42.1%)	5536 (58.4%)	<0.001
Antihypertensives therapy	2661 (69.1%)	1788 (42.8%)	383 (58.2%)	533 (66.7%)	5365 (56.6%)	<0.001
Antiplatelet therapy	3681 (95.6%)	4041 (96.7%)	632 (96.0%)	777 (97.2%)	9131 (96.3%)	0.026
Statin therapy	2908 (75.5%)	3621 (86.7%)	561 (85.3%)	750 (93.9%)	7840 (82.7%)	<0.001
Anticoagulation in AF	457 (46.9%)	102 (37.4%)	28 (77.8%)	78 (84.8%)	665 (48.4%)	<0.001
Swallow assessment	3226 (83.8%)	2865 (68.6%)	438 (66.6%)	607 (76.0%)	7136 (75.2%)	<0.001
Physiotherapy in disabled patients	1718 (94.9%)	346 (34.1%)	207 (63.1%)	314 (83.5%)	2585 (73.3%)	<0.001
Optimal stroke care	1001 (26.0%)	171 (4.1%)	151 (22.9%)	122 (15.3%)	1445 (15.2%)	<0.001

ASU: acute stroke unit, AF: atrial fibrillation

P value from logistic regression model

Table S4. Patient outcome by hospital characteristics: uni and multivariable logistic regression adjusted for patient characteristics.

Hospital characteristics	Univariable analysis					Multivariable analysis				
	mRS 0-2 (N=5112)	mRS 3-6 (N=3271)	Total (N=8383)	OR (95%CI)	P value	mRS 0-2 (N=4931) †	mRS 3-6 (N=3068) †	Total (N=7999) †	OR (95%CI)	P value
Number of stroke patients admitted annually										
<500	1133 (22.6%)	887 (27.5%)	2020 (24.5%)			1100 (22.7%)	836 (27.6%)	1936 (24.6%)		
[500,1000]	1792 (35.7%)	1343 (41.6%)	3135 (38.0%)	1.10 (0.84,1.44)		1718 (35.5%)	1269 (42.0%)	2987 (38.0%)	0.96 (0.74,1.24)	
>1000	2092 (41.7%)	995 (30.9%)	3087 (37.5%)	1.87 (1.41,2.47)	<0.001	2019 (41.7%)	920 (30.4%)	2939 (37.4%)	1.12 (0.84,1.50)	0.421
Academic hospital	4461 (88.9%)	2737 (84.6%)	7198 (87.2%)	1.36 (0.98,1.88)	0.067	4321 (89.3%)	2563 (84.6%)	6884 (87.5%)	1.02 (0.77,1.36)	0.882
Local special pathway or service organisation for stroke care	4459 (88.8%)	2990 (92.5%)	7449 (90.2%)	0.76 (0.51,1.13)	0.176	4290 (88.7%)	2795 (92.2%)	7085 (90.0%)	1.19 (0.85,1.65)	0.316
Local protocols for fever/blood glucose/swallow dysfunction	3828 (76.3%)	2355 (72.8%)	6183 (74.9%)	1.22 (0.93,1.61)	0.149	3697 (76.4%)	2201 (72.6%)	5898 (74.9%)	1.04 (0.84,1.29)	0.703
Organized ED clinical pathway/checklist/protocols for evaluation	4790 (95.4%)	3029 (93.7%)	7819 (94.7%)	1.46 (0.89,2.38)	0.130	4621 (95.5%)	2853 (94.1%)	7474 (95.0%)	1.20 (0.78,1.83)	0.404
Availability of a local multidisciplinary team	2675 (53.3%)	2114 (65.4%)	4789 (58.0%)	0.60 (0.48,0.76)	<0.001	2571 (53.1%)	1980 (65.3%)	4551 (57.8%)	0.80 (0.62,1.05)	0.106
Endovascular therapies available for stroke patients	2955 (59.3%)	1774 (55.5%)	4729 (57.8%)	1.22 (0.95,1.55)	0.112	2869 (59.7%)	1671 (55.7%)	4540 (58.2%)	1.22 (0.95,1.55)	0.270

†: Only patients with all non-missing covariates

mRS: modified Rankin Scale, ED: emergency department

Univariable analysis: hierarchical mixed logistic regression model, the link function is logit, with fixed period, fixed head position effect, random cluster, and random cluster-period effects.

Multivariable analysis: Adjusted for age, sex, previous history of stroke, heart disease, or diabetes, history of hypertension, prestroke mRS score, baseline NIHSS score, time from stroke onset to intervention and country.