Supplemental Appendix

Dysphagia screening and risks of pneumonia and adverse outcomes after acute stroke: an international multicentre study

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Supplementary Materials

Supplemental Table 11: Baseline characteristics by clinical outcomes at 90 days of follow up

	Outcomes of interests					
	Pneumonia			Modified Rankin Scale		
Baseline characteristics	Yes (N=362)	No (N=10731)	P-value	Poor outcome (N=3826)	Favourable outcome (N=5922)	P-value
Age, yr	77.0±12.7	67.7±13.7	<.0001	72.8±13.2	65.1±13.0	<.0001
Male	202 (55.8%)	6462 (60.2%)	0.092	2023 (52.9%)	3866 (65.3%)	<.0001
Region			<.0001			<.0001
Australia and UK	228 (63.0%)	4533 (42.2%)		1687 (44.1%)	2165 (36.6%)	
China and Taiwan	49 (13.5%)	4603 (42.9%)		1284 (33.6%)	3063 (51.7%)	
India and Sri Lanka	26 (7.2%)	744 (6.9%)		411 (10.7%)	283 (4.8%)	
South America	59 (16.3%)	851 (7.9%)		444 (11.6%)	411 (6.9%)	
Pathological subtype			<.0001			<.0001
Uncertain	13 (3.6%)	650 (6.1%)		146 (3.8%)	387 (6.6%)	
Ischaemic stroke	295 (82.2%)	9172 (85.7%)		3266 (85.6%)	5103 (86.4%)	
Intracerebral haemorrhage	51 (14.2%)	879 (8.2%)		404 (10.6%)	414 (7.0%)	
NIHSS at admission	13.0 (6.5, 19.0)	4.0 (2.0, 8.0)	<.0001	8.0 (4.0, 14.0)	3.0 (2.0, 5.0)	<.0001
GCS score at admission	14.0 (11.0, 15.0)	15.0 (14.0, 15.0)	<.0001	15.0 (12.0, 15.0)	15.0 (15.0, 15.0)	<.0001
Pre-morbid mRS score*			<.0001			<.0001
0-1	214(59.2)	8521(79.6)		2580(67.6)	5134(86.8)	
2	50(13.9)	1099(10.3)		488(12.8)	517(8.7)	
3-5	97(26.9)	1090(10.1)		747(19.6)	263(4.5)	
Past medical history†	218 (60.2%)	5478 (51.0%)	0.0006	2315 (60.5%)	2715 (45.8%)	<.0001
History of COPD	27 (7.6%)	379 (3.6%)	<.0001	191 (5.0%)	157 (2.7%)	<.0001
Smoker	37 (10.5%)	2088 (19.7%)	<.0001	527 (14.0%)	1342 (22.9%)	<.0001

Data are n (%), mean±SD, or median (interquartile range)

GCS denotes Glasgow coma scale, mRS modified Rankin scale, NIHSS National Institute of Health Stroke Scale, COPD donates Chronic Obstructive Pulmonary Disease

*Pre-stroke grade function according to mRS scores (0=no symptoms, 1=symptoms, 2=disability but independence, 3-5= increasing grades of disability requiring assistance)

†includes history of heart disease, stroke or diabetes mellitus

Supplemental Table S22: Hospital characteristics according to clinical outcomes at 90 days of follow up

	Outcomes of interests					
	Pneumonia			Modified Rankin Scale		
Hospital characteristics	Yes (N=362)	No (N=10731)	P-value	Poor outcome (N=3828)	Favourable outcome (N=5922)	P-value
Number of stroke patients admitted annually			<0.0001			<0.0001
<500	103 (28.5%)	2582 (24.4%)		1053 (27.9%)	1346 (23.1%)	
500-1000	175 (48.3%)	4115 (38.9%)		1578 (41.8%)	2090 (35.9%)	
>1000	84 (23.2%)	3880 (36.7%)		1146 (30.3%)	2386 (41.0%)	
Academic hospital	297 (82.0%)	9287 (86.5%)	0.014	3243 (84.8%)	5244 (88.6%)	<0.0001
Location of hospital			0.0004			0.22
Metropolitan or urban	263 (72.7%)	8553 (79.7%)		3010 (78.7%)	4740 (80.0%)	
Semi-metropolitan or semi-urban	84 (23.2%)	1975 (18.4%)		750 (19.6%)	1077 (18.2%)	
Rural or countryside	15 (4.1%)	203 (1.9%)		66 (1.7%)	105 (1.8%)	
Present of stroke unit	330 (91.2%)	9647 (91.1%)	0.96	3468 (91.6%)	5261 (90.3%)	0.039
Guidelines for acute treatment of stroke	341 (94.2%)	10080 (95.2%)	0.40	3612 (95.4%)	5520 (94.8%)	0.18
Local special pathway or service organisation for stroke care	332 (91.7%)	9641 (91.0%)	0.65	3496 (92.3%)	5203 (89.3%)	<0.0001
Local protocols for swallow dysfunction	338 (93.4%)	9780 (91.1%)	0.14	3454 (90.3%)	5384 (90.9%)	0.29
Available of neurologist	234 (64.6%)	7556 (70.4%)	0.018	2677 (70.0%)	4271 (72.1%)	0.022
Dysphagia specialist nurse	138 (38.1%)	3311 (30.9%)	0.0033	1225 (32.0%)	1810 (30.6%)	0.13
Speech language pathologist	308 (85.1%)	6250 (58.2%)	<0.0001	2429 (63.5%)	3114 (52.6%)	<0.0001

Data are n (%), Chi-square for P-value

Table S3. Baseline characteristics of 11,076 stroke patients according to use of dysphagia screen

Characteristic	Screened (N=8784)	Not screened (N=2292)	P Value
Age, yr	68±14	67±13	<0.0001
Male	5278 (60.1)	1379 (60.2)	0.95
Pathological subtype			
Ischaemic stroke	7466 (85.2)	1989 (87.1)	<0.0001
Intracerebral haemorrhage	703 (8.0)	226 (9.9)	
Uncertain	592 (6.8)	70 (3.1)	
GCS score	15 (14-15)	15 (13-15)	
Severe (3-8)	184 (2.1)	196 (8.6)	<0.0001
NIHSS score	4 (2-9)	4 (2-8)	
Severe ≥15	963 (11.1)	243 (10.9)	<0.0001
Pre-morbid mRS score*			
0-1	6980 (79.6)	1749 (76.3)	<0.0001
2	882 (10.1)	267 (11.7)	
3-5	907 (10.3)	276 (12.0)	
Prior cardiovascular disease risk†	4510 (51.3)	1182 (51.6)	0.85
Past history of COPD	329 (3.8)	76 (3.4)	0.38
Smoker	1736 (20.0)	387 (17.0)	0.0011

Data are n (%), mean±SD, or median (interquartile range)

GCS denotes Glasgow coma scale, mRS modified Rankin scale, NIHSS National Institute of Health Stroke Scale, COPD donates Chronic Obstructive Pulmonary Disease

*Pre-morbid function according to mRS scores (0=no symptoms, 1=symptoms, 2=disability but independence, 3-5 increasing grades of disability requiring assistance)

†includes history of heart disease, stroke or diabetes mellitus

Table S4 Error! Bookmark not defined.**: Admitted hospital characteristics of 11076 patients according to use of dysphagia screen**

Hospital characteristics	Screened (N=8784)	Not screened (N=2292)	P-value
More than 1000 stroke patients admitted annually	2944 (34.1%)	1015 (44.5%)	<.0001
Academic hospital	7545 (85.9%)	2028 (88.5%)	0.0013
Location of hospital			
Metropolitan or urban	6995 (79.6%)	1807 (78.8%)	0.042
Semi-metropolitan or semi-urban	1631 (18.6%)	425 (18.5%)	
Rural or countryside	158 (1.8%)	60 (2.6%)	
Present of stroke unit	8133 (94.0%)	1827 (79.9%)	<.0001
Guidelines for acute treatment of stroke	8262 (95.5%)	2142 (93.7%)	0.0002
Local special pathway or service organisation for stroke care	7895 (91.3%)	2061 (90.1%)	0.083
Local protocols for swallow dysfunction	8052 (91.7%)	2049 (89.4%)	0.0006
Available of neurologist	5897 (67.1%)	1890 (82.5%)	<.0001
Dysphagia specialist nurse	2565 (29.2%)	879 (38.4%)	<.0001
Speech language pathologist	5591 (63.6%)	950 (41.4%)	<.0001

Data are n (%), Chi-Square Test for p-value

Table S5 Error! Bookmark not defined.**: Admitted hospital characteristics of 11067 patients according to use of dysphagia assessment**

Hospital characteristics	Assessment N=3914	No assessment N=7153	P-value
More than 10000 stroke patients admitted annually	1250 (32.0%)	2708 (38.6%)	<.0001
Academic hospital	3342 (85.3%)	6230 (87.0%)	0.011
Location of hospital			
Metropolitan or urban	3057 (78.0%)	5743 (80.2%)	<.0001
Semi-metropolitan or semi-urban	717 (18.3%)	1339 (18.7%)	
Rural or countryside	143 (3.7%)	75 (1.0%)	
Present of stroke unit	3557 (90.9%)	6401 (91.1%)	0.73
Guidelines for acute treatment of stroke	3785 (96.8%)	6617 (94.2%)	<.0001
Local special pathway or service organisation for stroke care	3569 (91.3%)	6385 (90.9%)	0.55
Local protocols for swallow dysfunction	3797 (96.9%)	6302 (88.1%)	<.0001
Available of neurologist	2936 (75.0%)	4851 (67.8%)	<.0001
Dysphagia specialist nurse	1450 (37.0%)	1995 (27.9%)	<.0001
Speech language pathologist	2643 (67.5%)	3897 (54.5%)	<.0001

Data are n (%), Chi-Square Test for p-value

Table S6. Distribution of baseline characteristics by dysphagia assessment in 2,292 patients who did not have a dysphagia screen

Characteristic	Assessment N=739	No assessment N=1553	P Value
Age, yr	71±14	65±12	<0.0001
Male	406 (54.9)	973 (62.7)	<0.001
Pathological subtype			
Acute ischaemic stroke	635 (86.5)	1354 (87.3)	0.23
Intracerebral haemorrhage	70 (9.5)	156 (10.1)	
Uncertain	29 (4.0)	41 (2.6)	
GCS score	15 (14-15)	15 (13-15)	<0.0001
Severe (3-8)	20 (2.7)	176 (11.3)	
NIHSS score	6 (3-11)	3 (2-7)	<0.0001
Severe (≥15)	125 (17.1)	118 (7.9)	
Pre-morbid mRS score*			
0-1	504 (68.2)	1245 (80.2)	<0.0001
2	81 (11.0)	186 (12.0)	
3-5	154 (20.8)	122 (7.9)	
Feeding restriction	343 (46.4)	233 (15.0)	<0.0001

Data are n (%), mean±SD, or median (interquartile range).

GCS denotes Glasgow coma scale, mRS modified Rankin scale, NIHSS National Institute of Health Stroke Scale,

*Pre-morbid function according to mRS scores (0=no symptoms, 1=symptoms, 2=disability but independence, 3-5 increasing grades of disability requiring assistance)

Table S7. Distribution of baseline characteristics by dysphagia assessment in 2003 patients who failed a dysphagia screen

Characteristic	Assessment N=1402	No assessment N=601	*P* value
Age, yr	73.4±13.5	70.3±15.0	<0.0001
Male	721 (51.4)	341 (56.7)	0.03
Pathological subtype			
Acute ischaemic stroke	1213 (87.0)	501 (83.6)	0.01
Intracerebral haemorrhage	130 (9.3)	81 (13.5)	
Uncertain	52 (3.7)	17 (2.8)	
GCS score	15 (12-15)	14 (10-15)	
Severe (3-8)	49 (3.5)	68 (11.3)	<0.0001
NIHSS score	17 (10-22)	12 (7-19)	<0.0001
Severe (≥15)	461 (33.4)	244 (41.3)	<0.0001
Pre-morbid mRS score*			0.07
0-1	1028 (73.6)	445 (74.3)	
2	157 (11.2)	49 (8.2)	
3-5	212 (15.2)	105 (17.5)	
Feeding restrictions	1174 (83.7)	507 (84.4)	0.58

Data are n (%), mean±SD, or median (interquartile range).

GCS denotes Glasgow coma scale, mRS modified Rankin scale, NIHSS National Institute of Health Stroke Scale

*Pre-morbid function according to mRS scores (0=no symptoms, 1=symptoms, 2=disability but independence, 3-5 increasing grades of disability requiring assistance)

Table S83. Baseline characteristics by neither screen nor assessment compared to undertake screened

Baseline characteristics	Neither screen nor assessed N=1553	Dysphagia screened N=8784	P-value
Age, yr	65.4±12.4	68.2±13.9	0.0014
Male	973 (62.7%)	5278 (60.1%)	0.06
Region			<.0001
Australia and UK	149 (9.6%)	4338 (49.4%)	
China and Taiwan	1275 (82.1%)	3218 (36.6%)	
India and Sri Lanka	99 (6.4%)	670 (7.6%)	
South America	30 (1.9%)	558 (6.4%)	
Past medical history	777 (50.0%)	4510 (51.3%)	0.3407
Stroke category			<.0001
Acute Ischemic Stroke	1354 (87.3%)	7466 (85.2%)	
Intracerebral Haemorrhage	156 (10.1%)	703 (8.0%)	
Uncertain	41 (2.6%)	592 (6.8%)	
NIHSS at admission	3.0 (2.0, 7.0)	4.0 (2.0, 9.0)	<0.0001
Severe (≥15)	118(7.9)	963 (11.1)	0.0002
GCS score at admission	15.0 (13.0, 15.0)	15.0 (14.0, 15.0)	<0.0001
Severe(3-8)	176 (11.3)	184 (2.1)	<0.0001
Pre-morbid function*			0.0016
0-1	1245 (80.2)	6980 (79.6)	
2	186 (12.0)	882 (10.1)	
3-5	122 (7.8)	907 (10.3)	
History of COPD	36 (2.3%)	329 (3.8%)	0.0049
Smoker	292 (18.9%)	1736 (20.0%)	0.3061
Feeding restrictions	233 (15.1%)	2431 (27.9%)	<.0001

Data are n (%), mean±SD, or median (interquartile range).

GCS denotes Glasgow coma scale, mRS modified Rankin scale, NIHSS National Institute of Health Stroke Scale

*Pre-morbid function according to mRS scores (0=no symptoms, 1=symptoms, 2=disability but independence, 3-5 increasing grades of disability requiring assistance)

Table S9. Outcomes, by region of recruitment, according to use of dysphagia screen, dysphagia assessment, and feeding restriction

	Pneumonia		Poor outcome*	
Variable	n/N (%)	P Value	n/N (%)	P Value
Overall	362/11093 (3.3)		3826/9748 (39.3)	
Region of recruitment				
Australia/UK	228/4761 (4.8)	<0.0001	1687/3852 (43.8)	<0.0001
China†	49/4652 (1.1)		1284/4347 (29.5)	
India/Sri Lanka	26/770 (3.4)		411/694 (59.2)	
South America	59/910 (6.5)		444/855 (51.9)	
Dysphagia screen performed				
Yes	304/8784 (3.5)	0.03	3018/7675 (39.3)	0.72
No	58/2292 (2.5)		801/2060 (38.9)	
Dysphagia screen				
Pass	103/6778 (1.5)	<0.0001	1820/5913 (30.8)	<0.0001
Fail	201/2004 (10.0)		1198/1760 (68.1)	
Dysphagia assessment performed				
Yes	206/3917 (5.3)	<0.0001	1661/3495 (47.5)	<0.0001
No	156/7157 (2.2)		2157/6239 (34.6)	
Dysphagia assessment results				
Pass	72/2895 (2.5)	<0.0001	988/2605 (37.9)	<0.0001
Fail	134/1018 (13.2)		671/886 (40.5)	
Feeding restriction				
Yes	286/3007 (9.5)	<0.0001	1775/2627 (67.6)	<0.0001
No	73/8000 (0.9)		2022/7044 (28.7)	
Time to dysphagia screen, hrs				
<4	244/5258 (3.0)	0.001	1629/4602 (35.4)	<0.0001
4-24	80/2195 (3.6)		813/1894 (42.9)	
>24	38/667 (5.7)		345/609 (56.7)	

*defined by scores 3-6 on the modified Rankin scale at 90 days

†includes Taiwan

Table S10. Frequency and timing of dysphagia screen and assessment in stroke patients by outcomes

	Dysphagia screen performed			Dysphagia assessment performed		
		Time from hospital arrival			Time from hospital arrival	
Outcome	N (%)	Median (IQR), hr	P Value*	N (%)	Median (IQR), hr	P Value*
Pneumonia						
Yes (N=362)	304 (84.0)	3.0 (1.0-11.4)	<0.0001	206 (56.9)	25.3 (15.1-51.6)	<0.0001
No (N=10714)	8480 (79.2)	2.2 (0.8-6.3)		3711 (34.6)	11.0 (1.7-26.9)	
Clinical outcome						
Favourable (N=5922)†	4657 (78.6)	1.9 (0.8-5.2)	<0.0001	1834 (31.0)	4.6 (1.2-22.3)	<0.0001
Poor (N=3826)‡	3018 (79.0)	2.7 (1.0-10.3)		1661 (43.5)	19.3 (4.2-40.9)	

*P value for time from hospital arrival, obtained from Mann Whitney Test (Wilcoxon rank sum test)

†Favourable outcome refers to modified Rankin Scores (mRS) 0 to 2 at 90-day

‡Poor outcome refers to mRS 3-6 at 90-day

Table S11. Distribution of baseline characteristics, by 90-day outcome data

Characteristic	mRS Outcome at 90-day		*P* Value
	Available N=9748 (88%)	Missing N=1345 (12%)	
Age, yr	69±14	67±15	<0.01
Male	5889 (60.4)	775 (57.6)	0.05
Pathological subtype			
Ischaemic stroke	8369 (86.1)	1098 (81.9)	<0.0001
Intracerebral haemorrhage	818 (8.4)	112 (8.4)	
Uncertain stroke	533 (5.5)	130 (9.7)	
GCS score	15 (14-15)	15 (14-15)	0.15
Severe (3-8)	335 (3.4)	45 (3.4)	0.86
NIHSS score	4 (2-8)	4 (2-9)	<0.01
Severe≥15	1057 (11.0)	150 (11.5)	0.71
Pre-morbid mRS score*			
0-1	7714 (79.3)	1021 (76.1)	<0.0001
2	1005 (10.3)	144 (12.5)	
3-5	1010 (10.4)	177 (13.2)	
Prior cardiovascular disease risk†	5030 (51.6)	666 (49.5)	0.15
Prior COPD	348 (3.6)	58 (4.4)	0.16
Feeding restrictions	2627 (27.2)	380 (28.4)	0.33
Time to screen, hrs	2.1 (0.8-6.5)	2.4 (0.9-5.8)	0.81
>24	609 (8.6)	58 (5.7)	<0.01
Outcome of pneumonia	325 (3.3)	37 (2.8)	0.26

Data are n (%), mean±SD, or median (interquartile range).

GCS denotes Glasgow coma scale, mRS modified Rankin scale, NIHSS National Institute of Health Stroke Scale.

*Pre-morbid function according to mRS scores (0=no symptoms, 1=symptoms, 2=disability but independence, 3-5 increasing grades of disability requiring assistance)

†includes history of heart disease, stroke or diabetes mellitus

Table S12: Clinical outcomes by feeding restrictions in 2253 patients failed screen or assessment

Clinical outcomes	No feeding (N=339)	Feeding restriction (N=1910)	P-value
Pneumonia	6 (1.8)	227 (11.9)	<0.0001
Poor outcome	126 (41.9)	1238 (74.0)	<0.0001

Data are n (%), Chi-square P-value

Table S13. Feeding practices by region of recruitment in 2000 stroke patients who failed dysphagia screen

Region of recruitment	Use of feeding restriction N (%)		Feeding practice N (%)			
	No	Yes	Nil by mouth	IV fluids	Soft/puree diet	NG tube
Overall (N=2000)	319 (16.0)	1681 (84.0)	633 (37.7)	352 (20.9)	539 (32.1)	829 (49.3)
Region						
Australia/UK (N=1212)	219 (18.1)	993 (81.9)	537 (54.1)	300 (30.2)	442 (44.5)	322 (32.4)
China*(N=319)	75 (23.5)	244 (76.5)	1 (0.4)	7 (2.9)	21 (8.6)	143 (58.6)
India / Sri Lanka (N=257)	7 (2.7)	250 (97.3)	72 (28.8)	36 (14.4)	13 (5.2)	235 (94.0)
South America (N=212)	18 (8.5)	194 (91.5)	23 (11.9)	9 (4.6)	63 (32.5)	129 (66.5)

IV denotes intravenous, NG nasogastric tube
*includes Taiwan

Table S14 Error! Bookmark not defined.**: Baseline characteristics by use of dysphagia assessment in patients passed screen**

Baseline characteristics	Assessment (N=1775)	No assessment (N=5000)	P-value
Age (years)	66.8±13.2	66.9±13.8	0.63
Male	1124 (63.3%)	3089 (61.8%)	0.25
Country group			<0.0001
Australia and UK	438 (24.7%)	2679 (53.6%)	
China and Taiwan	1149 (64.7%)	1750 (35.0%)	
India and Sri Lanka	94 (5.3%)	319 (6.4%)	
South America	94 (5.3%)	252 (5.0%)	
Pathological subtype			<.0001
Acute Ischemic Stroke	1552 (87.4%)	4195 (84.1%)	
Intracerebral Haemorrhage	141 (7.9%)	350 (7.0%)	
Uncertain	82 (4.6%)	441 (8.8%)	
Prior cardiovascular disease risk	904 (50.9%)	2467 (49.3%)	0.25
NIHSS score	3 (2-6)	4 (2-6)	0.15
Severe(≥15)	78(4.4)	180(3.6)	0.13
GCS score	15(14-15)	15(15-15)	<0.0001
Severe (3-8)	23(1.3)	44(0.9)	0.13
Pre-morbid mRS score*			0.11
0-1	1112(63.0)	3043(61.6)	
2	574(32.5)	1721(34.8)	
3-5	78(4.4)	180(3.6)	
History of COPD	40 (2.3%)	198 (4.0%)	0.0008
Smoker	420 (23.8%)	1020 (20.6%)	0.0054
Feeding restriction	234 (13.2%)	515 (10.4%)	0.0013

Data are n (%), mean±SD, or median (interquartile range).

GCS denotes Glasgow coma scale, mRS modified Rankin scale, NIHSS National Institute of Health Stroke Scale.

*Pre-morbid score according to mRS scores (0=no symptoms, 1=symptoms, 2=disability but independence, 3-5 increasing grades of disability requiring assistance)

Table S15. Distribution of baseline characteristics of 3913 stroke patients, according to results of dysphagia assessment

Characteristic	Dysphagia assessment		P Value
	Pass N=2895	Fail N=1018	
Age,yr	69±13.7	74±13.3	<0.0001
Male	1732(59.8)	517(50.8)	
Pathological subtype			
Ischaemic stroke	2499(86.5)	898(88.7)	<0.0001
Intracerebral haemorrhage	241(8.3)	100(9.9)	
Uncertain	148(5.1)	15(1.5)	
GCS score	15(14-15)	14(11-15)	<0.0001
Severe (3-8)	33(1.1)	59(5.8)	<0.0001
NIHSS score	4(2-8)	12(7-19)	<0.0001
Severe ≥15	240(8.3)	425(41.8)	<0.0001
Pre-morbid mRS score*			
0-1	2297(79.3)	712(69.9)	<0.0001
2	272(9.4)	124(12.2)	
3-5	319(11.0)	181(17.8)	
Prior cardiovascular disease risk†	1527(52.8)	567(55.7)	0.10
Feeding restrictions	792(27.4)	1017(94.1)	<0.0001

Data are n (%), mean±SD, or median (interquartile range).

GCS denotes Glasgow coma scale, mRS modified Rankin scale, NIHSS National Institute of Health Stroke Scale.

*Pre-morbid function according to mRS scores (0=no symptoms, 1=symptoms, 2=disability but independence, 3-5 increasing grades of disability requiring assistance)

†includes history of cardiac disease, stroke or diabetes mellitus

Table S16: Baseline characteristics of patients in 5290 lying-flat head position by dysphagia screen

Characteristic	No screen (N=1072)	Screen (N=4218)	*P* value
Age,yr	67±13.1	69±14.1	0.02
Male	644(60.1)	2508(59.5)	0.71
Pathological subtype			
Ischaemic stroke	944(88.3)	3577(85.1)	<0.001
Intracerebral haemorrhage	92(8.6)	327(7.8)	
Uncertain	33(3.1)	303(7.2)	
GCS score	15(13-15)	15(14-15)	<0.0001
Severe (3-8)	99(9.2)	86(2.0)	<0.0001
NIHSS score	4(2-9)	4(2-9)	0.40
Severe≥15	126(11.5)	468(11.2)	0.17
Pre-morbid mRS score*			
0-1	839(78.3)	3365(80.0)	0.46
2	116(10.8)	417(9.9)	
3-5	117(10.9)	426(10.1)	
History of cardiovascular disease risk†	567(52.9)	2107(50.0)	0.09

Data are n (%), mean±SD, or median (interquartile range).

GCS denotes Glasgow coma scale, mRS modified Rankin scale, NIHSS National Institute of Health Stroke Scale.

*mRS modified Rankin scale (0=no symptoms, 1=symptoms, 2=disability but independence, 3-5 increasing grades of disability requiring assistance)

†includes history of cardiac disease, stroke or diabetes mellitus

Figure S1. Patient Flow

Patients flow of receiving dysphagia screening and assessment in the HeadPoST study

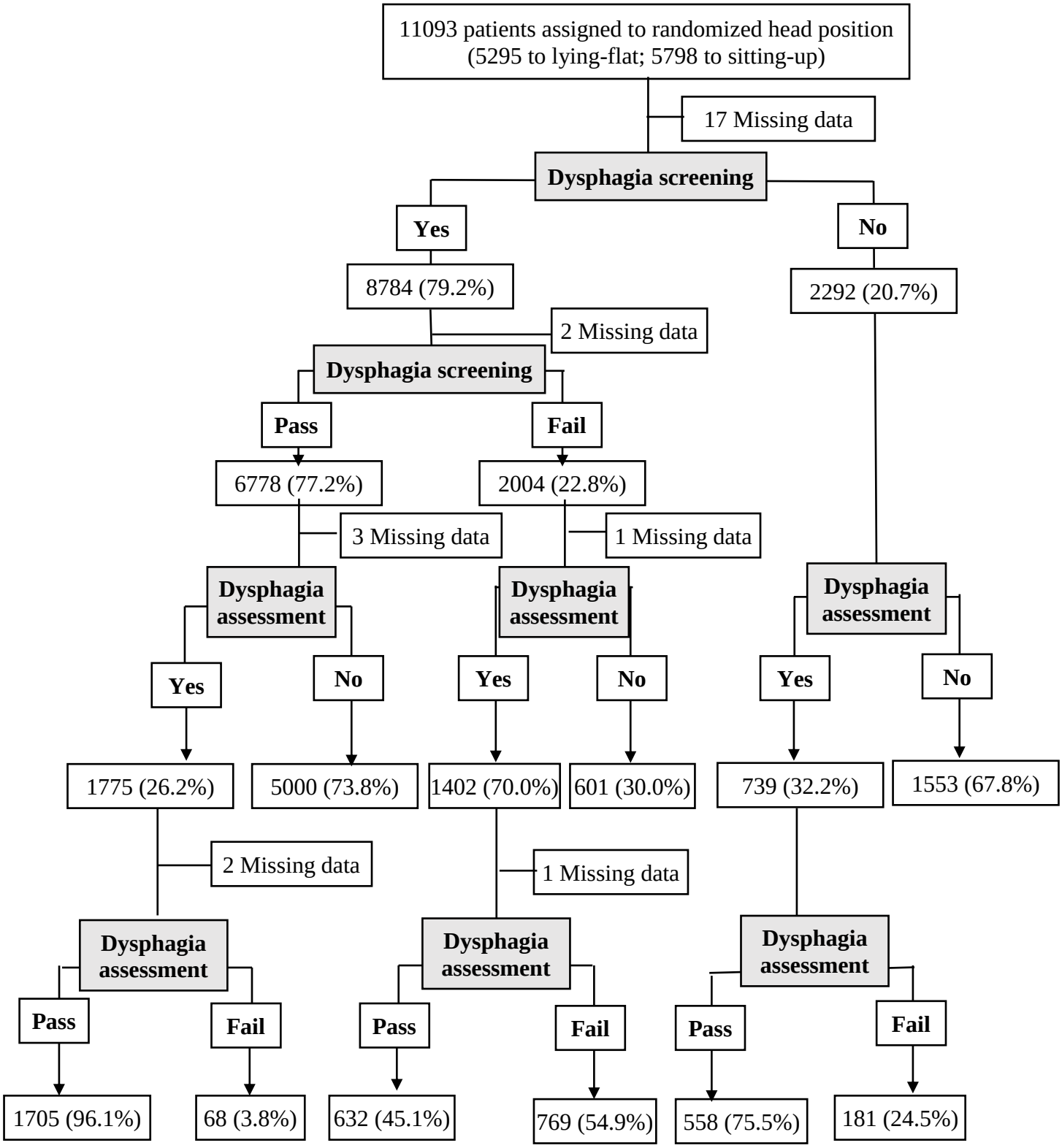
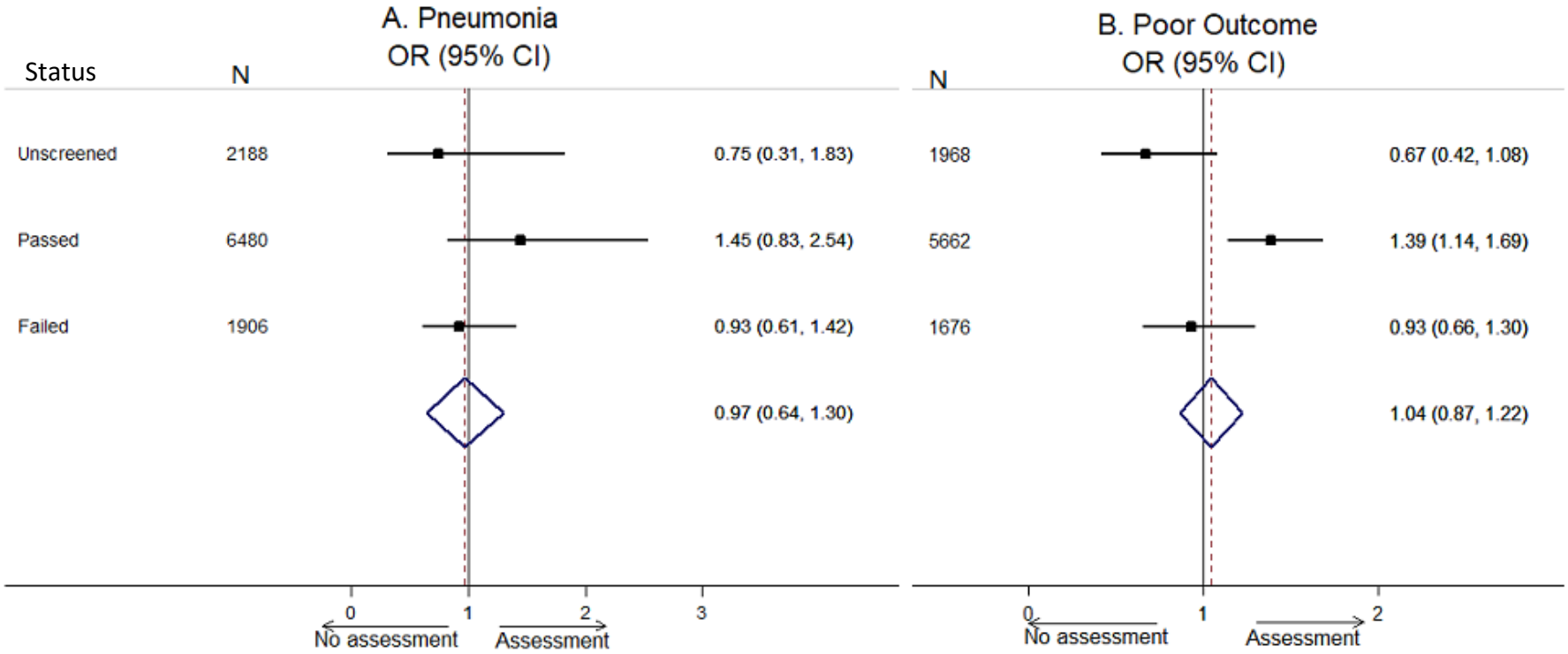


Figure S2. Effect of use of dysphagia assessment on clinical outcomes, by utility and results of dysphagia screen

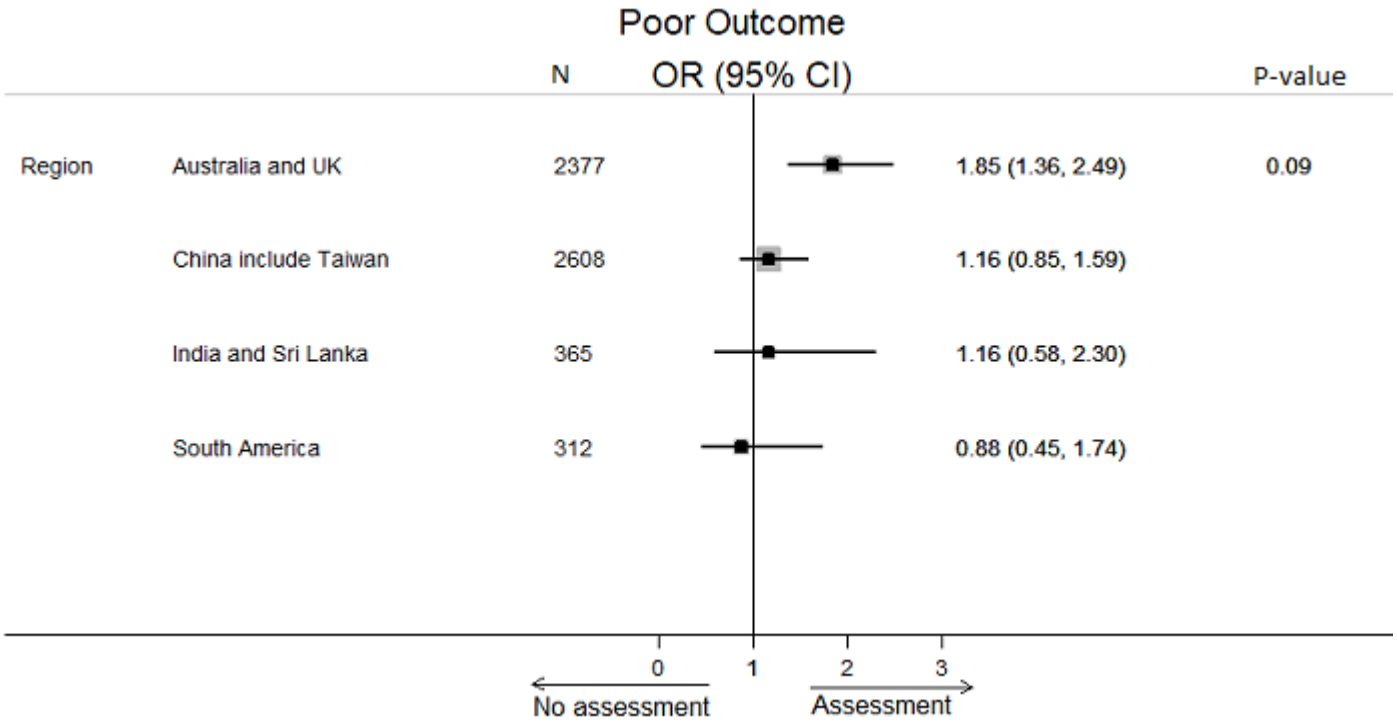


Status donates the utility of dysphagia screen; N donates the number of patients in each status

Poor outcome is death or disability at 90-day according to scores 3-6 on the modified Rankin scale

Hierarchical mixed models used in analyses

Figure S3. Effects of dysphagia assessment results on poor outcome stratified by country groups in 5662 patients passed screen

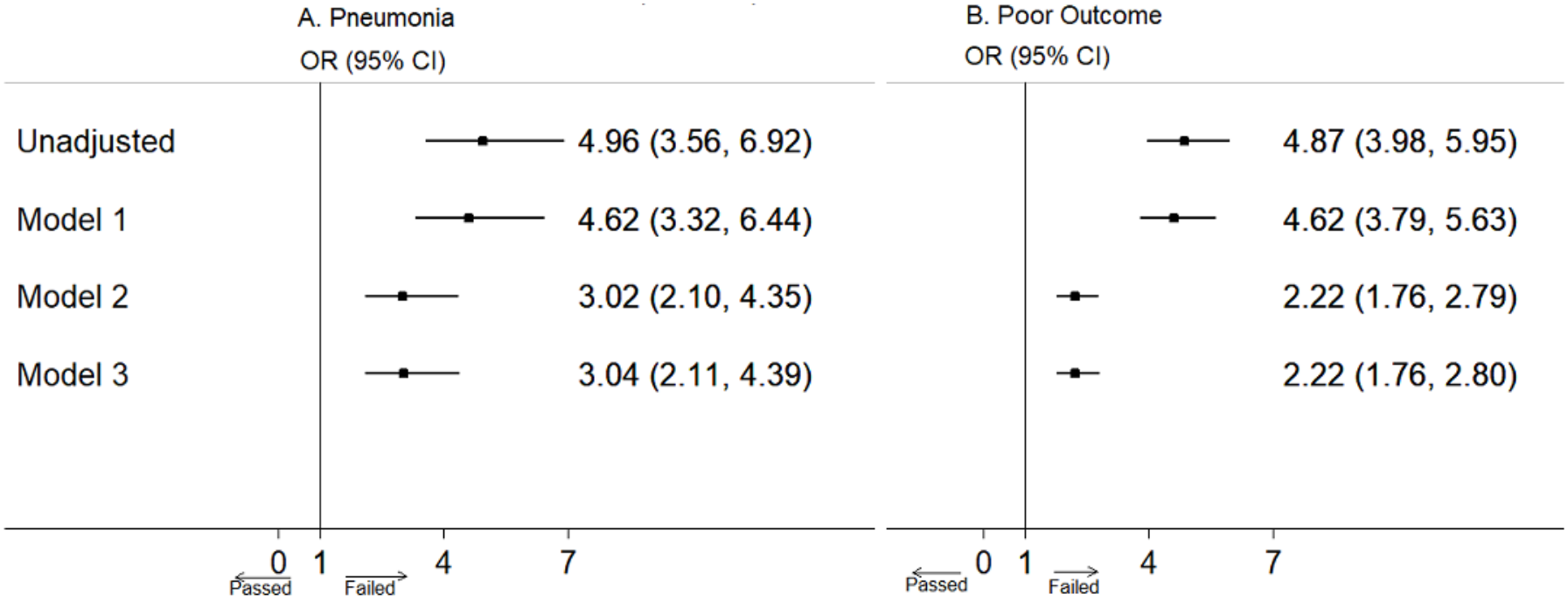


N donates the number of patients in each status

Poor outcome is death or disability at 90-day according to scores 3-6 on the modified Rankin scale

Hierarchical mixed models used in analyses

Figure S4. Effects of dysphagia assessment results on clinical outcomes



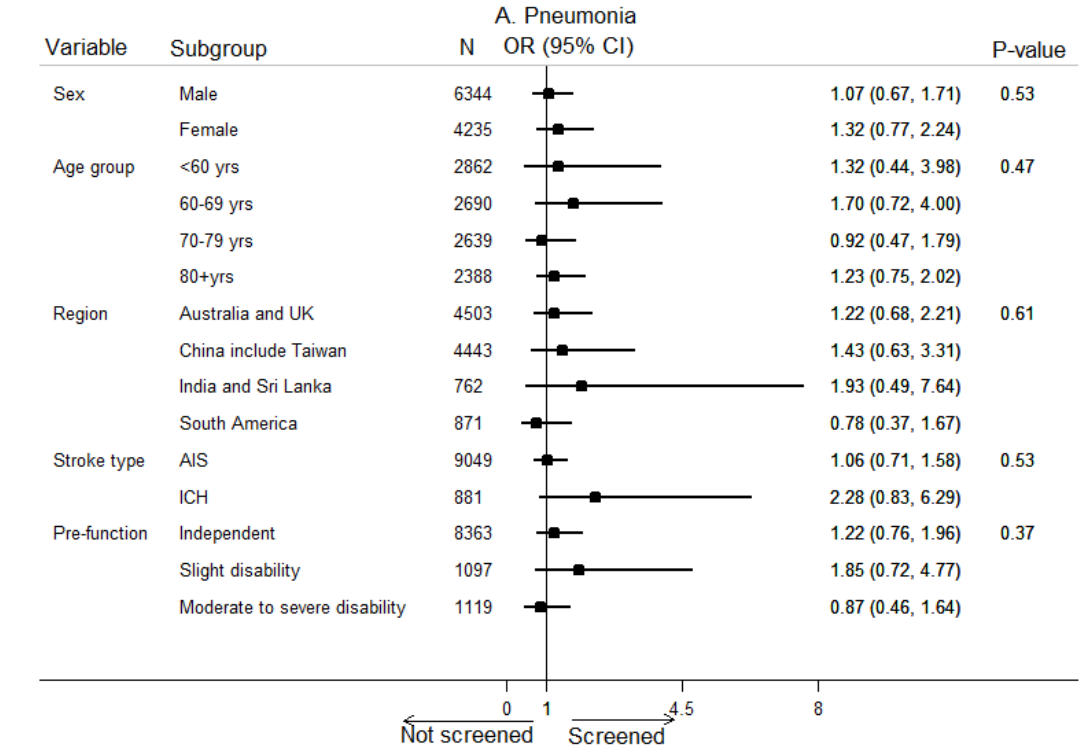
N donates the number of patients in each subgroup, Passed donates passed assessment, Failed donates failed assessment

Poor outcome is death or disability at 90-day according to scores 3-6 on the modified Rankin scale

Passed donates passed dysphagia assessment, Failed donates failed dysphagia assessment

Hierarchical mixed models used in analyses

Figure S5. Effects of use of dysphagia screen on pneumonia in 10579 patients by pre-defined subgroups

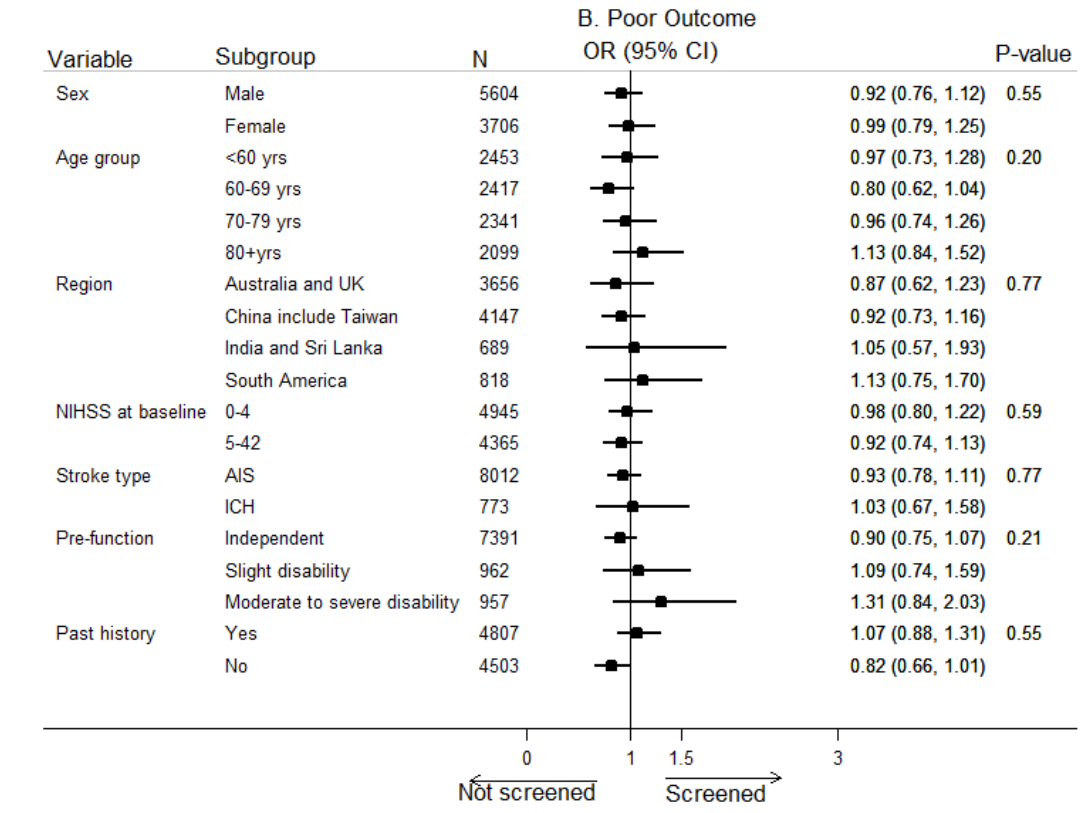


N donates number of patients in each subgroup

NIHSS donates National Institute of Health Stroke Scale, AIS acute ischaemic stroke, ICH intracerebral haemorrhage, Pre-function refers to grade of pre-morbid physical function on the modified Rankin scale where 0-1 = independent, 2= mild disability but independent, and 3-5 = increasing grades of disability and dependence on others for care

Hierarchical mixed models were used in analyses

Figure S6. Effects of use of dysphagia screen on poor outcome (death and disability) at 90-day in 9310 patients by pre-defined subgroups



Poor outcome is death or disability at 90-day according to scores 3-6 on the modified Rankin scale

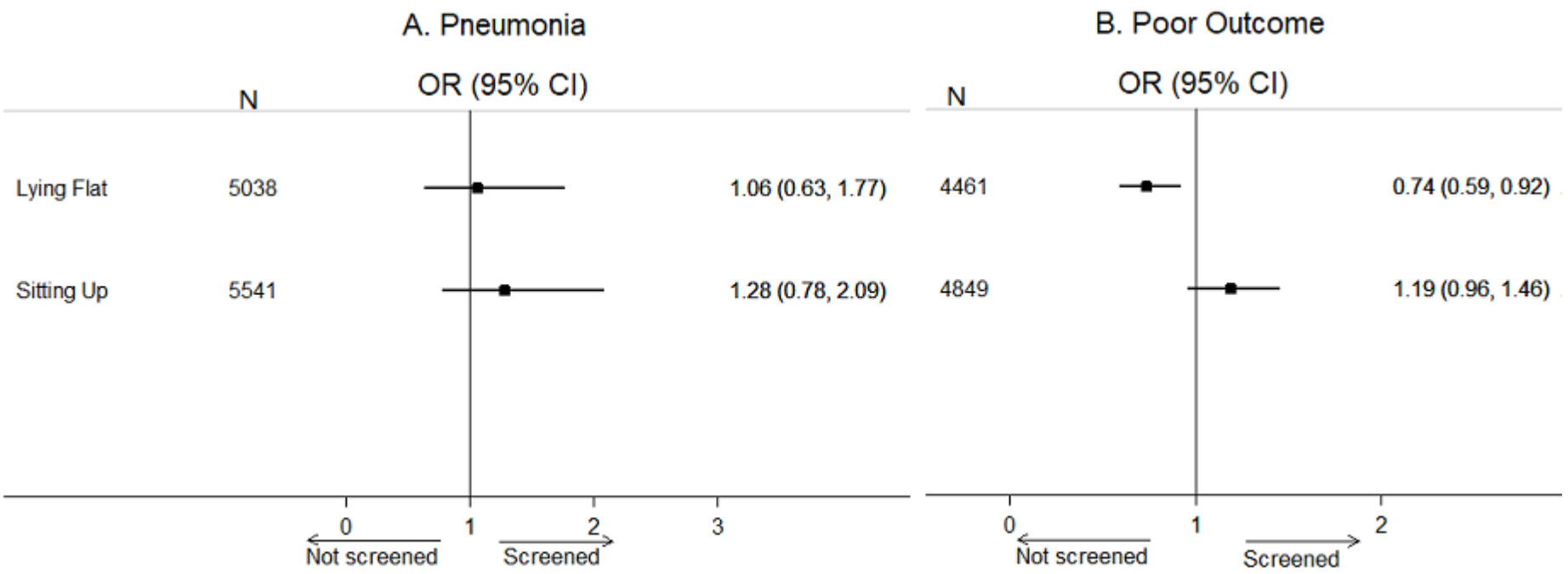
N donates number of patients in each subgroup

NIHSS donates National Institute of Health Stroke Scale, AIS acute ischaemic stroke, ICH intracerebral haemorrhage

Pre-function refers to grade of pre-morbid physical function on the modified Rankin scale where 0-1 = independent, 2= slight disability but independent, and 3-5 = moderate to severe disability

Hierarchical mixed models were used in analyses

Figure S7. Effects of use of dysphagia screen on the clinical outcomes, according to head position

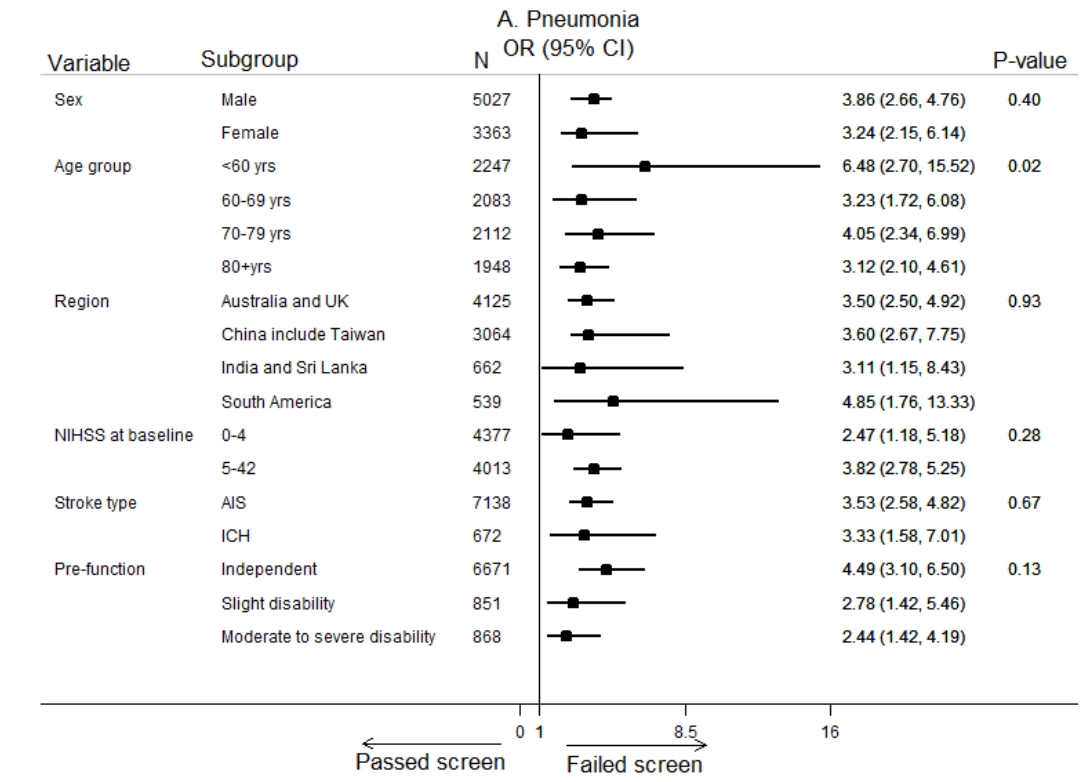


N donates the number of patients in each head position subgroup

Poor outcome is death or disability at 90-day according to scores 3-6 on the modified Rankin scale

Hierarchical mixed models used in analyses

Figure S8. Effects of dysphagia screen on pneumonia in 8586 patients in pre-defined subgroups



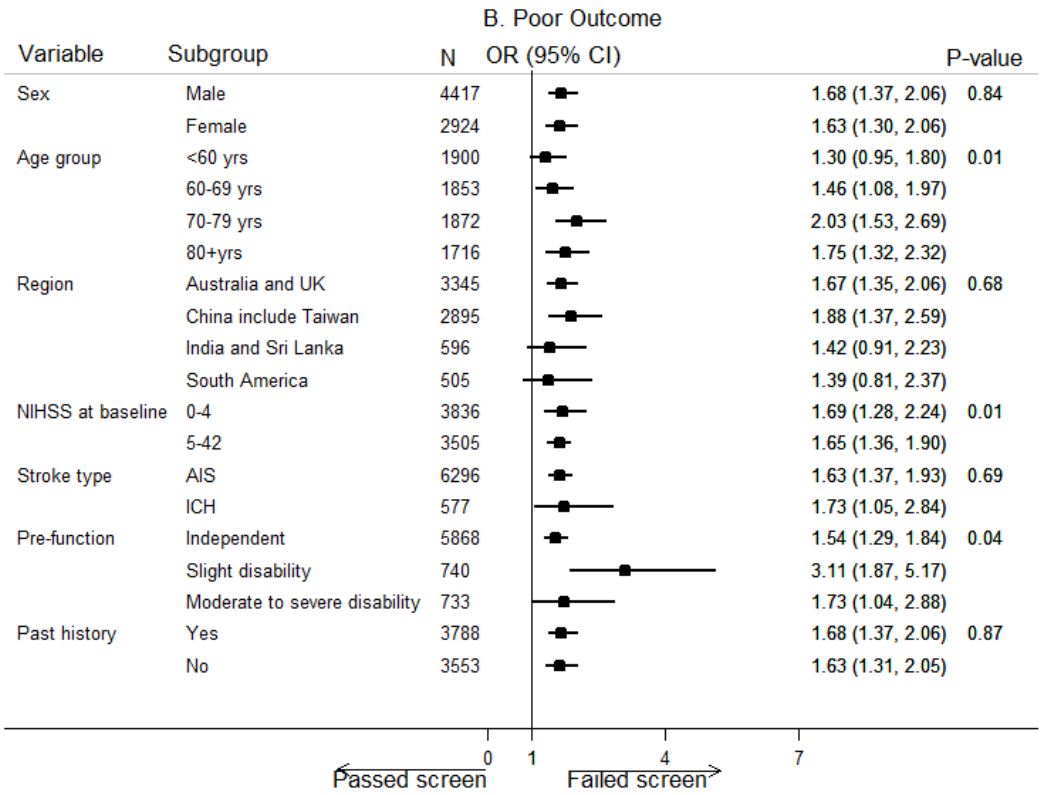
N donates the number of patients in each subgroup

NIHSS donates National Institute of Health Stroke Scale, AIS acute ischaemic stroke, ICH intracerebral haemorrhage

Pre-function refers to grade of pre-morbid physical function on the modified Rankin scale where 0-1 = independent, 2= slight disability but independent, and 3-5 = moderate to severe disability

Hierarchical mixed models were used in analyses

Figure S9. Effects of dysphagia screen on poor outcome at 90-day in 7020 patients according to pre-defined subgroups



N donates the number of patients in each subgroup

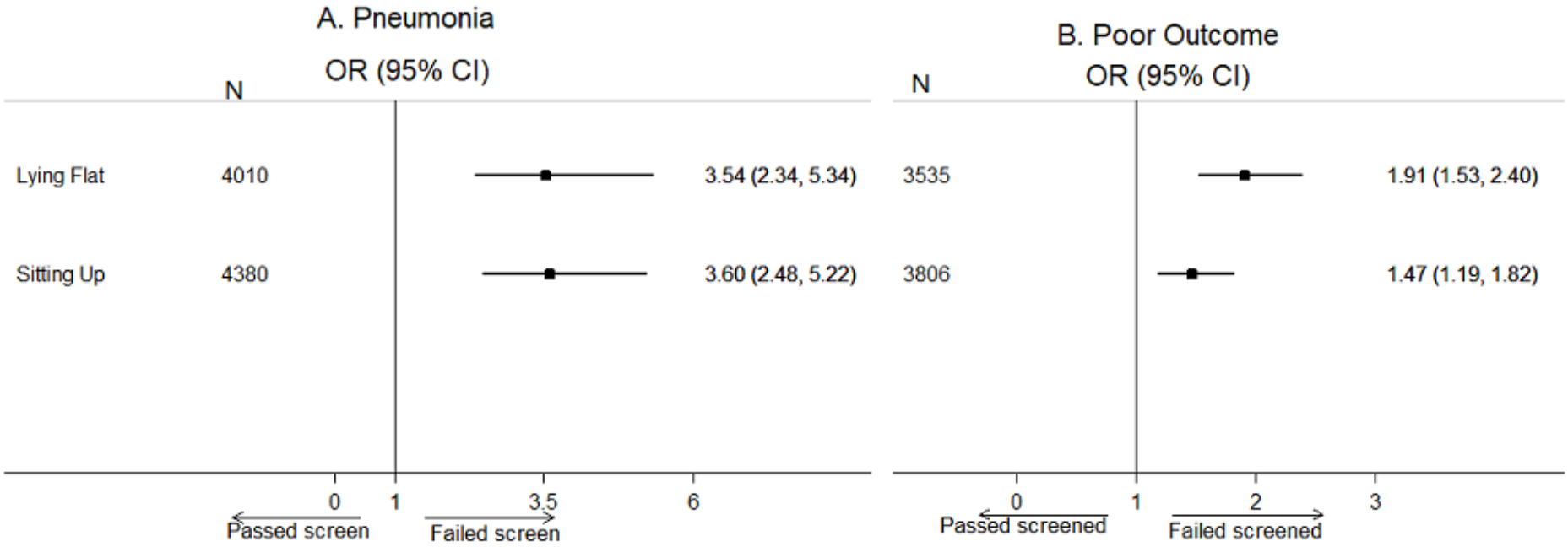
Poor outcome is death or disability at 90-day according to scores 3-6 on the modified Rankin scale

NIHSS donates National Institute of Health Stroke Scale, AIS acute ischaemic stroke, ICH intracerebral haemorrhage.

Pre-function refers to grade of pre-morbid physical function on the modified Rankin scale where 0-1 = independent, 2= slight disability but independent, and 3-5 = moderate to severe disability

Hierarchical mixed models were used in analyses

Figure S10. Effects of dysphagia screen results on clinical outcomes, according to head position

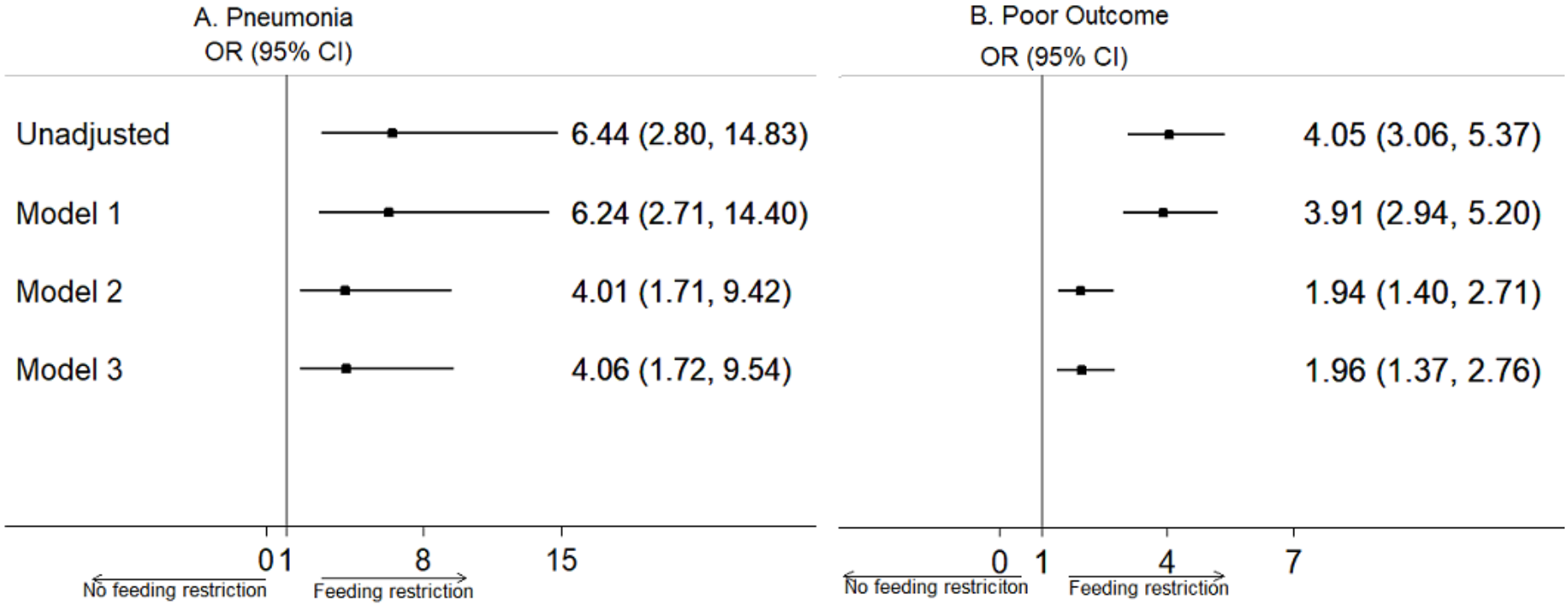


N donates the number of patients in each head position subgroup

Poor outcome is death or disability according to scores 3-6 on the modified Rankin scale

Hierarchical mixed models were used in analyses

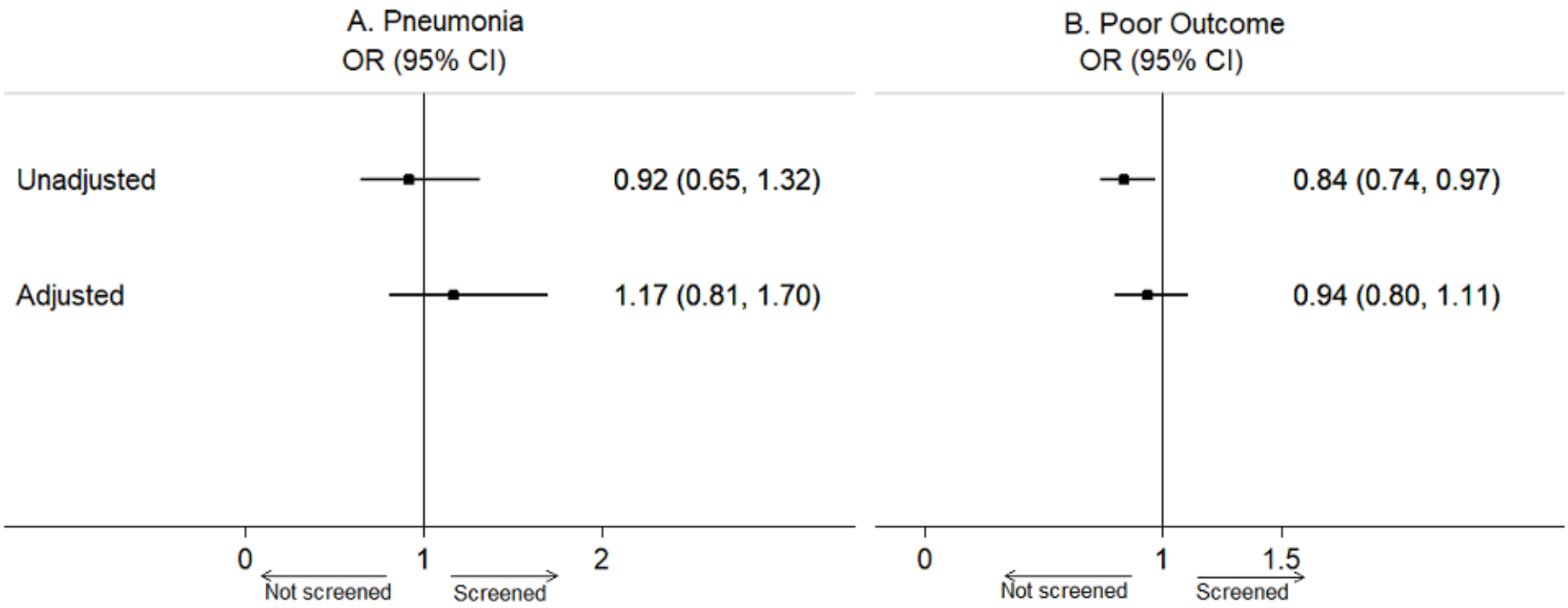
Figure S11. Effects of use feeding restrictions on clinical outcomes in patients either failed dysphagia screen or assessment



Poor outcome is death or disability according to scores 3-6 on the modified Rankin scale

Hierarchical mixed models were used in analyses

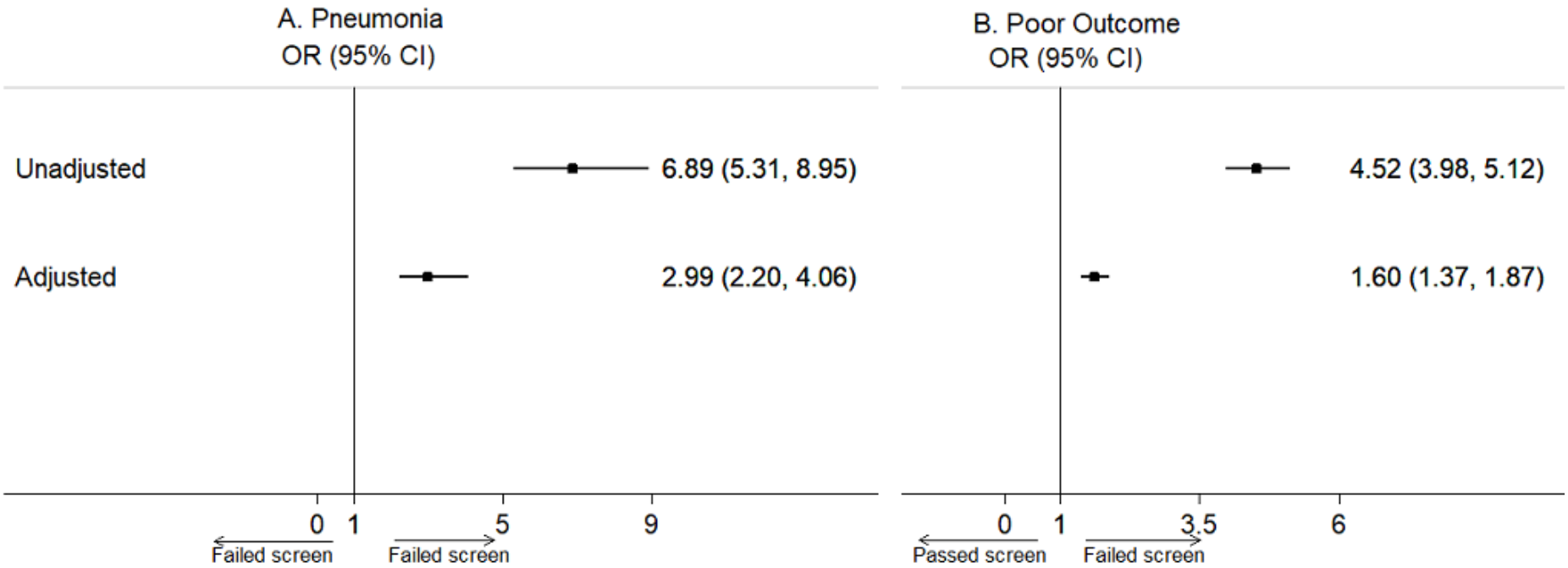
Figure S12. Multiple imputation analysis for effect of use of dysphagia screen on clinical outcomes



Poor outcome is death or disability according to scores 3-6 on the modified Rankin scale

Hierarchical mixed models were used in analyses

Figure S13. Multiple imputation analysis for effect of dysphagia screen results on clinical outcomes



Poor outcome is death or disability according to scores 3-6 on the modified Rankin scale

Hierarchical mixed models were used in analyses