

Appendix

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ONLINE SUPPLEMENT

Table S1. Words suggestive of behavioural disturbance

agitated	agitation	aggression	aggressive
combative	confused	confusion	delirious
delirium	disorganized	disorganised	disorientated
disorientation	distraction	disturbed	delusion
endangering	fluctuating	inattention	incoherent
paranoia	paranoid	restrained	restraint
shackled	violence	uncooperative	violent

Table S2. Negation and Resolution Words

no	not	nil	nill
resolved	resolving	cleared	clearing
ceased			

Table S3. Vital Signs and Laboratory Tests According to the Presence of NLP-Dx-BD

	NLP-Dx-BD (n = 5108)	No NLP-Dx-BD (n = 7267)	p value
Vital signs			
Temperature, °C			
Highest	37.3 (36.7 – 37.8)	37.2 (36.7 – 37.8)	0.021
Lowest	36.0 (35.5 – 36.5)	36.0 (35.5 – 36.5)	< 0.001
Heart rate, bpm			
Highest	100.0 (90.0 – 118.0)	98.0 (88.0 – 110.0)	< 0.001
Lowest	70.0 (60.0 – 85.0)	72.0 (62.0 – 82.0)	0.003
Systolic blood pressure, mmHg			
Highest	140.0 (128.0 – 160.0)	140.0 (125.0 – 155.0)	< 0.001
Lowest	95.0 (85.0 – 105.0)	95.0 (85.0 – 105.0)	< 0.001
Diastolic blood pressure, mmHg			
Highest	68.0 (60.0 – 80.0)	68.0 (60.0 – 78.0)	0.228
Lowest	50.0 (42.0 – 55.0)	50.0 (45.0 – 58.0)	< 0.001
Mean arterial pressure, mmHg			
Highest	93.0 (83.0 – 105.0)	91.0 (82.0 – 102.0)	< 0.001
Lowest	65.0 (58.0 – 72.0)	67.0 (60.0 – 73.0)	< 0.001
Respiratory rate, mpm			
Highest	18.0 (15.0 – 22.0)	18.0 (15.0 – 24.0)	0.022
Lowest	12.0 (10.0 – 15.0)	12.0 (10.0 – 15.0)	0.011
Urine output at the first day	1500.0 (1235.0 – 2265.0)	1500.0 (1265.0 – 2217.5)	0.688
Arterial blood gases			
pH	7.36 (7.30 – 7.42)	7.37 (7.31 – 7.42)	0.005
FiO ₂	0.50 (0.30 – 1.00)	0.50 (0.30 – 1.00)	<0.001
PaO ₂ / FiO ₂	304.0 (202.0 – 404.0)	327.1 (232.0 – 431.8)	<0.001
PaCO ₂ , mmHg	41.0 (36.0 – 46.0)	41.0 (36.0 – 46.0)	0.845
Lactate, mmol/L	2.3 (1.6 – 3.5)	2.0 (1.4 – 3.0)	<0.001
Laboratory tests			
Hemoglobin, g/dL			
Highest	11.1 (9.6 – 13.0)	11.1 (9.6 – 12.7)	0.126
Lowest	9.6 (8.0 – 11.6)	9.7 (8.2 – 11.5)	0.127
White blood cell count, cells/mm ³			
Highest	12.4 (9.1 – 16.9)	12.0 (9.0 – 16.1)	0.002
Lowest	9.5 (6.8 – 13.0)	9.4 (6.9 – 12.5)	0.368
Platelets, cells/mm ³			

Table S3. Vital Signs and Laboratory Tests According to the Presence of NLP-Dx-BD

	NLP-Dx-BD (n = 5108)	No NLP-Dx-BD (n = 7267)	p value
Highest	194.0 (137.0 – 264.0)	195.0 (144.0 – 258.0)	0.091
Lowest	162.0 (107.0 – 223.8)	167.0 (119.0 – 225.0)	< 0.001
Urea, mmol/L	7.6 (5.2 – 12.4)	6.4 (4.7 – 9.4)	< 0.001
Highest creatinine, mmol/L	99.0 (73.0 – 156.0)	88.0 (68.0 – 122.0)	< 0.001
Lowest albumin, g/dL	28.0 (24.0 – 32.0)	29.0 (25.0 – 33.0)	< 0.001
Bilirubin, mg/dL	14.0 (8.0 – 26.0)	13.0 (8.0 – 22.0)	< 0.001
Glucose, mmol/L			
Highest	9.3 (7.5 – 11.8)	9.2 (7.6 – 11.2)	0.001
Lowest	6.3 (5.3 – 7.5)	6.4 (5.4 – 7.6)	< 0.001
Bicarbonate, mmol/L			
Highest	25.0 (23.0 – 27.0)	25.0 (23.0 – 27.0)	0.033
Lowest	22.0 (19.3 – 24.0)	22.4 (20.0 – 24.0)	< 0.001
Potassium, mEq/L			
Highest	4.4 (4.1 – 4.8)	4.4 (4.1 – 4.7)	0.006
Lowest	3.7 (3.4 – 4.0)	3.8 (3.5 – 4.1)	< 0.001
Sodium, mEq/L			
Highest	140.0 (137.0 – 142.0)	139.0 (137.0 – 142.0)	< 0.001
Lowest	136.0 (133.0 – 139.0)	137.0 (134.0 – 139.0)	0.007

Data are median (quartile 25% - quartile 75%)

Table S4a. Baseline Characteristics According Different Cohorts

	Cohort 0-1 Day (n = 11626)			Cohort 0-2 Days (n = 7517)			Cohort 0-3 Days (n = 4893)			Cohort 0-4 Days (n = 3394)		
	NLP-Dx-BD (n = 2539)	No NLP-Dx-BD (n = 9087)	p value	NLP-Dx-BD (n = 2976)	No NLP-Dx-BD (n = 4541)	p value	NLP-Dx-BD (n = 2610)	No NLP-Dx-BD (n = 2283)	p value	NLP-Dx-BD (n = 2175)	No NLP-Dx-BD (n = 1219)	p value
Age, years	64.2 (50.0 – 75.5)	63.9 (51.7 – 73.6)	0.355	64.8 (51.4 – 75.4)	63.9 (52.3 – 73.4)	0.023	64.8 (51.8 – 75.2)	62.9 (51.2 – 73.1)	0.001	64.5 (51.7 – 74.7)	62.6 (50.3 – 72.3)	0.001
Male gender	1636 (64.4)	5590 (61.5)	0.007	1900 (63.8)	2786 (61.4)	0.030	1644 (63.0)	1404 (61.5)	0.287	1373 (63.1)	741 (60.8)	0.184
Body mass index, kg/m ²	28.1 (24.9 – 32.9)	27.9 (24.7 – 31.7)	0.413	28.1 (25.0 – 31.7)	27.8 (24.5 – 31.9)	0.610	28.2 (25.2 – 32.8)	27.4 (24.0 – 31.6)	0.178	27.5 (24.6 – 32.4)	27.8 (24.1 – 31.6)	0.700
Severity of illness												
APACHE III	54.0 (39.0 – 70.0)	49.0 (36.0 – 65.0)	< 0.001	57.0 (42.0 – 73.0)	53.0 (39.0 – 70.0)	< 0.001	59.0 (45.0 – 77.0)	57.0 (42.0 – 75.0)	0.001	62.0 (46.0 – 79.0)	59.0 (44.0 – 79.0)	0.056
ANZ Risk of Death, %	4.2 (1.0 – 15.7)	2.5 (0.6 – 11.4)	< 0.001	5.7 (1.4 – 19.7)	3.9 (0.9 – 15.8)	< 0.001	7.4 (1.9 – 23.9)	5.7 (1.4 – 20.9)	< 0.001	8.7 (2.5 – 27.1)	7.6 (1.8 – 25.7)	0.042
Source of admission			< 0.001			< 0.001			< 0.001			< 0.001
Operating room	933 (36.7)	4532 (49.9)		1131 (38.0)	2037 (44.9)		976 (37.4)	895 (39.2)		776 (35.7)	436 (35.8)	
Emergency room	783 (30.8)	2343 (25.8)		901 (30.3)	1220 (26.9)		773 (29.6)	612 (26.8)		603 (27.7)	326 (26.7)	
Ward	480 (18.9)	1201 (13.2)		550 (18.5)	696 (15.3)		480 (18.4)	404 (17.7)		430 (19.8)	221 (18.1)	
Other hospital	260 (10.2)	744 (8.2)		278 (9.3)	410 (9.0)		260 (10.0)	242 (10.6)		252 (11.6)	141 (11.6)	
Other ICU	82 (3.2)	213 (2.3)		115 (3.9)	137 (3.0)		120 (4.6)	101 (4.4)		114 (5.2)	77 (6.3)	
Others	1 (0.0)	54 (0.6)		1 (0.0)	41 (0.9)		1 (0.0)	29 (1.3)		0 (0.0)	18 (1.5)	
Planned admission	578 (24.5)	3169 (38.2)	< 0.001	675 (24.7)	1357 (33.0)	< 0.001	553 (23.1)	580 (28.1)	< 0.001	411 (20.5)	275 (24.8)	0.006
RRT admission	490 (20.8)	1196 (14.4)	< 0.001	540 (19.7)	672 (16.3)	0.001	460 (19.2)	388 (18.8)	0.573	411 (20.5)	204 (18.4)	0.198
Cardiac arrest	53 (2.2)	317 (3.8)	< 0.001	103 (3.8)	205 (5.0)	0.026	110 (4.6)	130 (6.4)	0.020	110 (5.5)	85 (7.8)	0.025
Acute respiratory failure	59 (2.5)	175 (2.1)	0.266	77 (2.8)	110 (2.7)	0.763	80 (3.4)	77 (3.8)	0.463	78 (3.9)	57 (5.3)	0.097
Type of admission			< 0.001			< 0.001			< 0.001			0.010
Medical	1418 (60.1)	3708 (44.7)		1595 (58.3)	2062 (50.1)		1423 (59.4)	1156 (56.0)		1229 (61.4)	662 (59.8)	
Elective surgery	576 (24.4)	3174 (38.3)		672 (24.6)	1356 (33.0)		550 (22.9)	579 (28.0)		409 (20.4)	274 (24.8)	
Urgent surgery	367 (15.5)	1412 (17.0)		469 (17.1)	695 (16.9)		424 (17.7)	331 (16.0)		363 (18.1)	171 (15.4)	
Diagnostic category			< 0.001			< 0.001			< 0.001			< 0.001
Cardiovascular	727 (28.6)	3610 (39.7)		907 (30.5)	1670 (36.8)		783 (30.0)	775 (33.9)		647 (29.7)	393 (32.2)	
Gastrointestinal	404 (15.9)	1558 (17.1)		512 (17.2)	848 (18.7)		476 (18.2)	427 (18.7)		422 (19.4)	230 (18.9)	
Respiratory	389 (15.3)	1346 (14.8)		438 (14.7)	702 (15.5)		392 (15.0)	378 (16.6)		333 (15.3)	202 (16.6)	
Sepsis	197 (7.8)	724 (8.0)		222 (7.5)	438 (9.6)		208 (8.0)	242 (10.6)		173 (8.0)	131 (10.7)	
Neurological	247 (9.7)	407 (4.5)		294 (9.9)	183 (4.0)		239 (9.2)	90 (3.9)		190 (8.7)	55 (4.5)	
Metabolic	227 (8.9)	357 (3.9)		170 (5.7)	151 (3.3)		116 (4.4)	52 (2.3)		77 (3.5)	32 (2.6)	
Muscle and skin	117 (4.6)	367 (4.0)		153 (5.1)	169 (3.7)		144 (5.5)	91 (4.0)		123 (5.7)	45 (3.7)	
Trauma	120 (4.7)	306 (3.4)		152 (5.1)	178 (3.9)		148 (5.7)	128 (5.6)		134 (6.2)	87 (7.1)	
Renal and genitourinary	90 (3.5)	328 (3.6)		97 (3.3)	159 (3.5)		79 (3.0)	70 (3.1)		55 (2.5)	29 (2.4)	
Hematological	18 (0.7)	69 (0.8)		28 (0.9)	36 (0.8)		25 (1.0)	25 (1.1)		21 (1.0)	13 (1.1)	
Gynecological	1 (0.0)	11 (0.1)		1 (0.0)	5 (0.1)		0 (0.0)	3 (0.1)		0 (0.0)	2 (0.2)	
Other	2 (0.1)	4 (0.0)		2 (0.1)	2 (0.0)		0 (0.0)	2 (0.1)				
Co-existing disorders												
Diabetes	558 (22.0)	1983 (21.8)	0.871	692 (23.3)	975 (21.5)	0.069	613 (23.5)	498 (21.8)	0.171	526 (24.2)	268 (22.0)	0.151

Table S4a. Baseline Characteristics According Different Cohorts

	Cohort 0-1 Day (n = 11626)			Cohort 0-2 Days (n = 7517)			Cohort 0-3 Days (n = 4893)			Cohort 0-4 Days (n = 3394)		
	NLP-Dx-BD (n = 2539)	No NLP-Dx-BD (n = 9087)	p value	NLP-Dx-BD (n = 2976)	No NLP-Dx-BD (n = 4541)	p value	NLP-Dx-BD (n = 2610)	No NLP-Dx-BD (n = 2283)	p value	NLP-Dx-BD (n = 2175)	No NLP-Dx-BD (n = 1219)	p value
Cirrhosis	184 (7.8)	552 (6.6)	0.059	238 (8.7)	373 (9.1)	0.634	246 (10.3)	202 (9.8)	0.618	218 (10.9)	117 (10.6)	0.809
Chronic respiratory disease	156 (6.1)	457 (5.0)	0.031	169 (5.7)	236 (5.2)	0.375	151 (5.8)	128 (5.6)	0.805	128 (5.9)	70 (5.7)	0.939
Use of immunosuppressors	129 (5.1)	441 (4.9)	0.640	154 (5.2)	265 (5.8)	0.237	147 (5.6)	157 (6.9)	0.075	134 (6.2)	84 (6.9)	0.422
Chronic kidney disease	127 (5.0)	388 (4.3)	0.114	148 (5.0)	221 (4.9)	0.827	143 (5.5)	123 (5.4)	0.900	115 (5.3)	70 (5.7)	0.582
Immunological disease	96 (3.8)	367 (4.0)	0.605	125 (4.2)	213 (4.7)	0.334	120 (4.6)	129 (5.7)	0.103	112 (5.1)	72 (5.9)	0.345
Metastatic cancer	96 (3.8)	384 (4.2)	0.338	108 (3.6)	186 (4.1)	0.331	93 (3.6)	82 (3.6)	1.000	74 (3.4)	42 (3.4)	1.000
Chronic cardiovascular disease	85 (3.3)	293 (3.2)	0.752	113 (3.8)	157 (3.5)	0.447	117 (4.5)	80 (3.5)	0.093	106 (4.9)	45 (3.7)	0.118
Hepatic failure	41 (1.6)	134 (1.5)	0.581	66 (2.2)	85 (1.9)	0.313	69 (2.6)	40 (1.8)	0.041	64 (2.9)	18 (1.5)	0.007
Leukemia	33 (1.3)	113 (1.2)	0.840	38 (1.3)	75 (1.7)	0.208	40 (1.5)	53 (2.3)	0.046	36 (1.7)	26 (2.1)	0.350
Lymphoma	22 (0.9)	97 (1.1)	0.435	29 (1.0)	58 (1.3)	0.270	30 (1.1)	38 (1.7)	0.142	25 (1.1)	20 (1.6)	0.273
Acute HIV infection	5 (0.2)	8 (0.1)	0.174	6 (0.2)	5 (0.1)	0.362	5 (0.2)	4 (0.2)	1.000	6 (0.3)	2 (0.2)	0.719
Organ support												
Mechanical ventilation	1443 (56.8)	5373 (59.5)	0.018	1939 (65.2)	2833 (63.0)	0.055	1835 (70.3)	1493 (66.2)	0.002	1639 (75.4)	870 (72.4)	0.064
Renal replacement therapy	234 (9.2)	688 (7.6)	0.008	333 (11.2)	475 (10.5)	0.322	359 (13.8)	329 (14.4)	0.510	375 (17.2)	219 (18.0)	0.605

Data are median (quartile 25% - quartile 75%) or No (%). Percentages may not total 100 because of rounding

ANZ: Australian and New Zealand; APACHE: Acute Physiology and Chronic Health Evaluation; HIV: human immunodeficiency viruses; ICU: intensive care unit; RRT: rapid response team

Table S4b. Baseline Outcomes According Different Cohorts

	Cohort 0-1 Day (n = 11626)			Cohort 0-2 Days (n = 7517)			Cohort 0-3 Days (n = 4893)			Cohort 0-4 Days (n = 3394)		
	NLP-Dx-BD (n = 2539)	No NLP-Dx-BD (n = 9087)	p value	NLP-Dx-BD (n = 2976)	No NLP-Dx-BD (n = 4541)	p value	NLP-Dx-BD (n = 2610)	No NLP-Dx-BD (n = 2283)	p value	NLP-Dx-BD (n = 2175)	No NLP-Dx-BD (n = 1219)	p value
Hospital mortality	303 (11.9)	933 (10.3)	0.018	379 (12.7)	559 (12.3)	0.593	392 (15.0)	324 (14.2)	0.418	354 (16.3)	214 (17.6)	0.338
ICU mortality	166 (6.5)	623 (6.9)	0.593	215 (7.2)	378 (8.3)	0.088	222 (8.5)	227 (9.9)	0.083	213 (9.8)	156 (12.8)	0.008
ICU length of stay	2.5 (1.4 – 4.6)	1.9 (1.0 – 3.8)	< 0.001	3.6 (2.2 – 6.0)	2.9 (2.0 – 5.0)	< 0.001	4.7 (3.4 – 7.8)	4.1 (3.0 – 7.0)	< 0.001	6.0 (4.4 – 10.0)	5.6 (4.2 – 9.1)	0.003
Hospital length of stay	12.7 (6.9 – 30.0)	10.0 (6.2 – 21.1)	< 0.001	14.8 (8.2 – 34.5)	12.3 (7.2 – 25.9)	< 0.001	18.1 (9.7 – 38.7)	15.0 (8.3 – 31.9)	< 0.001	21.6 (11.6 – 44.8)	17.8 (9.8 – 38.4)	< 0.001

Data are median (quartile 25% - quartile 75%) or No (%). Percentages may not total 100 because of rounding

Table S5. Univariable Model of the Association of NLP-Dx-BD on Hospital Mortality According to the Different Cohorts

	Cohort 0-1 Day (n = 11626)		Cohort 0-2 Days (n = 7517)		Cohort 0-3 Days (n = 4893)		Cohort 0-4 Days (n = 3394)	
	Odds Ratio (95% CI)	p value	Odds Ratio (95% CI)	p value	Odds Ratio (95% CI)	p value	Odds Ratio (95% CI)	p value
Overall population	1.18 (1.03 to 1.36)	0.016	1.04 (0.90 to 1.19)	0.585	1.07 (0.91 to 1.25)	0.414	0.91 (0.76 to 1.10)	0.338
Mechanical ventilation								
Yes	0.95 (0.80 to 1.13)	0.585	0.81 (0.68 to 0.96)	0.014	0.87 (0.72 to 1.05)	0.149	0.75 (0.61 to 0.93)	0.008
No	1.85 (1.47 to 2.32)	< 0.001	1.90 (1.46 to 2.48)	< 0.001	1.84 (1.33 to 2.58)	< 0.001	1.82 (1.19 to 2.86)	0.007
Type of admission								
Elective surgery	1.38 (0.68 to 2.60)	0.338	1.38 (0.73 to 2.56)	0.309	1.18 (0.61 to 2.32)	0.621	1.96 (0.85 to 5.06)	0.131
Urgency surgery	1.24 (0.88 to 1.73)	0.203	0.88 (0.62 to 1.24)	0.475	0.98 (0.65 to 1.46)	0.905	0.65 (0.41 to 1.03)	0.065
Medical	0.88 (0.74 to 1.04)	0.138	0.90 (0.76 to 1.06)	0.220	0.91 (0.75 to 1.11)	0.374	0.81 (0.65 to 1.02)	0.075
Source of admission								
Emergency room	0.66 (0.51 to 0.85)	0.001	0.76 (0.59 to 0.98)	0.033	0.86 (0.65 to 1.14)	0.296	0.86 (0.62 to 1.22)	0.401
Operating room	1.49 (1.11 to 1.98)	0.007	1.07 (0.80 to 1.44)	0.632	1.09 (0.79 to 1.52)	0.598	0.97 (0.66 to 1.44)	0.881
Ward	1.41 (1.09 to 1.82)	0.009	1.36 (1.03 to 1.79)	0.030	1.63 (1.17 to 2.28)	0.004	1.08 (0.73 to 1.60)	0.706
Other	0.84 (0.58 to 1.18)	0.324	0.80 (0.57 to 1.13)	0.215	0.83 (0.57 to 1.20)	0.315	0.73 (0.49 to 1.11)	0.143
Age								
≤ 56 years	0.96 (0.72 to 1.28)	0.815	0.94 (0.71 to 1.24)	0.674	0.89 (0.65 to 1.21)	0.462	0.71 (0.50 to 1.02)	0.061
56 - 70 years	1.29 (1.00 to 1.64)	0.042	0.96 (0.75 to 1.23)	0.765	0.91 (0.69 to 1.19)	0.501	0.87 (0.64 to 1.19)	0.395
> 70 years	1.23 (1.00 to 1.51)	0.043	0.95 (0.73 to 1.23)	0.705	1.34 (1.04 to 1.74)	0.026	1.07 (0.78 to 1.48)	0.662
Diagnosis								
Cardiovascular	1.14 (0.86 to 1.50)	0.349	0.95 (0.73 to 1.23)	0.705	0.75 (0.56 to 0.99)	0.047	0.66 (0.47 to 0.91)	0.012
Respiratory	1.26 (0.88 to 1.79)	0.197	1.12 (0.78 to 1.61)	0.529	0.91 (0.60 to 1.390)	0.682	0.71 (0.44 to 1.15)	0.164
Sepsis	1.38 (0.91 to 2.06)	0.124	1.34 (0.87 to 2.04)	0.180	2.00 (1.26 to 3.23)	0.003	1.74 (0.99 to 3.12)	0.056
Trauma	1.11 (0.56 to 2.07)	0.759	1.01 (0.52 to 1.95)	0.969	1.03 (0.51 to 2.12)	0.933	0.72 (0.32 to 1.61)	0.415
Gastrointestinal	1.59 (1.16 to 2.16)	0.003	1.27 (0.92 to 1.76)	0.146	1.09 (0.74 to 1.60)	0.664	1.05 (0.67 to 1.66)	0.833
Neurological	0.44 (0.29 to 0.66)	< 0.001	0.36 (0.23 to 0.56)	< 0.001	0.79 (0.45 to 1.41)	0.415	0.76 (0.38 to 1.56)	0.435

Table S6. P Value of the Interaction Between the Association of NLP-Dx-BD on Hospital Mortality and Baseline Characteristics

	Cohort 0-1 Day (n = 11626)	Cohort 0-2 Days (n = 7517)	Cohort 0-3 Days (n = 4893)	Cohort 0-4 Days (n = 3394)
Mechanical ventilation	0.007	< 0.001	0.007	0.005
Type of admission				
Urgency surgery	0.711	0.277	0.964	0.030
Medical	0.473	0.801	0.771	0.106
Source of admission				
Operating room	0.045	0.434	0.435	0.350
Ward	0.028	0.038	0.010	0.615
Other	0.774	0.785	0.914	0.405
Tertiles of age				
56 - 70 years	0.592	0.517	0.743	0.803
> 70 years	0.422	0.257	0.022	0.171
ICU admission diagnosis				
Respiratory	0.836	0.694	0.656	0.840
Sepsis	0.440	0.260	< 0.001	0.010
Trauma	0.964	0.399	0.716	0.986
Gastrointestinal	0.295	0.277	0.117	0.106
Neurological	0.045	0.055	0.485	0.561

Data are *p* value for interaction between characteristics and diagnosis of delirium in a multivariable model adjusted by ANZROD (after log transformation) and year of ICU admission

Table S7. Multivariable Model of the Effect of NLP-Dx-BD on ICU Length of Stay According to the Different Cohorts

	Cohort 0-1 Day (n = 11626)		Cohort 0-2 Days (n = 7517)		Cohort 0-3 Days (n = 4893)		Cohort 0-4 Days (n = 3394)	
	Mean Difference (95% CI)	p value	Mean Difference (95% CI)	p value	Mean Difference (95% CI)	p value	Mean Difference (95% CI)	p value
Overall population	0.34 (0.12 to 0.57)	0.003	0.37 (0.09 to 0.65)	0.009	0.38 (-0.01 to 0.77)	0.056	0.21 (-0.34 to 0.75)	0.453
Mechanical ventilation								
Yes	0.51 (0.15 to 0.87)	0.004	0.41 (0.01 to 0.81)	0.043	0.24 (-0.29 to 0.77)	0.367	0.07 (-0.62 to 0.76)	0.843
No	0.28 (0.09 to 0.46)	0.004	0.14 (-0.12 to 0.39)	0.294	0.21 (-0.18 to 0.60)	0.298	0.09 (-0.55 to 0.74)	0.769
Type of admission								
Elective surgery	0.48 (0.22 to 0.74)	< 0.001	0.54 (0.21 to 0.87)	0.001	0.36 (-0.14 to 0.86)	0.156	0.20 (-0.57 to 0.97)	0.603
Urgency surgery	0.08 (-0.65 to 0.81)	0.833	0.09 (-0.79 to 0.97)	0.842	-0.12 (-1.39 to 1.16)	0.858	0.26 (-1.55 to 2.06)	0.779
Medical	0.13 (-0.22 to 0.49)	0.456	0.03 (-0.39 to 0.45)	0.892	0.14 (-0.41 to 0.69)	0.622	-0.24 (-0.97 to 0.48)	0.508
Source of admission								
Emergency room	0.68 (0.29 to 1.06)	< 0.001	0.80 (0.34 to 1.27)	< 0.001	1.06 (0.41 to 1.71)	0.001	1.11 (0.19 to 2.04)	0.018
Operating room	0.29 (-0.02 to 0.60)	0.071	0.32 (-0.07 to 0.72)	0.107	0.06 (-0.54 to 0.66)	0.844	0.18 (-0.73 to 1.09)	0.697
Ward	0.33 (-0.31 to 0.96)	0.310	0.33 (-0.40 to 1.06)	0.372	0.25 (-0.71 to 1.21)	0.614	-0.15 (-1.43 to 1.12)	0.813
Other	-0.11 (-1.00 to 0.77)	0.799	-0.27 (-1.29 to 0.75)	0.609	0.33 (-0.90 to 1.56)	0.602	-0.58 (-2.07 to 0.90)	0.439
Age								
≤ 56 years	0.49 (0.07 to 0.91)	0.020	0.40 (-0.13 to 0.93)	0.138	0.64 (-0.08 to 1.36)	0.080	0.38 (-0.60 to 1.36)	0.450
56 - 70 years	0.45 (-0.00 to 0.91)	0.051	0.58 (0.03 to 1.13)	0.037	0.70 (-0.06 to 1.47)	0.070	0.29 (-0.77 to 1.35)	0.595
> 70 years	0.09 (-0.21 to 0.40)	0.536	0.21 (-0.15 to 0.57)	0.258	0.02 (-0.49 to 0.53)	0.937	0.33 (-0.41 to 1.06)	0.386
Diagnosis								
Cardiovascular	0.61 (0.24 to 0.98)	0.001	0.54 (0.08 to 1.00)	0.020	0.54 (-0.14 to 1.22)	0.118	0.51 (-0.47 to 1.50)	0.306
Respiratory	0.74 (0.19 to 1.29)	0.008	0.71 (0.06 to 1.37)	0.033	0.85 (-0.01 to 1.71)	0.053	0.65 (-0.53 to 1.83)	0.283
Sepsis	0.12 (-0.64 to 0.89)	0.751	0.21 (-0.66 to 1.08)	0.632	-0.48 (-1.61 to 0.65)	0.407	-0.38 (-1.93 to 1.18)	0.633
Trauma	-0.09 (-1.31 to 1.13)	0.889	-0.65 (-1.97 to 0.67)	0.333	0.80 (-0.64 to 2.24)	0.274	1.04 (-0.63 to 2.72)	0.221
Gastrointestinal	-0.23 (-0.97 to 0.51)	0.547	0.38 (-0.48 to 1.23)	0.385	0.09 (-1.09 to 1.27)	0.879	-0.28 (-1.91 to 1.35)	0.735
Neurological	-0.38 (-1.37 to 0.60)	0.445	-1.64 (-2.91 to -0.38)	0.010	-2.72 (-4.50 to -0.93)	0.003	-3.76 (-6.09 to -1.44)	0.002

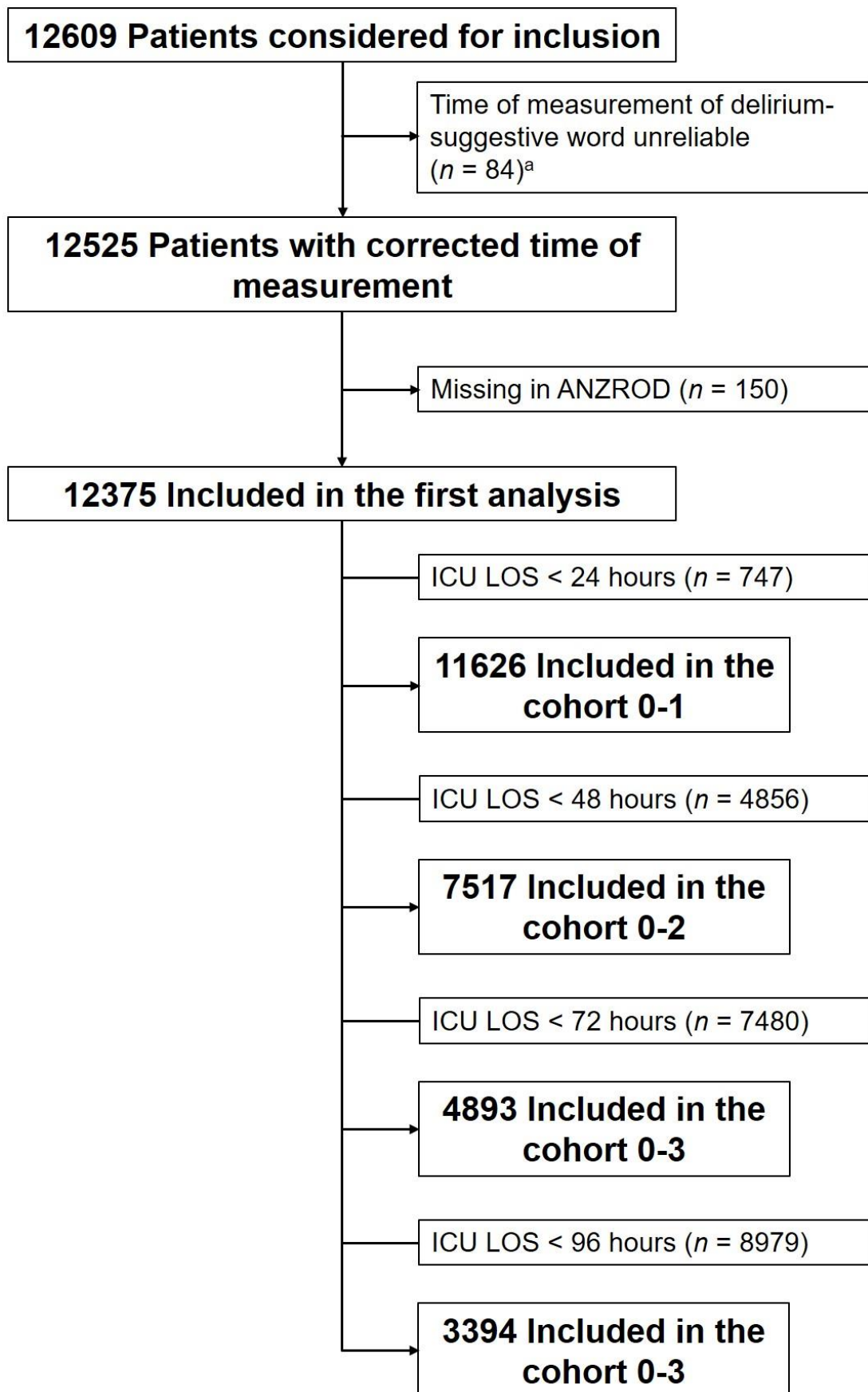
Table S8. Multivariable Model of the Effect of NLP-Dx-BD on Hospital Length of Stay According to the Different Cohorts

	Cohort 0-1 Day (n = 11626)		Cohort 0-2 Days (n = 7517)		Cohort 0-3 Days (n = 4893)		Cohort 0-4 Days (n = 3394)	
	Mean Difference (95% CI)	p value	Mean Difference (95% CI)	p value	Mean Difference (95% CI)	p value	Mean Difference (95% CI)	p value
Overall population	4.62 (3.15 to 6.10)	< 0.001	4.07 (2.32 to 5.82)	< 0.001	2.78 (0.36 to 5.20)	0.024	2.30 (-1.00 to 5.61)	0.171
Mechanical ventilation								
Yes	5.22 (3.07 to 7.36)	< 0.001	3.83 (1.39 to 6.27)	0.002	1.23 (-2.03 to 4.49)	0.459	0.56 (-3.67 to 4.79)	0.796
No	4.18 (2.34 to 6.03)	< 0.001	3.81 (1.64 to 6.00)	< 0.001	4.25 (1.27 to 7.22)	0.005	4.87 (0.75 to 8.98)	0.020
Type of admission								
Elective surgery	3.31 (1.57 to 5.05)	< 0.001	2.21 (0.05 to 4.36)	0.044	2.17 (-1.00 to 5.34)	0.179	3.36 (-0.99 to 7.72)	0.130
Urgency surgery	6.32 (2.56 to 10.09)	0.001	7.32 (3.02 to 11.63)	< 0.001	6.41 (0.62 to 12.20)	0.030	5.79 (-1.82 to 13.41)	0.135
Medical	3.71 (1.21 to 6.21)	0.004	2.21 (-0.69 to 5.11)	0.136	-0.63 (-4.43 to 3.18)	0.745	-0.95 (-5.99 to 4.08)	0.710
Source of admission								
Emergency room	5.00 (2.73 to 7.25)	< 0.001	4.53 (1.84 to 7.22)	< 0.001	7.24 (3.44 to 11.05)	< 0.001	6.89 (1.55 to 12.23)	0.011
Operating room	4.25 (2.54 to 5.97)	< 0.001	4.09 (2.01 to 6.17)	< 0.001	3.13 (0.19 to 6.07)	0.036	3.61 (-0.40 to 7.62)	0.078
Ward	2.71 (-1.30 to 6.72)	0.185	2.21 (-2.17 to 6.60)	0.322	-2.45 (-7.96 to 3.05)	0.382	-3.25 (-10.54 to 4.04)	0.381
Other	6.58 (-0.48 to 13.64)	0.067	3.55 (-4.43 to 11.54)	0.382	-1.05 (-10.60 to 8.49)	0.828	-1.12 (-12.51 to 10.27)	0.847
Age								
≤ 56 years	6.10 (3.04 to 8.98)	< 0.001	3.81 (0.11 to 7.51)	0.043	2.82 (-2.25 to 7.89)	0.275	1.05 (-5.74 to 7.84)	0.762
56 - 70 years	4.39 (1.72 to 7.06)	0.001	5.98 (2.80 to 9.15)	< 0.001	5.30 (0.97 to 9.64)	0.017	5.04 (-0.83 to 10.92)	0.092
> 70 years	3.55 (1.58 to 5.52)	< 0.001	2.82 (0.61 to 5.03)	0.012	1.02 (-1.98 to 4.01)	0.505	2.17 (-1.92 to 6.26)	0.298
Diagnosis								
Cardiovascular	3.80 (2.30 to 5.30)	< 0.001	3.08 (1.37 to 4.79)	< 0.001	3.75 (1.36 to 6.14)	0.002	5.22 (1.77 to 8.66)	0.003
Respiratory	2.44 (-0.19 to 5.06)	0.068	2.20 (-0.89 to 5.29)	0.163	0.67 (-3.33 to 4.66)	0.743	1.49 (-3.98 to 6.96)	0.592
Sepsis	7.35 (2.61 to 12.09)	0.002	4.75 (-0.61 to 10.11)	0.082	-1.58 (-8.48 to 5.31)	0.652	-3.21 (-13.00 to 6.59)	0.520
Trauma	1.51 (-17.25 to 20.27)	0.874	-2.69 (-23.29 to 17.92)	0.797	-0.15 (-22.84 to 22.54)	0.989	10.20 (-16.16 to 36.57)	0.446
Gastrointestinal	1.59 (-1.73 to 4.92)	0.347	3.40 (-0.16 to 6.95)	0.061	4.05 (-0.45 to 8.56)	0.077	1.79 (-3.91 to 7.49)	0.536
Neurological	1.63 (-5.84 to 9.10)	0.669	-0.47 (-9.77 to 8.82)	0.920	-8.04 (-20.78 to 4.70)	0.215	-10.71 (-27.92 to 6.49)	0.221

Table S9. Multivariable Model of the Effect of NLP-Dx-BD on Hospital Mortality in Overall Cohort

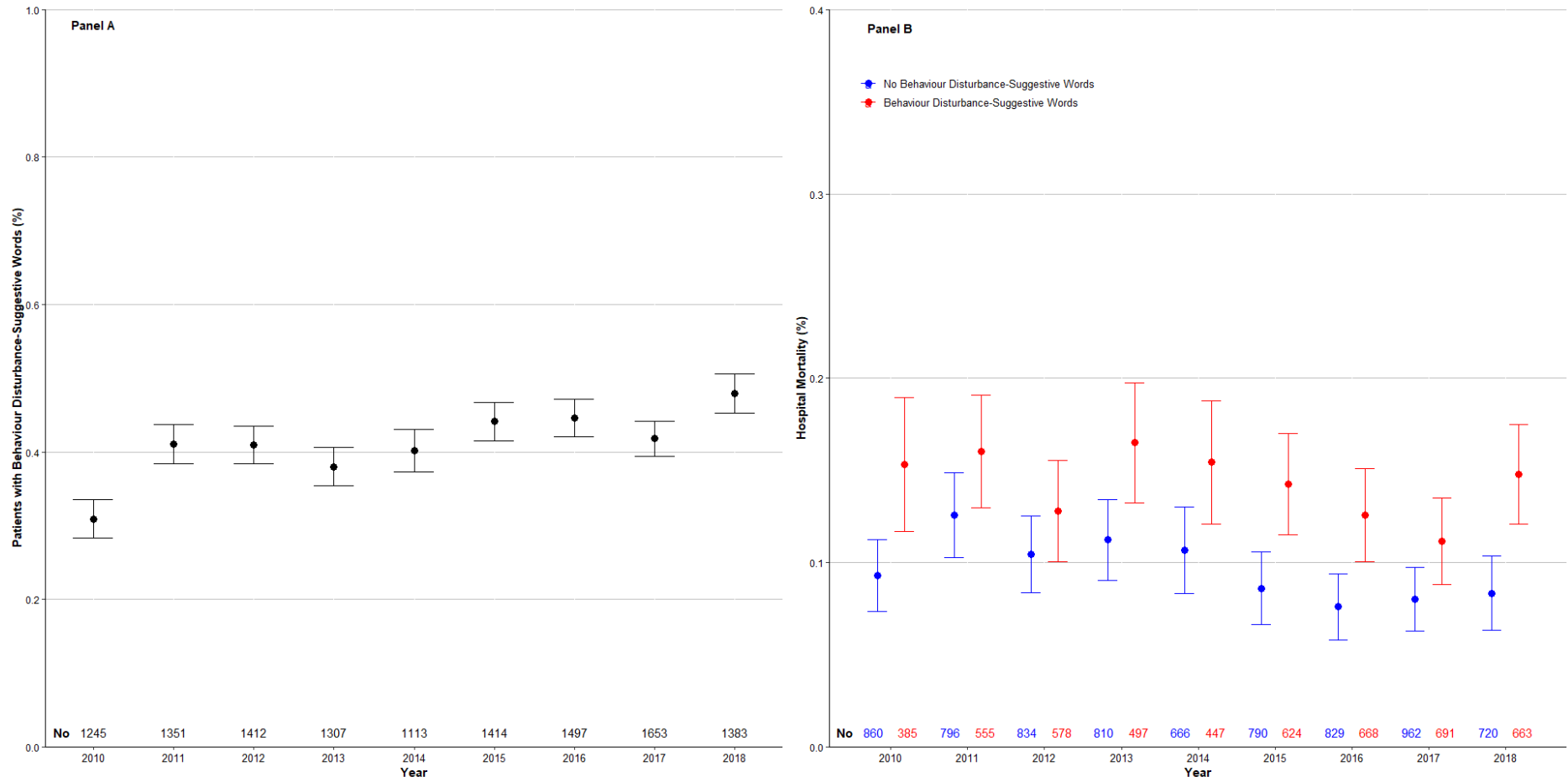
	Cohort 0-1 Day (n = 11626)		Cohort 0-2 Days (n = 7517)		Cohort 0-3 Days (n = 4893)		Cohort 0-4 Days (n = 3394)	
	Odds Ratio (95% CI)	p value	Odds Ratio (95% CI)	p value	Odds Ratio (95% CI)	p value	Odds Ratio (95% CI)	p value
NLP-Dx-BD	0.94 (0.80 to 1.10)	0.453	0.88 (0.74 to 1.03)	0.125	0.97 (0.81 to 1.16)	0.734	0.84 (0.68 to 1.03)	0.097
ANZROD	3.53 (3.31 to 3.78)	< 0.001	3.12 (2.90 to 3.37)	< 0.001	2.80 (2.58 to 3.05)	< 0.001	2.58 (2.35 to 2.84)	< 0.001
Year of admission								
2010	1 (Reference)	---	1 (Reference)	---	1 (Reference)	---	1 (Reference)	---
2011	1.16 (0.86 to 1.56)	0.324	0.97 (0.70 to 1.35)	0.869	0.93 (0.64 to 1.35)	0.706	1.05 (0.68 to 1.60)	0.835
2012	1.21 (0.89 to 1.64)	0.220	1.03 (0.73 to 1.45)	0.865	1.05 (0.71 to 1.54)	0.809	1.22 (0.79 to 1.90)	0.366
2013	0.78 (0.58 to 1.04)	0.092	0.76 (0.55 to 1.06)	0.104	0.77 (0.53 to 1.12)	0.174	0.89 (0.57 to 1.37)	0.586
2014	0.90 (0.66 to 1.22)	0.512	0.93 (0.66 to 1.30)	0.673	0.89 (0.61 to 1.31)	0.566	1.16 (0.76 to 1.78)	0.495
2015	1.31 (0.97 to 1.78)	0.077	1.27 (0.91 to 1.78)	0.153	1.21 (0.83 to 1.76)	0.311	1.35 (0.89 to 2.06)	0.157
2016	1.09 (0.80 to 1.47)	0.595	1.23 (0.88 to 1.72)	0.227	1.08 (0.74 to 1.59)	0.669	1.25 (0.81 to 1.92)	0.305
2017	1.28 (0.94 to 1.75)	0.110	1.28 (0.91 to 1.80)	0.150	1.27 (0.87 to 1.86)	0.217	1.35 (0.87 to 2.08)	0.176
2018	1.24 (0.91 to 1.69)	0.073	1.13 (0.80 to 1.59)	0.495	1.11 (0.76 to 1.62)	0.594	1.35 (0.87 to 2.08)	0.177

Figure S1. Flowchart of Participants



^a time of measurement was either negative or longer than ICU length of stay

Figure S2. Prevalence of Words Suggestive of Behavioral Disturbance and Mortality over the Study Period



Proportion and 95% confidence interval

Figure S3. Distribution of the Day of Diagnosis of NLP-Dx-BD

