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Accuracy of the Australian National Sub-Acute and Non-Acute Patient Classification in predicting rehabilitation length of stay for stroke survivors who are ≥65 years of age and have lateropulsion

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ABSTRACT

Background

Lateropulsion is a common impairment after stroke. Regardless of stroke severity, functional recovery is slower in people with lateropulsion, resulting in requirement for longer rehabilitation duration. In Australia, inpatient rehabilitation funding is determined via the Australian National Sub-Acute and Non-Acute Patient Classification (AN-SNAP). AN-SNAP class is determined using age, diagnosis, weighted Functional Independence Measure (FIM) motor score, and FIM cognitive score.

Objectives

To explore accuracy of the AN-SNAP to predict length of stay (LOS) for people with post-stroke lateropulsion.

Methods

A retrospective database audit was undertaken. AN-SNAP predicted LOS for each participant was calculated based on 2019 calendar year national benchmarks. A multivariable linear regression model estimated mean differences in reported LOS and AN-SNAP predicted LOS after adjusting for lateropulsion severity (Four Point Pusher Score). A separate logistic regression model assessed whether FIM change during admission was associated with reported LOS exceeding AN-SNAP predicted LOS.

Results

Data were available from 1,126 admissions. Reported LOS exceeding AN-SNAP predicted LOS was associated with greater lateropulsion severity on admission. Where AN-SNAP predicted LOS was longer, those with no lateropulsion on admission showed shorter reported than predicted LOS. Greater improvement in FIM during rehabilitation was associated with increased odds of reported LOS exceeding AN-SNAP predicted LOS (OR 1.02, 95%CI 1.01-1.03, $p<0.001$).

Conclusions

Inclusion of a measure of post-stroke lateropulsion in the AN-SNAP classification model would result in more accurate LOS predictions to inform funding. Costs of longer rehabilitation LOS may be countered by optimised long-term physical function, reducing requirement for ongoing care.

Key words: lateropulsion, pusher syndrome, stroke, rehabilitation, recovery

INTRODUCTION

Lateropulsion is a common impairment after stroke whereby an affected person actively pushes their body toward their hemiparetic side, or actively resists accepting weight onto their nonparetic side(1-5). Regardless of stroke severity, functional recovery is slower in people with lateropulsion, resulting in requirement for longer rehabilitation duration if an individual is to achieve their optimal functional capacity(2, 3, 5-9).

Resolution of severe lateropulsion can reduce the physical burden of caring for an affected person(7). Lateropulsion can improve, or completely resolve, over time, even in severe strokes(2, 3, 6-9). Danells et al.(9) found that participants with lateropulsion showed average length of stay (LOS) of 89 days compared to those without lateropulsion (57 days), while Clark et al.(8) reported average LOS of 59 days in participants with lateropulsion versus 29 days in those without lateropulsion. In a study of 34 participants with lateropulsion, Pedersen et al.(3) reported that affected participants needed 3.6 weeks longer than those without lateropulsion to achieve the same level of function and discharge home, after accounting for stroke severity (Scandinavian Stroke Scale). In a retrospective database analysis including 1,087 participants (483 with lateropulsion), it was found that those with severe lateropulsion showed average LOS almost nine days longer than those with no lateropulsion on admission, after accounting for post-stroke disability (modified Rankin Scale - mRS), Functional Independence Measure (FIM), and presence of inattention on admission(5). This study also reported that severe lateropulsion was associated with lower functional improvement, as compared with those with no lateropulsion on admission(5). This is in contrast to findings of studies with greater differences in LOS between those with and without lateropulsion, which showed similar functional change in participants with and without lateropulsion(3, 5, 9, 10). For instance, a matched cohort study found similar average LOS between patients who did, and did not, recover from lateropulsion during rehabilitation after stroke, which the authors suggested was likely due to funding constraints on the duration of rehabilitation offered, rather than the individual's potential for recovery(7). It was recommended that lateropulsion be included as an important factor for consideration in the funding model for rehabilitation(7). It is proposed from the exisiting literature that similar levels of functional improvement could be achieved if stroke survivors with lateropulsion, even those with severe post-stroke impairments, were given the opportunity for an extended rehabilitation duration, based on progressive improvement in function and mobility status(5, 9). A recent systematic review(11) showed that in studies reporting longer LOS associated with lateropulsion, likelihood of discharge home was similar among participants with and without lateropulsion; whereas in studies that did not show longer LOS to be associated with lateropulsion, likelihood of discharge home was reduced in those with lateropulsion.

In Australia, inpatient rehabilitation funding is determined via the Australian National Sub-Acute and Non-Acute Patient Classification (AN-SNAP)(12) (version 4). On admission to rehabilitation, a patient's AN-SNAP class is determined using age, diagnosis or *Impairment Group*, FIM motor score, and FIM cognitive score(12) (Table 1). In AN-SNAP version 4, components of the motor score are weighted to highlight the impact of each component on the burden of care for the patient of that *Impairment Group*(12).

PLEASE INSERT TABLE 1 ABOUT HERE

The Independent Hospital Pricing Authority uses the AN-SNAP classification to inform activity-based inpatient rehabilitation funding for public hospitals in Australia(13). Funding for

each rehabilitation inpatient is determined by their AN-SNAP class and LOS(13). Based on national average, upper and lower boundaries are set for a typical LOS for each AN-SNAP class(13). Where LOS is shorter than the lower boundary, hospitals are paid a daily rate. Where LOS is between the upper and lower boundaries, the hospital is paid a fixed "inlier" rate, based on the weighting of the AN-SNAP class and a pre-determined "National Efficient Price"(13). Where LOS is greater than the upper boundary, the fixed "inlier" rate is paid, as well as a daily rate for each additional day above the upper LOS boundary(13). When comparing hospital revenue to cost associated with the admission, the extent to which revenue exceeds cost is greatest when a patient's LOS is relatively short within the AN-SNAP LOS boundaries. Accurately predicting LOS to inform funding means that rehabilitation providers will be supported to accommodate for those requiring longer inpatient rehabilitation durations.

Overall stroke severity is a likely confounder in determining the influence of lateropulsion on rehabilitation LOS and functional outcome. Although post-stroke disability and lateropulsion resolution are related(5), it is proposed that the effect of lateropulsion on LOS, and consequently rehabilitation funding requirements, should be considered separately from post-stroke disability because lateropulsion generally resolves over time, independent of disability level(2, 3, 6-9). The selection bias against the transfer of people with severe stroke, or high levels of post-stroke disability, to rehabilitation, may lead to exclusion of people with lateropulsion who have potential for significant recovery. Those with moderate to severe lateropulsion are likely to require higher levels of care and support without appropriate therapeutic input. Consequently, access to a longer rehabilitation duration for those with moderate and severe lateropulsion may reduce overall cost burden on a health system, reduce carer burden, and improve quality of life for stroke survivors and their support network.

This study aimed to explore the accuracy of the AN-SNAP funding model to predict LOS for people with post-stroke lateropulsion, using the largest published cohort of inpatients with lateropulsion to date.

METHODS

This was a retrospective, observational audit that conformed to the STROBE Guidelines.

The study was undertaken within the Stroke Rehabilitation Unit (SRU) at Osborne Park Hospital in Western Australia. Consecutive patients admitted to the SRU from 2005-2018 were included in a retrospective analysis. The SRU admits stroke survivors who are aged >65 years, with a diagnosis of acute stroke. Those with lateral medullary syndrome, bilateral stroke, and those who were non-ambulant pre-stroke were excluded from the analysis.

This study was approved by the Edith Cowan University Human Research Ethics Committee (2019-00501) and the Sir Charles Gairdner Osborne Park Health Care Group (Quality Activity 27180/34609). It was not feasible to gain consent for use of retrospective data. Procedures were approved as outlined.

OUTCOME MEASURES

Data from the SRU Microsoft Access database were used. Routinely collected data were accessed from case report forms, then entered by a senior physiotherapist into the database. To assess integrity of data, an independent audit of data from 115 randomly selected admissions was conducted. Where discrepancies were noted, five cases immediately preceding and five cases immediately succeeding the discrepant case were

added to the audit, with the aim of detecting systematic errors. Ninety-four percent of audited records showed complete agreement between case report forms and the database.

Age, sex, Oxford Stroke Classification(21), and presence of neglect/inattention (binary, assessed by a physician, physiotherapist or occupational therapist) were recorded on admission. The Four-Point Pusher Score (4PPS, assessed by a senior physiotherapist), Functional Independence Measure (FIM – motor, cognitive, and total scores, assessed by senior physiotherapists and occupational therapists within 48 hours of admission to and discharge from SRU) and Modified Rankin Scale (mRS, assessed by a senior physiotherapist) were recorded at admission to, and discharge from, the SRU. Acute and rehabilitation length of stay (LOS) were calculated from admission and discharge dates. Discharge destination from inpatient rehabilitation (categorical scale, seven categories) was recorded.

The 4PPS(17) is commonly used to assess lateropulsion in Australia. The 4PPS ranges from a score of zero (absence of lateropulsion) to three (severe lateropulsion)(17). Previous studies have used the Scale for Contraversive Pushing (SCP)(2, 14) and the Burke Lateropulsion Scale (BLS)(15) to assess lateropulsion severity(16). In a review comparing the SCP (and modified versions) with the BLS, the BLS was found to be more sensitive in identifying lateropulsion and was the tool recommended for use in research(16). Agreement between the 4PPS with the BLS has been shown to be excellent(17).

Scales used to measure stroke severity vary widely(14). Measures of disability, such as the mRS, are commonly used in rehabilitation trials(14). The mRS is closely related to stroke severity and may be used as a proxy to indicate stroke severity(14, 15). The mRS ranges from a score of zero (absence of any symptoms), to five (severe disability) and six (denotes death)(15).

The FIM is a 126-point scale that measures burden of care and is divided into motor (13 components) and cognitive scores (five components)(12). In the database, FIM scores are recorded as motor, cognitive and total scores only. As AN-SNAP version 4 requires weighting of each motor component of the FIM, files for all participants were recalled, to permit accurate weighting of FIM motor components. AN-SNAP predicted LOS was calculated based on 2019 calendar year national benchmarks via the Australian Rehabilitation Outcomes Centre website(12) and entered into the database for each participant.

DATA ANALYSIS

Data were analysed using Stata 16 (College Station, Texas). A multivariable linear regression model was constructed to estimate the mean difference in reported LOS and AN-SNAP predicted LOS after accounting for potential confounders. As the AN-SNAP LOS variable contains non-integer values, it was treated as a continuous variable. To account for the non-linear asssocation between the difference in reported LOS and AN-SNAP LOS, a 2,3 fractional polynomial transformation of AN-SNAP LOS was included in the final model.

AN-SNAP LOS was included in the regression model as a 2,3 fractional polynomial transformation (i.e. as AN-SNAP LOS^2 and AN-SNAP LOS^3) to represent the curved relationship with reported LOS. Interaction terms were included to test whether association of the difference in reported LOS and AN-SNAP predicted LOS was modified by admission 4PPS. A logistic regression model was used to identify whether FIM change during admission was associated with the odds of a reported LOS greater than the AN-SNAP

predicted LOS. Results were presented as odds ratios with 95% confidence intervals (95%CI) and p-values. P-values <0.05 were considered to represent significant differences.

RESULTS

Data for 1,126 participants were available. Participant characteristics are summarised in Table 2. Almost half (44.5%) of participants showed evidence of some lateropulsion on the 4PPS. In the study cohort, left-sided strokes were slightly more prevalent than right, most strokes were due to ischaemia (80.8%), and approximately one third (31.7%) of participants had inattention present on admission to rehabilitation. Reported LOS less than or equal to AN-SNAP predicted LOS was more prevalent in those with no lateropulsion on admission, younger age, Lacunar (LACS) Oxford Stroke Classification, those with no inattention on admission, and those who were discharged home. Reported LOS exceeding AN-SNAP predicted LOS was more prevalent in those with moderate or severe lateropulsion on admission, Total Anterior Circulation (TACS) Oxford Stroke Classification, those with inattention on admission, and those who were discharged to Transitional Care.

PLEASE INSERT TABLE 2 ABOUT HERE

When AN-SNAP predicted LOS was shorter, the reported LOS for those with higher lateropulsion severity on admission (higher 4PPS) was longer than predicted (Table 3 and represented graphically in Figure 1). Where AN-SNAP predicted LOS was longer, the difference between reported and predicted LOS decreased for all levels of the 4PPS at admission. Where AN-SNAP predicted LOS was longer, those with no lateropulsion on admission (4PPS of 0) had shorter reported LOS than predicted LOS.

PLEASE INSERT TABLE 3 ABOUT HERE

PLEASE INSERT FIGURE 1 ABOUT HERE

Other factors associated with increased difference between reported and predicted AN-SNAP LOS were presence of inattention and higher mRS on admission. Factors which were significantly associated with decreased difference in LOS were more recent calendar year of admission, the participant having died or been transferred to another hospital, and older age. Those who died or were transferred to another hospital (usually due to an acute event) would have shown truncated LOS relative to severity of their condition. Thirty percent of variation in LOS difference was explained by the full model.

Three participants with severe lateropulsion (4PPS of 3) were found to have low AN-SNAP predicted LOS (Table 4). With the exception of the participant transferred to an acute hospital, these participants with lateropulsion had a LOS which was much longer than their AN-SNAP predictions; however they made significant improvements in function and lateropulsion severity.

PLEASE INSERT TABLE 4 ABOUT HERE

The relative odds and predicted probability of reported LOS exceeding AN-SNAP predicted LOS by discharge destination and FIM change, are presented in Table 5.

PLEASE INSERT TABLE 5 ABOUT HERE

Both discharge destination and change in FIM were associated with the odds of reported LOS exceeding AN-SNAP-predicted LOS. Greater improvement in FIM was associated with increased odds of reported LOS exceeding the AN-SNAP predicted LOS ($p<0.001$). Discharge destinations other than home or a relative's home were associated with increased odds of reported LOS exceeding the AN-SNAP predicted LOS (home with carer, residential care, or transitional care: $p<0.001$; other hospital: $p=0.018$).

DISCUSSION

Using retrospective data from a large cohort of stroke survivors undergoing rehabilitation, this study aimed to explore the accuracy of the AN-SNAP model to predict LOS for people with lateropulsion post stroke.

The findings of this study indicate that inclusion of a measure of lateropulsion severity (4PPS) in the AN-SNAP classification would result in more accurate predictions of LOS, and would allow the rehabilitation needs of this population to be more appropriately funded. In addition to ensuring adequate rehabilitation duration for those requiring an extended LOS, inclusion of lateropulsion in the AN-SNAP classification would also avoid allocating excess funding for those with no lateropulsion or mild lateropulsion, who do not require the full predicted LOS to make the expected improvements with rehabilitation.

The odds of reported LOS exceeding AN-SNAP predicted LOS were strongly associated with discharge destination and FIM change. Greater functional improvement (FIM change) was associated with LOS exceeding the AN-SNAP predicted LOS. Compared to participants discharged home without a carer, those discharged to residential or transitional care were more likely to show LOS exceeding the AN-SNAP predicted LOS. In cases where a stroke survivor's discharge destination can be predicted early in an admission (for example, in the absence of a carer so residential or transitional care is likely to be required), these data may assist care providers in planning for longer LOS and guiding allocation of healthcare resources.

As anticipated, those who died or were transferred to an acute hospital showed lower difference between reported and AN-SNAP predicted LOS, as rehabilitation was truncated by the event leading to hospital transfer, or death. In this study, older age was associated with reduced difference between reported and AN-SNAP predicted LOS. Older age is already associated with lower AN-SNAP predicted LOS. Those with a lower admission FIM

score who are <67 years of age are allocated a longer LOS than those >68 years of age. A prior study(5) found increasing age to be associated with poorer improvement in 4PPS, reduced functional change (FIM) with rehabilitation, and reduced likelihood of discharge home. It is possible that if older stroke survivors with lateropulsion were permitted a longer LOS, similar functional improvements and increased likelihood of discharge home would be seen, similar to their younger counterparts.

It was anticipated that all participants with severe lateropulsion (4PPS=3) would be allocated longer LOS according to AN-SNAP benchmarks. The three participants with severe lateropulsion on admission who were found to have low AN-SNAP predicted LOS made significant improvements in function and lateropulsion severity during their longer than predicted LOS, supporting the concept that including lateropulsion in the AN-SNAP classification would allow more accurate prediction of rehabilitation LOS, more appropriately accounting for rehabilitation needs in stroke survivors with lateropulsion.

A major strength of the study was the large size of the cohort of participants (n=501 with lateropulsion). The database contained clinical outcomes for admissions over 13 years. The majority of previous studies investigating outcomes associated with lateropulsion reported relatively small cohorts of participants with lateropulsion (n<170)(11).

Lack of carer availability and persistent incontinence have both been shown to be associated with increased likelihood of discharge to residential care after stroke(16-19). A limitation of these findings is that data for continence and carer availability were not included in the database and consequently could not be considered in the analyses.

Of note, although the SRU began using Australian Rehabilitation Outcomes Centre benchmarks to guide discharge planning in 2013 and AN-SNAP version 4 was first introduced in 2015(12), data for all participants in this study were compared with 2019 national benchmarks. It was therefore expected that data from more recent years would more closely align with AN-SNAP predicted LOS. Negative differences between reported and AN-SNAP predicted LOS in more recent years could also be related to a general trend towards reduced LOS, and increased efficiencies within the SRU team processes.

This study is limited in that data were collected at only one site, and included only those aged >65 years, which may introduce selection bias. The SRU is, however, among the largest stroke rehabilitation units in Australia, with approximately 120 admissions annually. Future investigations across multiple sites in Australia, including participants of all ages, to confirm these findings, would be beneficial in guiding improvement of the AN-SNAP classification system, particularly for those with post-stroke lateropulsion.

In conclusion, findings from this study provide evidence that inclusion of the 4PPS in the AN-SNAP classification would result in a better fit for LOS predictions, allowing longer LOS to be planned for those admitted with higher lateropulsion severity, and shorter LOS for those without lateropulsion. A longer rehabilitation LOS would give stroke survivors with severe lateropulsion the opportunity to make similar functional improvements as their counterparts without lateropulsion, increasing likelihood of discharge home and reducing the amount of ongoing assistance needed(5). Redistribution of funding allocation for stroke survivors across the entire AN-SNAP funding model, including reduction of LOS in the model for those with no or mild lateropulsion, may contribute to neutralising costs of longer rehabilitation duration for those with severe stroke and lateropulsion. It is anticipated that results of this study may be generalised to similar healthcare systems globally, where improved understanding of the rehabilitation needs of stroke survivors with lateropulsion will allow healthcare providers to optimise prioritisation and allocation of healthcare resources. The

costs of longer rehabilitation LOS for those with lateropulsion may also be countered by optimised long-term physical function, thus reducing financial and social burden of ongoing care, particularly if the level of function achieved means that residential care can be avoided.

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Competing interests

The authors declare that there is no conflict of interest.

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Table 1: Australian National Sub-Acute and Non-Acute Patient Classification (AN-SNAP) predictions for stroke rehabilitation length of stay (LOS) according to 2019 calendar year national benchmarks.

AN-SNAP classification criteria	LOS (days)
Weighted FIM motor 51-91, FIM cognition 29-35	13.8
Weighted FIM motor 51-91, FIM cognition 19-28	18.0
Weighted FIM motor 51-91, FIM cognition 5-18	23.0
Weighted FIM motor 36-50, age ≥68	26.0
Weighted FIM motor 36-50, age ≤67	31.4
Weighted FIM motor 19-35, age ≥68	38.9
Weighted FIM motor 19-35, age ≤67	52.7

Table 2. Summary characteristics of study participants stratified by Reported LOS in relation to AN-SNAP predicted LOS. Chi-square tests of equality were performed.

	Reported LOS ≤ AN-SNAP LOS		Reported LOS > AN-SNAP LOS		Total	Missing data	P-value
	N	%	N	%	N	N	
Admission 4PPS*						0	
0	387	61.9	238	38.1	625		<0.001
1	76	47.2	85	52.8	161		
2	54	36.7	93	63.3	147		
3	61	31.6	132	68.4	193		
Age group (years)						0	
65-69	97	61.4	61	38.6	158		0.090
70-74	91	47.6	100	52.4	191		
75-79	113	49.6	115	50.4	228		
80-84	118	48.0	128	52.0	246		
85-89	103	51.0	99	49.0	202		
90+	56	55.4	45	44.6	101		
Sex						0	
Female	273	50.6	267	49.4	540		0.617
Male	305	52.0	281	48.0	586		
Oxford Classification**						5	
LACS	122	58.1	88	41.9	210		0.001
PACS	276	50.1	275	49.9	551		
POCS	107	57.5	79	42.5	186		
TACS	70	40.2	104	59.8	174		
Side of stroke						2	
Left	310	53.3	272	46.7	582		0.161
Right	266	49.1	276	50.9	542		
Type of stroke						0	
Haemorrhage	105	48.6	111	51.4	216		0.373
Infarct	473	52.0	437	48.0	910		
Inattention						0	
No	429	55.8	340	44.2	769		<0.001
Yes	149	41.7	208	58.3	357		
Discharge destination						1	
Home	233	61.2	148	38.8	381		<0.001
Home with carer	164	56.4	127	43.6	291		
Relative's home	13	50.0	13	50.0	26		

Residential Care	40	41.7	56	58.3	96
Transitional Care	66	28.7	164	71.3	230
Other hospital	50	61.0	32	39.0	82
Deceased	12	63.2	7	36.8	19

444 *4PPS: Four Point Pusher Score
445 **
LACS: Lacunar Stroke
PACS: Partial Anterior Circulation Stroke
POCS: Posterior Circulation Stroke
TACS: Total Anterior Circulation Stroke
446
447

448 Table 3. Model estimated mean difference (days) between reported and AN-SNAP predicted
449 LOS, stratified by admission 4PPS, after adjusting for mRS, presence of inattention,
450 calendar year, age, and discharge destination.

		Relative mean difference between reported LOS and AN-SNAP LOS			Predicted mean difference between reported LOS and AN-SNAP LOS		
			95%CI	p		95%CI	p
AN-SNAP LOS	**4PPS**						
13.8	0	ref	-	-	2.9	0.7-5.1	0.009
	1	2.9	-2.7-8.6	0.309	5.9	0.5-11.2	0.032
	2	7.2	-1.1-15.6	0.091	10.1	2.0-18.3	0.015
	3	13.8	1.3-26.2	0.031	16.7	4.5-28.8	0.007
18	0	ref	-	-	3.2	1.6-4.8	<0.001
	1	1.7	-2.6-6.1	0.431	4.9	0.9-9.0	0.018
	2	7.0	0.5-13.5	0.034	10.2	3.9-16.5	0.002
	3	12.9	3.1-22.8	0.010	16.1	6.5-25.7	0.001
23	0	ref	-	-	3.1	1.5-4.7	<0.001
	1	0.5	-2.9-4.0	0.762	3.6	0.6-6.7	0.020
	2	6.9	2.3-11.6	0.003	10.0	5.7-14.4	<0.001
	3	12.0	5.1-18.8	0.001	15.1	8.6-21.6	<0.001
26	0	ref	-	-	2.7	0.9-4.6	0.004
	1	0.0	-3.4-3.5	0.980	2.8	-0.1-5.6	0.056
	2	7.1	3.1-11.1	0.001	9.8	6.3-13.3	<0.001
	3	11.5	6.2-16.8	0.000	14.2	9.4-19.1	<0.001
31.4	0	ref	-	-	1.2	-1.2-3.5	0.325
	1	-0.1	-4.0-3.7	0.942	1.0	-1.9-4.0	0.493
	2	7.7	4.0-11.4	0.000	8.9	6.0-11.8	<0.001
	3	11.0	7.2-14.8	0.000	12.2	9.2-15.1	<0.001
38.9	0	ref	-	-	-3.3	-6.5--0.1	0.045
	1	1.8	-2.8-6.4	0.451	-1.5	-4.9-1.8	0.365
	2	9.8	5.3-14.3	0.000	6.5	3.3-9.7	<0.001
	3	11.3	6.8-15.8	0.000	8.0	4.8-11.2	<0.001
52.7	0	ref	-	-	-21.6	-34.9--8.3	0.001
	1	15.2	-2.6-33.0	0.094	-6.4	-18.4-5.5	0.293
	2	18.8	0.0-37.6	0.050	-2.8	-16.2-10.5	0.676
	3	16.9	0.7-33.1	0.041	-4.7	-14.2-4.7	0.326
mRS							
0		5.25	-11.48-21.97	0.538	12.73	-3.76-29.22	0.130
1		-11.90	-20.85--2.95	0.009	-4.42	-12.79-3.96	0.301
2		-9.49	-16.00--2.99	0.004	-2.01	-7.69-3.66	0.487
3		-7.53	-11.84--3.21	0.001	-0.04	-3.02-2.94	0.977
4		-3.21	-6.16--0.27	0.033	4.27	3.21-5.33	<0.001

5	ref	-	-	7.48	4.83-10.14	<0.001
Discharge destination						
Home	ref	0.00-0.00	-	1.74	0.08-3.39	0.039
Home with carer	2.29	-0.07-4.65	0.058	4.03	2.30-5.75	<0.001
Relative's home	1.99	-4.18-8.15	0.528	3.72	-2.26-9.71	0.223
Residential Care	2.50	-1.21-6.21	0.187	4.24	1.07-7.40	0.009
Transitional Care	10.21	7.27-13.15	<0.001	11.95	9.79-14.11	<0.001
Other hospital	-4.85	-8.57--1.14	0.010	-3.12	-6.36-0.13	0.060
Died	-8.29	-15.46--1.11	0.024	-6.55	-13.42-0.32	0.062
Inattention						
No	ref	-	-	3.30	2.21-4.39	<0.001
Yes	2.60	0.53-4.67	0.014	5.89	4.23-7.55	<0.001
Age	-0.14	-0.3 - -0.01	0.029			
Calendar year	-1.4	-1.7 - -1.2	<0.001			

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Table 4. Description of participants with admission Four-Point Pusher Score (4PPS) of 3 and low AN-SNAP predicted length of stay (LOS).

Participant	Predicted LOS	Reported LOS	Description
1	13.8 days	56 days	• ischaemic brainstem stroke • admission: Functional Independence Measure (FIM)=91 • discharge: 4PPS=1, FIM=105 • could walk independently on discharge • discharge destination: transitional care
2	18 days	20 days*	• right basal ganglia and posterior limb of internal capsule haemorrhage • admission: FIM=90 • discharge: 4PPS=1, FIM=94 • could walk independently with aid on discharge • transferred to acute hospital due to acute adverse event (rehabilitation LOS truncated by acute event)*
3	18 days	51 days	• left middle cerebral artery ischaemic stroke • admission: FIM=72 • discharge: 4PPS=0, FIM=117 • could walk independently with aid on discharge • discharge destination: home

457 Table 5. Relative odds and predicted probability of reported LOS exceeding AN-SNAP
458 predicted LOS by discharge destination and FIM change (n=1,098).

		Odds Ratio	95% CI	p-value	Probability	95% CI
Discharge Destination	Home	1.00	(ref)	(ref)	0.38	0.33-0.43
	Home with carer	1.20	0.88-1.64	0.261	0.43	0.37-0.48
	Relative's home	1.68	0.75-3.75	0.205	0.51	0.32-0.70
	Residential Care	2.62	1.64-4.18	<0.001	0.62	0.52-0.71
	Transitional Care	4.15	2.90-5.94	<0.001	0.72	0.66-0.77
	Other Hospital	1.14	0.68-1.89	0.626	0.41	0.33-0.43
FIM change		1.02	1.01-1.03	<0.001		

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