

Supplementary Material

National Disability Insurance Scheme timeframes and functional outcomes for inpatient rehabilitation patients: a 5-year retrospective audit

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Supplementary Material

NDIS vs. non-NDIS participant comparison: Addressing statistical independence

As detailed in the manuscript, the ‘NDIS vs. non-NDIS participant comparison’ analyses were carried out on 2311 concatenated rehabilitation episodes pertaining to 2022 individual patients, with a total of 247 patients having more than one rehabilitation episode entry in the dataset. As it was not feasible to determine whether these multiple entries related to distinct hospital admissions or the same overall hospital stay (where inpatient rehabilitation program interruptions exceeded 2 weeks), all entries were retained in the main analyses. However, to address a violation to the statistical assumption of independence, all analyses were re-run with one entry randomly selected per patient with multiple episodes.

In line with the pattern of results reported in the manuscript, analyses revealed that the NDIS group ($M = 49.86$ years, $SD = 11.98$ years, $n = 291$) were significantly younger than the non-NDIS group ($M = 73.96$ years, $SD = 15.56$ years, $n = 11731$), $t(471.54) = 30.29$, $p < .001$. As can be seen in Table S1, and again in line with the pattern of results reported in the manuscript, the NDIS group was also comprised of significantly more males and Indigenous patients than the non-NDIS group. In addition, people with brain dysfunction, neurological conditions, and amputations were more likely to be on the NDIS. People with orthopaedic fractures and reconditioning were least likely to be on the NDIS.

Table S1

Demographic characteristics of rehabilitation inpatients as a function of engagement with NDIS (one rehabilitation episode randomly selected for each patient with multiple episodes)

	NDIS		Non-NDIS		χ^2	<i>df</i>	<i>p</i>
	<i>n</i>	%	<i>n</i>	%			
Gender					16.37	1	<.001
Male	187	64.26%	891	51.47%			
Female	104	35.74%	840	48.53%			
Indigenous status					47.97	1	<.001

Aboriginal and/or Torres Strait Islander	35	12.03%	53	3.07%			
Non-indigenous	256	87.97%	1675	96.93%			
Impairment group					299.25	17	<.001
Stroke	74	25.43%	314	18.14%			
Brain dysfunction	56	19.24%	151	8.72%			
Neurological conditions	42	14.43%	124	7.16%			
Spinal cord dysfunction	2	0.69%	7	0.40%			
Amputation	75	25.77%	83	4.80%			
Arthritis	0	0.00%	8	0.46%			
Pain syndromes	2	0.69%	18	1.04%			
Orthopaedic - fractures	3	1.03%	206	11.90%			
Orthopaedic – replacements	0	0.00%	15	0.87%			
Orthopaedic – soft tissue injury	0	0.00%	3	0.17%			
Orthopaedic – others	0	0.00%	9	0.52%			
Cardiac	0	0.00%	19	1.10%			
Pulmonary	0	0.00%	11	0.64%			
Burns	1	0.34%	2	0.12%			
Other disabling impairments	3	1.03%	20	1.16%			
Major multiple trauma	0	0.00%	11	0.64%			
Developmental disabilities	1	0.34%	1	0.06%			
Reconditioning	32	11.00%	729	42.11%			
Socio-Economic Indexes for Areas Quintile							
1 (Most disadvantaged)	50	17.24%	203	11.75%	8.93	4	.063
2	47	16.21%	246	14.24%			
3	123	42.41%	830	48.03%			
4	49	16.90%	299	17.30%			
5 (Most advantaged)	21	7.24%	150	8.68%			

Next, in re-running the NDIS vs. non-NDIS participant comparison analyses with one rehabilitation episode entry randomly selected for each patient with multiple entries, various rehabilitation metrics were examined. As can be seen in Table S2, and again in line with the pattern of results reported in the manuscript, NDIS participants spent significantly greater lengths of time in both the rehabilitation unit and the hospital overall as compared to the non-NDIS participants. Relatedly, onset days (number of days from acute admission to rehabilitation start) were also significantly greater for the NDIS participants and admission FIM was significantly lower which may suggest greater complexity in presentation. However, FIM efficiency (change in FIM score from admission to discharge, divided by days spent in rehabilitation) was significantly lower for the NDIS group which is suggestive of unnecessary time spent in rehabilitation. **Despite this, the overall FIM gain**

was greater for the NDIS cohort compared to the non-NDIS cohort albeit with discharge FIM scores being equivalent in both groups.

Table S2

Rehabilitation metrics for inpatients as a function of engagement with NDIS (one rehabilitation episode randomly selected for each patient with multiple episodes)

	NDIS			Non-NDIS			<i>t</i>	<i>df</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>			
Onset days	40.34	50.22	192	22.10	22.40	1017	4.94 ^a	205.57	<.001*
Admission FIM	70.56	27.10	290	77.59	21.21	1726	4.21 ^a	350.96	<.001*
Discharge FIM	95.95	24.19	290	94.29	24.01	1726	1.09	2014	.277
FIM gain	25.38	21.35	290	16.69	16.71	1726	6.60^a	350.92	<.001*
FIM efficiency	0.62	0.56	290	0.80	1.59	1726	3.59 ^a	1214.51	<.001*
Rehabilitation LOS	52.57	42.01	291	25.16	18.64	1731	10.95 ^a	309.46	<.001*
Total Hospital LOS	97.19	72.11	192	48.16	33.04	1017	9.24 ^a	206.38	<.001*

Note. FIM = Functional Independence Measure. LOS = length of stay.

^a Welch's t-test performed as equality of variance assumption was violated.

* significant at $\alpha_{\text{adjusted}} = .007$

NDIS vs. non-NDIS participant comparison: Controlling for differences in age, gender, indigenous status, and impairment group

In the manuscript, and again above in Table S1, it was revealed that there were significant characteristic differences between the NDIS and non-NDIS groups (e.g., the non-NDIS group had significantly more people with orthopaedic fractures and reconditioning). To ensure that it was not these particular group differences driving the significant results related to rehabilitation metrics seen in the manuscript and mirrored above in Table S2, these analyses were re-run with age, gender, Indigenous status, and impairment group included as covariates. As displayed in Tables S3 to S9, a series of ANCOVAs reflected the same broad pattern of results reported in the manuscript. Specifically, NDIS participants spent significantly greater lengths of time in both the rehabilitation unit and the hospital overall as compared to the non-NDIS participants even after the influence of covariates was removed. Relatedly, onset days were significantly greater, and admission FIM was significantly lower, for the NDIS participants even after controlling for age, gender, Indigenous

status, and impairment group. Again mirroring the results reported in the manuscript, FIM efficiency was still significantly lower for the NDIS group once the influence of covariates was removed which suggests unnecessary time spent in rehabilitation. **Despite this, the overall FIM gain was greater for the NDIS cohort compared to the non-NDIS cohort, and unlike the results reported in the manuscript, these analyses also revealed an additional significant finding in that NDIS participants had a significantly higher discharge FIM.**

Table S3

ANCOVA Results: Difference in onset days for NDIS vs Non-NDIS participants after controlling for age, gender, indigenous status, and impairment group

Source	Sum of Squares	df	F	p	η^2
Group (NDIS vs Non-NDIS)	9.871	1	15.309	< .001	0.011
Age	35.472	1	55.014	< .001	0.038
Gender	3.334	1	5.170	0.023	0.004
Indigenous status	1.246	1	1.933	0.165	0.001
Impairment group	11.848	1	18.375	< .001	0.013
Error	873.037	1354			

Note. Type III Sum of Squares. Onset days variable was log-transformed to address violation of normality and to reduce violation of equality of variances.

Table S4

ANCOVA Results: Difference in admission FIM for NDIS vs Non-NDIS participants after controlling for age, gender, indigenous status, and impairment group

Source	Sum of Squares	df	F	p	η^2
Group (NDIS vs Non-NDIS)	95.609	1	38.139	< .001	0.016
Age	188.846	1	75.331	< .001	0.031
Gender	0.184	1	0.074	0.786	< 0.001
Indigenous status	0.800	1	0.319	0.572	< 0.001
Impairment group	126.084	1	50.295	< .001	0.020
Error	5755.811	2296			

Note. Type III Sum of Squares. Admission FIM variable was reflected and square-root-transformed to address violation of normality and to reduce violation of equality of variances.

Table S5

ANCOVA Results: Difference in discharge FIM for NDIS vs Non-NDIS participants after controlling for age, gender, indigenous status, and impairment group

Source	Sum of Squares	df	F	p	η^2
Group (NDIS vs Non-NDIS)	15.182	1	25.853	< .001	0.010

Source	Sum of Squares	df	F	p	η^2
Age	99.141	1	168.824	< .001	0.068
Gender	1.678	1	2.858	0.091	0.001
Indigenous status	1.572	1	2.677	0.102	0.001
Impairment group	1.038	1	1.768	0.184	<0.001
Error	1348.306	2296			

Note. Type III Sum of Squares. Discharge FIM variable was reflected and log-transformed to address violation of normality and to maintain minor violation of equality of variances.

Table S6

ANCOVA Results: Difference in FIM gain for NDIS vs Non-NDIS participants after controlling for age, gender, indigenous status, and impairment group

Source	Sum of Squares	df	F	p	η^2
Group (NDIS vs Non-NDIS)	2395.588	1	8.043	0.005	0.003
Age	3983.880	1	13.376	< .001	0.006
Gender	832.679	1	2.796	0.095	0.001
Indigenous status	844.914	1	2.837	0.092	0.001
Impairment group	11581.380	1	38.886	< .001	0.016
Error	683822.936	2296			

Note. Type III Sum of Squares. Original, untransformed FIM gain variable used in the analyses given small normality and equal variance violations were not addressed by non-linear transformations.

Table S7

ANCOVA Results: Difference in FIM efficiency for NDIS vs Non-NDIS participants after controlling for age, gender, indigenous status, and impairment group

Source	Sum of Squares	df	F	p	η^2
Group (NDIS vs Non-NDIS)	50.489	1	22.712	< .001	0.010
Age	66.903	1	30.095	< .001	0.013
Gender	25.083	1	11.283	< .001	0.005
Indigenous status	1.474	1	0.663	0.416	<0.001
Impairment group	0.196	1	0.088	0.767	<0.001
Error	5104.116	2296			

Note. Type III Sum of Squares. Original, untransformed FIM efficiency variable used in the analyses given small normality and equal variance violations were not addressed by non-linear transformations.

Table S8

ANCOVA Results: Difference in rehabilitation length of stay for NDIS vs Non-NDIS participants after controlling for age, gender, indigenous status, and impairment group

Source	Sum of Squares	df	F	p	η^2
Group (NDIS vs Non-NDIS)	116.764	1	207.192	< .001	0.080
Age	20.189	1	35.825	< .001	0.014
Gender	0.931	1	1.652	0.199	<0.001

Source	Sum of Squares	df	F	p	η^2
Indigenous status	0.808	1	1.434	0.231	<0.001
Impairment group	22.106	1	39.225	< .001	0.015
Error	1297.311	2302			

Note. Type III Sum of Squares. Rehabilitation length of stay variable was log-transformed to address violations of normality and equality of variances.

Table S9

ANCOVA Results: Difference in total hospital length of stay for NDIS vs Non-NDIS participants after controlling for age, gender, indigenous status, and impairment group

Source	Sum of Squares	df	F	p	η^2
Group (NDIS vs Non-NDIS)	48.691	1	129.632	< .001	0.087
Age	1.186	1	3.157	0.076	0.002
Gender	1.084	1	2.885	0.090	0.002
Indigenous status	0.329	1	0.875	0.350	<0.001
Impairment group	0.009	1	0.024	0.876	<0.001
Error	508.577	1354			

Note. Type III Sum of Squares. Total hospital length of stay variable was log-transformed to address violation of normality and reduce violation of equality of variances.

NDIS patient database analysis: Addressing statistical independence

The second source of data analysed and presented in the manuscript was a retrospective clinical database audit of 301 rehabilitation episodes pertaining to 292 NDIS-referred patients. To again address a violation of the statistical assumption of independence, all NDIS patient database analyses presented in the manuscript were therefore re-run with one entry randomly selected for each patient with multiple episodes.

In line with the pattern of results presented in the manuscript, for the NDIS group as a whole (i.e. new and existing participants), there was a statistically significant difference between AROC calculated expected length of stay ($M = 38.88$ days; $SD = 23.63$ days) and actual length of stay ($M = 66.76$ days; $SD = 56.84$ days), $F(1, 289) = 50.69$, $p < .001$. Additionally, the magnitude of the difference between expected and actual rehabilitation length of stay did not significantly differ as a function of whether participants were new applicants or existing NDIS participants, $F(1, 289) = 2.74$, $p = .099$.

When analysing whether discharge was contingent upon NDIS plan implementation, however, a mixed ANOVA revealed a significant interaction effect ($F(1, 289) = 95.88, p < .001$) such that the discrepancy between expected and actual length of stay in rehabilitation was substantially greater for participants' who required NDIS supports on discharge compared to those who could discharge without an approved plan in place.

Re-analysis of demographic characteristics produced findings that also mirrored the pattern of results reported in the manuscript. As shown in Table S10, those participants whose discharge from rehabilitation was contingent upon plan implementation compared to those who discharged prior to their plan approval found those participants were more likely to require Specialist Disability Accommodation/ Supported Independent Living. Conversely, those participants who discharged prior to their plan approval (i.e., did not require plan implementation) were more likely to go into Residential Aged Care or another hospital. Additionally, NDIS Scheme participants whose discharge from rehabilitation was contingent upon plan implementation were also more likely to be new applicants to the scheme.

Table S10

Demographic characteristics of NDIS participants whose discharge is contingent on plan approval vs not contingent (one rehabilitation episode randomly selected for each patient with multiple episodes)

	Contingent on plan approval		Not contingent on plan approval		χ^2	df	p
	n	%	n	%			
Gender					1.79	1	.181
Male	77	71.96%	119	64.32%			
Female	30	28.04%	66	35.68%			
Indigenous status					0.47	1	.495
Aboriginal and/or Torres Strait Islander	11	10.28%	24	12.97%			
Non-indigenous	96	89.72%	161	87.03%			
Impairment group					15.50	9	.078
Stroke	37	34.58%	37	20.00%			
Brain dysfunction	21	19.63%	40	21.62%			
Neurological conditions	13	12.15%	30	16.22%			
Spinal cord dysfunction	1	0.94%	1	0.54%			

Amputation	30	28.04%	46	24.87%			
Arthritis	0	0.00%	1	0.54%			
Pain syndromes	0	0.00%	1	0.54%			
Orthopaedic - fractures	0	0.00%	2	1.08%			
Burns	0	0.00%	1	0.54%			
Reconditioning	5	4.67%	26	14.05%			
Discharge accommodation type					24.01	5	<.001
Mainstream	73	68.22%	115	62.16%			
SDA/SIL	17	15.89%	12	6.49%			
Housing NSW	14	13.08%	18	9.73%			
RACF	0	0.00%	16	8.65%			
Other hospital	3	2.80%	23	12.43%			
Boarding house	0	0.00%	1	0.54%			
Socio-Economic Indexes for Areas Quintile					4.76	4	.313
1 (Most disadvantaged)	14	13.08%	39	21.08%			
2	20	18.69%	28	15.14%			
3	43	40.19%	71	38.38%			
4	19	17.76%	36	19.46%			
5 (Most advantaged)	11	10.28%	11	5.95%			
NDIS applicant status					10.86	1	<.001
New applicant	92	85.98%	127	68.65%			
Existing applicant	15	14.02%	58	31.35%			

Note. SDA/SIL = RACF = Residential Aged Care Facility. Specialist Disability Accommodation/ Supported Independent Living.

Similar to above, re-analysis of rehabilitation metrics produced results that were again in line with the pattern of results reported in the manuscript. Indeed, as shown in Table S11, participants whose discharge from rehabilitation was contingent on plan implementation experienced a significantly greater number of onset days (i.e., days from acute hospital start date to admission to the rehabilitation unit) as well as significantly lower FIM efficiency, suggesting greater complexity in presentation but also unnecessary time spent in rehabilitation. **Despite this, the overall FIM gain was greater for patients whose discharge from rehabilitation was contingent on plan implementation albeit with discharge FIM scores being equivalent in both groups.** As to be expected, those participants **whose discharge from rehabilitation was contingent on plan approval** also spent a greater amount of time in the rehabilitation unit and in the hospital, overall.

Table S11

Rehabilitation metrics for NDIS participants whose discharge is contingent on plan approval vs not contingent (one rehabilitation episode randomly selected for each patient with multiple episodes)

	Contingent on plan approval			Not contingent on plan approval			<i>t</i>	<i>df</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>			
Onset days	49.70	56.82	107	30.37	29.30	185	3.27 ^a	139.21	.001*
Admission FIM	65.93	28.35	107	73.80	26.21	184	2.40	290	.017
Discharge FIM	97.03	23.80	107	94.86	25.89	185	0.71	290	.478
FIM gain	31.10	21.78	107	21.06	21.28	185	3.85	290	<.001*
FIM efficiency	0.38	0.31	107	0.73	1.42	184	3.24 ^a	211.29	.001*
Rehabilitation LOS	106.58	66.77	107	43.61	32.73	184	9.14 ^a	136.15	<.001*
Total Hospital LOS	152.56	103.56	106	72.67	46.91	182	7.51 ^a	130.52	<.001*

Note. FIM = Functional Independence Measure. LOS = length of stay.

^a Welch's t-test performed as equality of variance assumption was violated.

* significant at $\alpha_{\text{adjusted}} = .007$

In addition, and again as per the results reported in the manuscript, a logistic regression analysis revealed that FIM admission scores significantly predicted whether NDIS participants' discharge would require NDIS plan implementation, or whether they could leave prior to plan approval.

Specifically, the odds of having to wait until plan implementation to be discharged from rehabilitation increased by 1.1% for each 1-point decrease in admission FIM score (OR = 0.989, 95% CI 0.981-0.998, $p = .018$).

Finally, and again in line with the pattern of results reported in the manuscript, results of 3 (transition point) x 2 (year of discharge from rehabilitation: 2021, 2017-2020) Greenhouse-Geisser-corrected mixed ANOVA revealed a significant interaction effect, $F(1.74, 157.76) = 3.94, p = .027$. This was thus followed up with a series of independent samples t-tests to examine at which transition point, and in what direction, differences may lie. Results of a Welch's t-test revealed a significantly faster progression from scheme application to scheme acceptance for participants who left rehabilitation in 2021 ($M = 8.14$ days; $SD = 7.98$ days) compared to those who left in the four years prior ($M = 21.25$ days; $SD = 24.09$ days), $t(118.54) = 4.52, p < .001$. However, when

examining the next transition point, it was revealed that progression from scheme acceptance to planning meeting took significantly longer for participants who left rehabilitation in 2021 ($M = 24.35$ days; $SD = 13.40$ days) compared to those who left in the four years prior ($M = 16.72$ days; $SD = 13.90$ days), $t(115) = 2.72$, $p = .007$. Examination of the final transition point (from planning meeting to plan approval) revealed no significant differences across time.

Indeed, despite improvements at earlier stages of the NDIS process, a Bayesian one-way ANOVA revealed moderate evidence of no difference in the total amount of time from rehabilitation start date to plan approval across the five-year period, $BF_{01} = 5.86$.