

BMJ Open

BMJ Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (<http://bmjopen.bmj.com>).

If you have any questions on BMJ Open's open peer review process please email info.bmjopen@bmj.com

BMJ Open

Factors associated with discharge from hospital to residential aged care for younger people with neuropsychiatric disorders: An exploratory case-control study using linked data in New South Wales, Australia

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2022-065982
Article Type:	Original research
Date Submitted by the Author:	27-Jun-2022
Complete List of Authors:	Cvejic, Rachael; UNSW Sydney, Department of Developmental Disability Neuropsychiatry Watkins, Tim; UNSW Sydney, Department of Developmental Disability Neuropsychiatry Walker, Adrian; UNSW Sydney, Department of Developmental Disability Neuropsychiatry Reppermund, Simone; UNSW Sydney, Department of Developmental Disability Neuropsychiatry; UNSW Sydney, Centre for Healthy Brain Ageing Srasuebkul, Preeyaporn; UNSW Sydney, Department of Developmental Disability Neuropsychiatry Draper, Brian; Prince of Wales Hospital, Eastern Suburbs Older Persons Mental Health Service Withall, Adrienne; UNSW Sydney, School of Population Health Winkler, Di; Summer Foundation; La Trobe University, Living with Disability Research Centre Honan, Ingrid; Cerebral Palsy Alliance Mackechnie, Deidre; MS Australia Trollor, Julian; University of New South Wales, Department of Developmental Disability Neuropsychiatry; UNSW Sydney, Centre for Healthy Brain Ageing
Keywords:	NEUROLOGY, PSYCHIATRY, EPIDEMIOLOGY

SCHOLARONE™
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

1
2
3 1 **Factors associated with discharge from hospital to residential aged**
4
5
6 2 **care for younger people with neuropsychiatric disorders: An**
7
8 3 **exploratory case-control study using linked data in New South**
9
10 4 **Wales, Australia**

11
12
13
14 5
15
16 6 Rachael C Cvejic^{1*}, Tim R Watkins^{1*}, Adrian R Walker¹, Simone Reppermund^{1, 2},
17
18 7 Preeyaporn Srasuebku¹, Brian Draper^{2, 3}, Adrienne Withall⁴, Di Winkler⁵, Ingrid
19
20 8 Honan⁷, Deidre Mackechnie⁸, Julian N Trollor^{1, 2}

21
22
23 9
24
25 10 * Joint first author

26
27
28 11
29
30 12 ¹ The Department of Developmental Disability Neuropsychiatry, Discipline of
31
32 13 Psychiatry and Mental Health, School of Clinical Medicine, Faculty of Medicine and
33
34 14 Health, UNSW Sydney, Australia

35
36
37 15 ² Centre for Healthy Brain Ageing, Discipline of Psychiatry & Mental Health, School
38
39 16 of Clinical Medicine, Faculty of Medicine and Health, UNSW Sydney, Australia

40
41 17 ³ Eastern Suburbs Older Persons Mental Health Service, Prince of Wales Hospital,
42
43 18 Randwick, Australia

44
45
46 19 ⁴ School of Population Health, Faculty of Medicine and Health, UNSW Sydney,
47
48 20 Australia

49
50 21 ⁵ Summer Foundation, Box Hill, Victoria, Australia

51
52
53 22 ⁶ Living with Disability Research Centre, La Trobe University, Melbourne, Victoria,
54
55 23 Australia

56
57 24 ⁷ Cerebral Palsy Alliance, Allambie Heights, New South Wales, Australia

58
59 25 ⁸ MS Australia, North Sydney, New South Wales, Australia

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

26 Corresponding Author: Professor Julian Trollor

27 Email: J.Trollor@unsw.edu.au,

28 Phone: +61 (2) 9065 8076

29 Address: The Department of Developmental Disability Neuropsychiatry, School of
30 Psychiatry, UNSW Sydney, NSW 2052, Australia

31

32 **Word count:** 2,741

33

34 **Key words:** Neurology; Psychiatry; Epidemiology

For peer review only

1
2
3 **35 Abstract**
4

5 **36 Objectives:** To examine the sociodemographic and diagnostic factors associated
6
7
8 **37** with a discharge from hospital to residential aged care (RAC) for younger people
9
10 **38** (aged 15–64 years) with neuropsychiatric disorders.
11

12 **39**
13
14 **40 Design:** An exploratory case-control study using a historic cohort of people with
15
16
17 **41** neuropsychiatric disorders. Cases were people transferred to RAC on hospital
18
19 **42** discharge during the study period. Controls were people not transferred to RAC on
20
21 **43** discharge during the study period.
22

23 **44**
24
25
26 **45 Setting:** Public and private hospital admissions in New South Wales (NSW),
27
28 **46** Australia.
29

30 **47**
31
32
33 **48 Participants:** People aged 15–64 years with a neuropsychiatric disorder hospitalised
34
35 **49** in NSW between July 2002 and June 2015 (n=516,469).
36

37 **50**
38
39
40 **51 Outcome measures:** The main outcome was transfer to RAC on discharge from
41
42 **52** hospital. We calculated odds ratios for sociodemographic and diagnostic factors to
43
44 **53** determine factors that may impact discharge to RAC.
45

46 **54**
47
48
49 **55 Results:** During the period of data capture, 4,406 people were discharged from
50
51 **56** hospitals to RAC. Discharge to RAC was most strongly associated with diagnoses of
52
53 **57** progressive neurological and cognitive disorders. Acute precipitants of RAC transfer
54
55 **58** included a broad range of conditions and injuries (e.g. Wernicke's encephalopathy,
56
57 **59** stroke, falls) in the context of issues such as older age, not being partnered (married
58
59
60

1
2
3 60 or de facto), living in areas of lower socioeconomic status, functional issues, and the
4
5 61 need for palliative care.
6
7
8 62

9
10 63 *Conclusions:* There are multiple intersecting and interacting pathways culminating in
11
12 64 discharge from hospital to RAC among younger people with neuropsychiatric
13
14 65 disorders. Improved capacity for interdisciplinary home care and alternative housing
15
16
17 66 and support options for people with high support needs are required.
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

67 Article Summary

68 Strengths and limitations

- 69 • This study utilises a large linked dataset that includes information from all
70 hospital admissions in NSW, Australia, for people with recorded diagnoses of
71 neuropsychiatric disorders over a period of 14 years.
- 72 • The study was completed in consultation with an advisory group comprising
73 people with lived experience of being, or supporting, a younger person in
74 RAC.
- 75 • The cohort included all people hospitalised with a recorded neuropsychiatric
76 diagnosis; other related diagnoses (e.g., traumatic brain injury, stroke) were
77 not used to derive the cohort and as such only a subpopulation of younger
78 people discharged to RAC were included.
- 79 • We used a lookback period and excluded persons with any indication of
80 previous placement in RAC but we could not confirm that index admissions for
81 cases reflected the first ever transfer to RAC.
- 82 • Some information relevant to the risk of transfer to RAC was not available in
83 the datasets used, including the reasons for placement in RAC, time since
84 diagnoses were first made, and information about functional abilities and
85 availability of informal care.

86 Introduction

87 Residential aged care (RAC) facilities in Australia provide accommodation and
88 personal care (including access to nursing and health services) to older adults who
89 are not able to continue living within their own homes. Although most people living in
90 RAC in Australia are over 65 years of age, people aged under 65 years (hereafter
91 “younger people”) may also be placed in RAC, largely due to a lack of access to age-
92 appropriate community-based accommodation and supports.(1) Over 3,400 younger
93 people were living in RAC in Australia as of 31 December 2021, with over 600 new
94 RAC placements in this age group occurring in the preceding year.(2) Younger
95 people living in RAC typically have high clinical needs and experience activity
96 limitations as a result of disability, e.g. due to intellectual and developmental
97 disability, physical disability (e.g. paraplegia), acquired brain injury, and progressive
98 neurological disorders (e.g. dementia, multiple sclerosis and Huntington disease).(3)
99 It is known that younger people living in RAC experience a range of negative
100 outcomes, including a lack of appropriate recreational activities and medical and
101 rehabilitation services, loss of function, and experiences of grief, hopelessness, and
102 neglect.(4, 3, 5, 6) Further, many RAC facilities are not equipped to adequately meet
103 the specific and complex health and rehabilitation needs of younger people with
104 disability.(4)

105

106 The placement of younger people into RAC in Australia has previously been targeted
107 through the Younger People with Disability in Residential Aged Care Initiative.
108 However, a review showed that this was unlikely to result in a sustainable reduction
109 in younger people entering RAC.(7) The prevention of the placement of younger
110 people into RAC has since been identified as an area for immediate action by the

1
2
3 111 Australian Royal Commission into Aged Care Quality and Safety;(6, 8) in particular,
4
5 112 stopping the “pipeline” from hospital to RAC. Using a large, linked dataset of younger
6
7 113 people with neuropsychiatric disorders admitted to hospital in New South Wales
8
9 114 (NSW), Australia, this study aims to identify sociodemographic and diagnostic factors
10
11 115 that may be associated with a transfer to RAC upon discharge from hospital.
12
13 116 Identification of these factors will inform the development of strategies to prevent or
14
15 117 delay the transfer of younger people from hospital to RAC.
16
17
18
19
20
21

22

119 **Methods**

120 *Study design and data sources*

23
24
25 121 This exploratory case-control study used data from a large linkage study of people
26
27 122 with neuropsychiatric disorders, including mental health disorders, neurological
28
29 123 disorders, and intellectual and developmental disabilities.(9) The primary dataset
30
31 124 used in the current study was the NSW Admitted Patient Data Collection (APDC; 1
32
33 125 July 2001-30 June 2015) which contains information recorded during all admissions
34
35 126 to NSW hospitals and psychiatric facilities. This includes admission/discharge dates
36
37 127 and up to 51 diagnoses (coded according to the International Statistical
38
39 128 Classification of Diseases and Related Health Problems; 10th revision, Australian
40
41 129 modification (ICD-10-AM)) for each episode.
42
43
44
45
46
47
48

49

131 *Study population*

50
51 132 We defined our study population as people aged 15–64 years with a
52
53 133 neuropsychiatric disorder who were admitted to a hospital in NSW between 1 July
54
55 134 2001 and 30 June 2015. Neuropsychiatric disorders were determined by any of the
56
57 135 following: i) diagnosis of intellectual disability recorded in any dataset from the
58
59
60

1
2
3 136 broader linkage study previously described,(9); ii) ICD-10-AM diagnoses of mental
4
5 137 and behavioural disorders ('F00-F99', 'S06'), disorders of the nervous system ('G00-
6
7 138 G99'), or intellectual and developmental disability ('P04.3', 'Q86.0', 'Q87.0', 'Q87.1',
8
9
10 139 'Q87.2', 'Q87.3', 'Q87.5', 'Q87.8', 'Q89.8', 'Q90', 'Q91', 'Q93', 'Q99.2') recorded
11
12 140 during a hospital admission; iii) an admission to a psychiatric unit, indicated where
13
14 141 unit type on admission was one of 'Psychiatric Acute', 'Psychiatric Rehabilitation',
15
16 142 'Psychiatric Secure', 'Brain Injury Rehabilitation', 'Psychiatric Intensive Care', 'Post
17
18 143 Natal Depression', 'Psychiatric Extended Care', 'Neuro-Psychiatry', 'Psychiatric
19
20 144 Medium Secure', 'Psychiatric Emergency', or where days in a psychiatric unit were
21
22
23
24 145 >0.

25
26 146
27
28 147 Cases were people transferred to RAC on discharge from hospital during the study
29
30 148 (i.e., mode of hospital separation was 'Transfer to Nursing Home'). Controls were
31
32 149 people with hospital admissions but no recorded transfers to RAC. The index
33
34 150 admission for cases was defined as the date of the first transfer to RAC from hospital
35
36 151 occurring in the study period. To obtain a similar distribution of control index
37
38 152 admission dates across the study period to that of the cases, index admissions for
39
40 153 controls were randomly selected by matching eligible control hospital discharge
41
42 154 dates to case index dates using the SAS macro 'gmatch' greedy matching
43
44
45
46 155 algorithm.(10)

47
48
49 156
50
51 157 Individuals were excluded if the mode of separation of their index admission was
52
53 158 'Death with Autopsy' or 'Death without Autopsy'. To minimise the chance of previous
54
55 159 transfer to RAC, individuals were excluded if: they were transferred to RAC on
56
57
58 160 discharge from hospital before 1 July 2002; the source of referral was 'Nursing
59
60

1
2
3 161 Home/RAC' at or before the index admission; the diagnosis "Place of occurrence,
4
5 162 aged care facility" was recorded at or before the index admission. Individuals were
6
7
8 163 also excluded if the index admission was a same-day admission or if diagnostic or
9
10 164 sociodemographic data were missing.
11
12
13
14

15 166 *Sociodemographic and other non-diagnosis variables*

16
17 167 Sex, Aboriginal and/or Torres Strait Islander status, country of birth (Australia or
18
19
20 168 overseas), Index of Relative Socioeconomic Disadvantage (IRSD) quintiles,
21
22 169 remoteness of area of residence categories and date of death were obtained from
23
24 170 multiple datasets as previously described.(9) Marital Status was sourced from the
25
26 171 APDC at the index admission and, if missing, we used Last Observation Carried
27
28 172 Forward if recorded in a previous admission. Age at the index admission was
29
30 173 analysed using five-year age groups to allow for a non-linear association with the
31
32 174 outcome. We also calculated the year of the index date, and the total admission
33
34 175 length of stay (days) over all admissions within a lookback period of 365 days prior to
35
36 176 the index date.
37
38
39

40 177

41
42
43 178 *Diagnosis group variables*

44
45 179 We extracted all ICD-10-AM diagnosis codes recorded during the index admission
46
47 180 and collapsed these into broad but meaningful groupings. We initially grouped
48
49 181 diagnoses based on two previous reports.(11, 12) Conditions that were deemed
50
51 182 unlikely to affect the chance of RAC transfer (e.g., those relating to pregnancy and
52
53 183 birth) were excluded. To avoid sparse data bias,(13) diagnosis groups with less than
54
55 184 20 cases were also removed. This process resulted in 224 diagnostic groupings.
56
57
58
59
60

1
2
3 185 Following this, the groupings were further collapsed into 57 general diagnostic
4
5 186 categories (see Supplementary Table A).
6
7
8 187

9
10 188 *Statistical analysis*

11
12 189 We used logistic regression models to estimate the effect of sociodemographic and
13
14 190 diagnostic factors on transfer to RAC. For sociodemographic factors we report both
15
16 191 the unadjusted effects and full model results, as while the individual models do not
17
18 192 adjust for confounding factors, adjusting for mediators in the full model would
19
20 193 potentially bias the estimates.(14) Likewise, it is likely that some diagnosis groups
21
22 194 share overlapping causal pathways and, hence, odds ratio estimates from our full
23
24 195 logistic model might be affected by overadjustment bias.(17) For diagnostic factors,
25
26 196 estimates were also produced using a separate logistic model for each diagnosis
27
28 197 group that adjusted for sociodemographic/non-diagnosis variables only. While this
29
30 198 approach does not adjust for confounding by other diagnostic variables, it is less
31
32 199 likely to exhibit overadjustment bias.
33
34
35
36
37
38 200

39
40 201 *Supplementary analyses utilising the lookback period*

41
42 202 The above analyses utilise data only from the index admission and so include the
43
44 203 acute precipitants of transfer to RAC on discharge from hospital. To determine
45
46 204 whether inclusion of diagnoses recorded in the 365 days preceding the index
47
48 205 admission impacted the effect estimates of variables that may be associated with
49
50 206 transfer to RAC, we repeated the above analyses using all diagnoses received at
51
52 207 hospital admissions occurring during the look-back period. Results of these analyses
53
54 208 are presented in Supplementary Table B.
55
56
57
58
59
60

1
2
3 210 Analyses were conducted using SAS 9.4 (SAS Institute) and Stata 15.1 (StataCorp).
4
5

6 211

7
8 212 *Patient and Public Involvement: Consultation with Lived Experience Advisory Group*
9

10 213 We established an advisory group comprising nine people with lived experience of
11
12 214 being, or supporting, a younger person living in RAC and consulted with them about
13
14 215 the aims, methods, and findings of the research.
16

17 216

18
19 217 *Ethics approval*
20

21 218 This study was approved by the NSW Population & Health Services Research Ethics
22
23 219 Committee (CINSW 2013/02/445, AU RED reference: HREC/13/CIPHS/7, substudy
24
25 220 number 2019UMB0601). Ethics approval included a waiver of consent.
26
27

28 221

30 222 **Results**

31
32 223 *Cohort characteristics*
33

34 224 Details of the selection process for cases and controls are shown in Figure 1.
35
36

37 225 Sociodemographic characteristics are provided in Table 1.
38
39

40 226

41
42 227 [Figure 1 about here]
43

44 228

45
46 229 LEGEND: Figure 1. Selection of cases and controls. RAC= residential aged care.
47
48
49
50
51
52
53
54
55
56
57
58
59
60

230 Table 1. Sociodemographic characteristics of cohort

Variable	Cases ^a (n=4,406)	Controls ^b (n=512,063)	<i>p</i>
Sex			< 0.001
Male	2,586 (58.7%)	271,636 (53.0%)	
Female	1,820 (41.3%)	240,427 (47.0%)	
Age (grouped)			< 0.001
15-19	18 (0.4%)	37,345 (7.3%)	
20-24	29 (0.7%)	41,765 (8.2%)	
25-29	47 (1.1%)	45,252 (8.8%)	
30-34	63 (1.4%)	52,919 (10.3%)	
35-39	100 (2.3%)	54,086 (10.6%)	
40-44	203 (4.6%)	54,187 (10.6%)	
45-49	359 (8.1%)	53,575 (10.5%)	
50-55	678 (15.4%)	55,677 (10.9%)	
55-59	1,250 (28.4%)	59,401 (11.6%)	
60-64	1,659 (37.7%)	57,856 (11.3%)	
Remoteness of area of residence			0.001
Major Cities	3,180 (72.2%)	361,626 (70.6%)	
Inner Regional	932 (21.2%)	110,864 (21.7%)	
Outer Regional	281 (6.4%)	35,747 (7.0%)	
Remote	13 (0.3%)	3,826 (0.7%)	
Index of Relative Socioeconomic Disadvantage			< 0.001
1 (Most disadvantaged)	1,068 (24.2%)	111,963 (21.9%)	
2	912 (20.7%)	99,973 (19.5%)	
3	958 (21.7%)	102,797 (20.1%)	
4	818 (18.6%)	91,313 (17.8%)	
5 (Least disadvantaged)	650 (14.8%)	106,017 (20.7%)	
Marital status			< 0.001
Married or de facto	1,295 (29.4%)	245,387 (47.9%)	
Never married	1,779 (40.4%)	201,768 (39.4%)	
Widowed	277 (6.3%)	9,155 (1.8%)	
Separated or divorced	1,055 (23.9%)	55,753 (10.9%)	
Born in Australia			0.021
Yes	3,457 (78.5%)	408,941 (79.9%)	
No	949 (21.5%)	103,122 (20.1%)	
Year of index admission, median (IQR)	2009 (2006-2012)	2009 (2006-2013)	0.007
Total length of stay (days), median (IQR)	62 (28-116)	4 (2-12)	< 0.001
Hospital type			< 0.001
Public	4,245 (96.3%)	387,607 (75.7%)	
Private	161 (3.7%)	124,456 (24.3%)	

231 ^aCases were persons transferred to residential aged care during the study period; ^bControls were
232 persons not transferred to residential aged care during the study period

1
2
3 233 *Predictors of transfer to RAC on discharge from hospital*
4

5 234 Predictors of transfer to RAC on discharge are shown in Tables 2 (sociodemographic
6 variables) and 3 (diagnosis variables). Accounting for all covariates, the odds of
7
8 235 transfer to RAC increased with advancing age (ORs range from 2.18 (95% CI=1.16-
9
10 236 4.10) for 20-24 years of age to 82.50 (95% CI=49.51-137.47) for 60-64 years).
11
12 237 People living in regional and remote areas were less likely to be transferred to RAC
13
14 238 than people living in major cities (inner regional OR=0.89, 95% CI=0.81-0.98, outer
15
16 239 regional OR=0.80, 95% CI=0.69-0.93, remote OR=0.28, 95% CI=0.15, 0.53). People
17
18 240 living in the most disadvantaged areas were slightly more likely to be discharged to
19
20 241 RAC than those living in the least disadvantaged areas (OR=1.15, 95% CI=1.02-
21
22 242 1.30). Individuals who were never married (OR=2.76, 95% CI=2.51-3.04), widowed
23
24 243 (OR=2.60, 95% CI=2.22-3.05), or separated/divorced (OR=2.61, 95% CI=2.37-2.88)
25
26 244 were more likely to be transferred to RAC on discharge than individuals who were
27
28 245 currently partnered (married or de facto).
29
30 246
31
32
33
34
35
36
37

38 248 For diagnosis group predictors, adjusting for all variables, people with Huntington
39
40 249 disease had the greatest likelihood of transfer to RAC on discharge (OR=29.97, 95%
41
42 250 CI=20.88-43.01), followed by people living with dementia (OR=15.14, 95% CI=13.10-
43
44 251 17.51), multiple sclerosis (OR=8.43, 95% CI=6.96-10.22), Wernicke's
45
46 252 encephalopathy (OR=6.58, 95% CI=4.40-9.83), motor neurone disease (OR=5.62,
47
48 253 95% CI=3.93-8.03), Parkinson's disease (OR=5.55, 95% CI=4.33-7.11), a need for
49
50 254 palliative care (OR=5.32, 95% CI=4.48-6.33), intellectual disability (OR=3.72, 95%
51
52 255 CI=3.31-4.19), stroke (OR=3.08, 95% CI=2.75-3.46), and mobility and personal care
53
54 256 issues (OR=2.87, 95% CI=2.57-3.22). When adjusting only for sociodemographic
55
56 257 and other non-diagnosis variables the same diagnoses emerged as the strongest
57
58
59
60

1
2
3 258 predictors though in a slightly different order; diagnoses of Huntington disease
4
5 259 (OR=30.23, 95% CI=22.26-41.05), dementia (OR=19.78, 95% CI=17.44-22.43), and
6
7 260 Wernicke's encephalopathy (OR=9.03, 95% CI=6.41-12.71) conferred the greatest
8
9 261 likelihood of transfer to RAC on discharge from hospital, followed by a need for
10
11 262 palliative care (OR=8.47, 95% CI=7.50-9.56), multiple sclerosis (OR=8.21, 95%
12
13 263 CI=6.94-9.71), and difficulties with mobility and personal care (OR=7.72, 95%
14
15 264 CI=7.01-8.51). Similar results were obtained when utilising diagnostic variables
16
17 265 available from hospital admissions occurring during the lookback period (365 days
18
19 266 preceding the index admission; Supplementary Table B).
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

267 Table 2. Sociodemographic and other non-diagnosis predictors of transfer from hospital to RAC on
 268 discharge

Variable	Unadjusted Odds ratio (95% CI)	Full model ^a Odds ratio (95% CI)
Sex		
Male	Reference	Reference
Female	0.80 (0.75–0.84)	0.92 (0.85–0.99)
Age (grouped)		
15-19	Reference	Reference
20-24	1.44 (0.80–2.59)	2.18 (1.16–4.10)
25-29	2.15 (1.25–3.71)	3.87 (2.16–6.95)
30-34	2.47 (1.46–4.17)	5.06 (2.87–8.92)
35-39	3.84 (2.32–6.34)	7.56 (4.39–13.03)
40-44	7.77 (4.80–12.59)	13.65 (8.08–23.06)
45-49	13.90 (8.66–22.32)	22.79 (13.58–38.23)
50-55	25.26 (15.82–40.35)	39.80 (23.85–66.41)
55-59	43.66 (27.41–69.53)	66.59 (39.98–110.91)
60-64	59.49 (37.38–94.67)	82.50 (49.51–137.47)
Remoteness		
Major cities	Reference	Reference
Inner regional	0.96 (0.89–1.03)	0.89 (0.81–0.98)
Outer regional	0.89 (0.79–1.01)	0.80 (0.69–0.93)
Remote	0.39 (0.22–0.67)	0.28 (0.15–0.53)
Index of Relative Social Disadvantage		
5 Least disadvantaged	Reference	Reference
4	1.46 (1.32–1.62)	1.10 (0.97–1.24)
3	1.52 (1.38–1.68)	1.13 (1.00–1.28)
2	1.49 (1.34–1.65)	1.09 (0.96–1.23)
1 Most disadvantaged	1.56 (1.41–1.72)	1.15 (1.02–1.30)
Marital status		
Married (incl. de facto)	Reference	Reference
Never married	1.67 (1.55–1.80)	2.76 (2.51–3.04)
Widowed	5.73 (5.03–6.54)	2.60 (2.22–3.05)
Separated or divorced	3.59 (3.30–3.89)	2.61 (2.37–2.88)
Born in Australia		
Yes	Reference	Reference
No	1.09 (1.01–1.17)	0.86 (0.79–0.94)
Year of index admission	0.98 (0.97–0.99)	0.96 (0.95–0.97)
Total length of stay	1.01 (1.01–1.01)	1.01 (1.01–1.01)
Hospital type		
Public	Reference	Reference
Private	0.12 (0.10–0.14)	0.30 (0.25–0.36)

^aModel output was dependent on the collapsed diagnosis groups included in the full model (reported in Table 3)

271 Table 3. Diagnostic predictors of transfer from hospital to RAC on discharge

Diagnosis variable	Cases^a n=4,406	Controls^b n=512,063	Unadjusted Odds ratio (95% CI)	Partially adjusted Odds ratio ^c (95% CI)	Full model Odds ratio ^d (95% CI)
Huntington disease	84 (1.9%)	181 (0.0%)	54.96 (42.36–71.32)	30.23 (22.26–41.05)	29.97 (20.88–43.01)
Dementia	561 (12.7%)	951 (0.2%)	78.42 (70.31–87.45)	19.78 (17.46–22.43)	15.14 (13.10–17.51)
Multiple sclerosis	189 (4.3%)	2,752 (0.5%)	8.29 (7.14–9.64)	8.21 (6.94–9.71)	8.43 (6.96–10.22)
Wernicke's encephalopathy	58 (1.3%)	177 (0.0%)	38.58 (28.64–51.97)	9.03 (6.41–12.71)	6.58 (4.40–9.83)
Motor neurone disease	52 (1.2%)	516 (0.1%)	11.84 (8.89–15.77)	6.54 (4.79–8.93)	5.62 (3.93–8.03)
Parkinson's disease	130 (3.0%)	1,084 (0.2%)	14.33 (11.92–17.23)	5.55 (4.52–6.82)	5.55 (4.33–7.11)
Need for palliative care	421 (9.6%)	2,032 (0.4%)	26.52 (23.77–29.59)	8.47 (7.50–9.56)	5.32 (4.48–6.33)
Intellectual disability	700 (15.9%)	17,257 (3.4%)	5.42 (4.99–5.88)	3.89 (3.52–4.30)	3.72 (3.31–4.19)
Stroke	929 (21.1%)	12,094 (2.4%)	11.05 (10.25–11.90)	3.72 (3.42–4.04)	3.08 (2.75–3.46)
Difficulties with mobility and personal care	797 (18.1%)	3,860 (0.8%)	29.08 (26.76–31.59)	7.72 (7.01–8.51)	2.87 (2.57–3.22)
Other genitourinary diseases	1,810 (41.1%)	26,785 (5.2%)	12.63 (11.88–13.43)	5.93 (5.53–6.36)	2.65 (2.43–2.90)
Cerebral palsy	78 (1.8%)	1,925 (0.4%)	4.78 (3.80–6.00)	5.82 (4.48–7.56)	2.52 (1.89–3.37)
Pressure injury and ulcers	811 (18.4%)	4,844 (0.9%)	23.62 (21.78–25.62)	4.74 (4.30–5.22)	2.35 (2.09–2.64)
Primary malignant cancers	635 (14.4%)	14,552 (2.8%)	5.76 (5.28–6.27)	2.47 (2.25–2.71)	1.88 (1.59–2.21)
Epilepsy	377 (8.6%)	12,843 (2.5%)	3.64 (3.27–4.05)	3.08 (2.73–3.47)	1.78 (1.54–2.05)
Neurological symptoms and signs	1,371 (31.1%)	26,414 (5.2%)	8.31 (7.78–8.86)	3.81 (3.54–4.10)	1.77 (1.61–1.93)
Falls	785 (17.8%)	18,284 (3.6%)	5.85 (5.41–6.33)	2.47 (2.26–2.70)	1.76 (1.55–2.00)
Chronic liver disease	433 (9.8%)	12,884 (2.5%)	4.22 (3.82–4.67)	1.95 (1.75–2.18)	1.67 (1.46–1.91)
Chronic respiratory diseases	919 (20.9%)	19,644 (3.8%)	6.61 (6.13–7.11)	1.95 (1.79–2.11)	1.48 (1.35–1.64)
Gastrointestinal symptoms and signs	978 (22.2%)	25,828 (5.0%)	5.37 (5.00–5.77)	3.07 (2.83–3.32)	1.43 (1.29–1.58)
Other factors influencing health status and contact with health services	3,140 (71.3%)	230,981 (45.1%)	3.02 (2.83–3.22)	1.62 (1.51–1.74)	1.35 (1.25–1.47)
Secondary mental disorders	150 (3.4%)	1,674 (0.3%)	10.75 (9.07–12.73)	3.02 (2.46–3.70)	1.34 (1.06–1.70)
Delirium	289 (6.6%)	3,439 (0.7%)	10.38 (9.17–11.75)	3.29 (2.86–3.79)	1.32 (1.12–1.57)
Other neurological conditions	1,806 (41.0%)	125,113 (24.4%)	2.15 (2.02–2.28)	2.21 (2.06–2.36)	1.31 (1.20–1.43)
Diabetes	886 (20.1%)	31,542 (6.2%)	3.83 (3.56–4.13)	1.38 (1.27–1.50)	1.30 (1.18–1.43)
Other endocrine, nutritional and metabolic diseases	1,941 (44.1%)	63,638 (12.4%)	5.55 (5.23–5.89)	2.03 (1.90–2.17)	1.26 (1.15–1.37)
Infections	1,968 (44.7%)	60,793 (11.9%)	5.99 (5.64–6.36)	2.61 (2.44–2.79)	1.21 (1.11–1.32)

1					
2					
3	Behavioural and emotional symptoms				
4	and signs	355 (8.1%)	17,421 (3.4%)	2.49 (2.23–2.78)	1.81 (1.59–2.05)
5	Traumatic brain injury	153 (3.5%)	9,652 (1.9%)	1.87 (1.59–2.20)	1.47 (1.22–1.76)
6	Other symptoms and signs	1,616 (36.7%)	53,259 (10.4%)	4.99 (4.69–5.31)	2.60 (2.43–2.79)
7	Problems related to housing,				
8	economic and social situation	653 (14.8%)	45,332 (8.9%)	1.79 (1.65–1.95)	1.27 (1.15–1.39)
9	Dental caries	54 (1.2%)	1,597 (0.3%)	3.97 (3.02–5.21)	1.45 (1.04–2.02)
10	Skin disease	678 (15.4%)	19,168 (3.7%)	4.68 (4.30–5.08)	1.84 (1.67–2.02)
11	Alcohol, substance and other mental				
12	disorders	1,158 (26.3%)	132,886 (26.0%)	1.02 (0.95–1.09)	1.02 (0.95–1.10)
13	Secondary malignant cancers	324 (7.4%)	5,743 (1.1%)	7.00 (6.23–7.86)	2.90 (2.57–3.28)
14	Diseases of eyes and ears	527 (12.0%)	13,616 (2.7%)	4.97 (4.53–5.46)	1.90 (1.71–2.12)
15	Acute and chronic renal disease	565 (12.8%)	14,548 (2.8%)	5.03 (4.60–5.50)	1.38 (1.25–1.53)
16	Other injuries	1,691 (38.4%)	104,213 (20.4%)	2.44 (2.29–2.59)	1.53 (1.43–1.63)
17	Diseases of the digestive system	1,192 (27.1%)	53,957 (10.5%)	3.15 (2.94–3.37)	1.51 (1.40–1.62)
18	Fractures	392 (8.9%)	22,140 (4.3%)	2.16 (1.95–2.40)	1.26 (1.13–1.42)
19	Other circulatory system disorders	1,838 (41.7%)	69,117 (13.5%)	4.59 (4.32–4.87)	1.44 (1.34–1.54)
20	Musculoskeletal	1,465 (33.3%)	82,920 (16.2%)	2.58 (2.42–2.75)	1.52 (1.41–1.62)
21	Other common mental disorders	767 (17.4%)	116,898 (22.8%)	0.71 (0.66–0.77)	0.75 (0.69–0.82)
22	Other cancers	116 (2.6%)	8,165 (1.6%)	1.67 (1.39–2.01)	1.01 (0.83–1.25)
23	Circulatory and respiratory symptoms				
24	and signs	303 (6.9%)	21,903 (4.3%)	1.65 (1.47–1.86)	0.91 (0.80–1.03)
25	Asthma	58 (1.3%)	7,585 (1.5%)	0.89 (0.68–1.15)	0.67 (0.51–0.88)
26	Blood disorders	554 (12.6%)	14,237 (2.8%)	5.03 (4.59–5.51)	1.55 (1.40–1.72)
27	Schizophrenia	372 (8.4%)	31,106 (6.1%)	1.43 (1.28–1.59)	0.32 (0.28–0.37)
28	Other oral disorders	98 (2.2%)	3,420 (0.7%)	3.38 (2.76–4.14)	1.26 (0.99–1.61)
29	Intentional self-harm	51 (1.2%)	22,161 (4.3%)	0.26 (0.20–0.34)	0.36 (0.26–0.48)
30	Coronary heart disease	196 (4.4%)	13,550 (2.6%)	1.71 (1.48–1.98)	0.59 (0.51–0.69)
31	Rehabilitation, convalescence and				
32	respite	1,089 (24.7%)	18,829 (3.7%)	8.60 (8.02–9.22)	1.85 (1.70–2.02)
33	Upper respiratory diseases	39 (0.9%)	9,763 (1.9%)	0.46 (0.34–0.63)	0.65 (0.46–0.92)
34	Spinal cord injury	21 (0.5%)	638 (0.1%)	3.84 (2.48–5.94)	0.35 (0.21–0.59)
35					
36					
37					
38					
39					
40					
41					
42					
43					
44					
45					
46					

272 ^aCases were persons transferred to residential aged care during the study period; ^bControls were persons not transferred to residential aged care during the
273 study period; ^c Partially adjusted odds ratios were calculated using a model adjusting only for sociodemographic/non-diagnosis variables shown in Table 2.
274 ^dAdjusted odds ratios were calculated using a model adjusting for all diagnosis and sociodemographic/non-diagnosis variables (sociodemographic/non-
275 diagnosis variables are shown in Table 2).

276 **Discussion**

277 This study investigated multiple factors that may lead to transfer from hospital to
278 RAC for younger people with neuropsychiatric disorders in NSW, Australia. Within
279 this cohort, people at greatest risk of transfer from hospital to RAC were those with
280 progressive cognitive and neurological disorders. People with neurodevelopmental
281 disorders were also at increased risk. Acute precipitants of transfer from hospital to
282 RAC included a range of medical conditions in the context of issues such as older
283 age, not being partnered, living in areas of lower socioeconomic status, functional
284 issues related to mobility and personal care, and the need for palliative care. These
285 findings highlight opportunities for interventions that might prevent or delay
286 placement of younger people in RAC, including reducing preventable causes of
287 disability, the development of hospital discharge protocols, rapid intensive and
288 responsive support in the home, alternative high support housing options, and
289 alternative palliative care pathways.

290

291 Our findings indicate that specific conditions and acute health events are major
292 factors associated with greater odds of transfer from hospital to RAC for younger
293 people with neuropsychiatric disorders. We found an increased risk of discharge to
294 RAC specifically for people with progressive cognitive and neurological disorders
295 (particularly Huntington disease and young onset dementia) and people with
296 neurodevelopmental disorders (intellectual disability and cerebral palsy). Acute
297 medical factors associated with increased risk of RAC transfer included Wernicke's
298 encephalopathy, stroke, and cancer. Indicators of increasing support needs included
299 difficulties with mobility and personal care, injuries (e.g. falls, pressure injuries and
300 ulcers), and a need for palliative care. Importantly, some of these primary drivers of

1
2
3 301 transfer from hospital to RAC are preventable, or amenable to intervention.
4
5 302 Prevention strategies include minimising fall risk amongst people with progressive
6
7 303 cognitive and neurological disorders (e.g., Parkinson's disease) through
8
9 304 individualised exercise, physical therapy, and falls prevention programs.(15) The
10
11 305 development and evaluation of individualised falls prevention and balance programs
12
13 306 for people with intellectual disability is needed to improve functional outcomes and
14
15 307 reduce fall risk in this prematurely frail group.(16, 17) Additionally, long-term
16
17 308 neurocognitive disability due to Wernicke's encephalopathy (Korsakoff syndrome)
18
19 309 should be prevented with rapid treatment with thiamine, and addressing issues such
20
21 310 as alcohol abuse and malnutrition.(18) An increased emphasis on rehabilitation
22
23 311 following acute health events may also lead to improved outcomes, including
24
25 312 addressing barriers to post-stroke rehabilitation among people with cognitive
26
27 313 disabilities. People with cognitive disabilities typically experience poorer outcomes
28
29 314 post-stroke including institutionalisation (19) and are often considered unlikely to
30
31 315 benefit from rehabilitation, however demonstrate functional improvements when
32
33 316 appropriate rehabilitation is provided.(20)
34
35
36
37
38
39
40 317
41
42 318 In November 2019, the Prime Minister of Australia declared that no younger people
43
44 319 should be living in RAC by 2025.(21) A number of specific actions required to meet
45
46 320 this commitment were outlined by the Royal Commission into Aged Care Quality and
47
48 321 Safety (Recommendation 74; (8)), which have since been accepted but not
49
50 322 necessarily funded by the Australian Government.(22)) Our findings highlight the
51
52 323 need to prioritise the funding and development of health and disability support
53
54 324 pathways as alternatives to RAC, including hospital discharge protocols to prevent
55
56 325 younger people being discharged into RAC and, alternative housing and support
57
58
59
60

1
2
3 326 options for younger people at risk of entering RAC (8). Potential hospital discharge
4
5 327 protocols could include a trial and evaluation of a short-term specialised transition
6
7
8 328 disability care model (e.g. 12 weeks; similar to the Australian Transition Care
9
10 329 Programme for eligible older people leaving hospital)(23) to be implemented prior to
11
12 330 consideration of RAC, as well as alternative palliative care pathways for younger
13
14 331 people with life-limiting conditions. Alternative housing and support options could
15
16 332 include the establishment of high-support needs community living options through
17
18 333 expansion of intensive disability supports and home in-reach programs from health
19
20 334 and allied health professionals, and extending trials of “Health care homes” to target
21
22 335 those at risk.(24)
23
24
25
26 336
27
28 337 Further actions relate to Australia’s National Disability Insurance Scheme (NDIS),
29
30 338 which provides individualised funding packages for disability supports and services
31
32 339 to eligible individuals with permanent and significant disability (e.g. intellectual,
33
34 340 cognitive, neurological, sensory, physical or psychosocial disability).(25) Potential
35
36 341 actions include improving capacity for the NDIS to enable health and disability
37
38 342 systems to provide interdisciplinary care, echoing the recommendations of the Royal
39
40 343 Australian and New Zealand College of Psychiatrists to the Joint Standing
41
42 344 Committee of the NDIS.(26) This could include the development of a system for
43
44 345 rapid crisis response in the case of a new or deteriorating primary condition, a
45
46 346 medical comorbidity that affects functioning, or when a person requires palliative
47
48 347 care. This would entail ensuring a joint response from health and disability services
49
50 348 with rapid response to assessment of new and emerging support needs, timely
51
52 349 provision of funding to meet those needs, and finally, establishing a pipeline of
53
54 350 available alternative high support housing options.
55
56
57
58
59
60

1
2
3 351 Strengths of our study include the use of a large dataset including all hospital
4
5 352 admissions in NSW over a period of 14 years. Furthermore, our study was done in
6
7 353 consultation with a Lived Experience Advisory Group who provided feedback on our
8
9 354 interpretation of the results, ensuring that our research was relevant to the needs
10
11 355 and experiences of younger people living in RAC. Limitations include the restricted
12
13 356 cohort, which only included people hospitalised in NSW, Australia, with a recorded
14
15 357 neuropsychiatric diagnosis. Diagnoses used for cohort formation in the broader data
16
17 358 linkage on which this study is based did not include other related diagnoses (e.g.,
18
19 359 traumatic brain injury and stroke). As such, the findings must be interpreted in the
20
21 360 context of younger people with neuropsychiatric disorders (who represent a
22
23 361 substantial proportion of younger people living in RAC in Australia),(3) but not the
24
25 362 entire population of younger people at risk of transfer to RAC. Further, we could not
26
27 363 confirm that index admissions for cases reflected the first ever transfer to RAC,
28
29 364 though we attempted to do this by using a lookback period and excluding persons
30
31 365 with any indication of previous placement in RAC. Finally, other information relevant
32
33 366 to the risk of transfer to RAC was not available in the datasets used, including
34
35 367 reason for placement in RAC (e.g., respite, residential, or palliative care), time since
36
37 368 diagnosis, detailed information about functional abilities, and information about
38
39 369 informal care.

40
41
42
43
44
45
46
47 370

48
49 371 Our study has identified acute precipitants of transfer to RAC on discharge from
50
51 372 hospital for younger people with neuropsychiatric disorders in NSW, Australia.
52
53 373 Significant investment in health and disability support pathways as alternatives to
54
55 374 RAC, as well as cross-sector support to rapidly respond to escalating needs, may
56
57 375 prevent the movement of younger people from hospital to RAC.
58
59
60

1
2
3 376 **Acknowledgements:** We thank the Lived Experience Advisory Group (including
4
5 377 Imelda Gilmore, Chanelle McKenna, Lisa Corcoran, Denis Cavanagh, Andrew
6
7 378 Wallner, Paulene Bates, Helen Burt, and others) for their continued input into this
8
9 379 study. We also thank Andrew Giles (National Policy Manager, MS Australia) for his
10
11 380 ongoing contributions to this project.
12
13
14
15 381

16
17 382 **Funding statement:** This project was funded by the Summer Foundation (award
18
19 383 number: N/A; Title: Understanding the health and support needs of younger people
20
21 384 with disabilities discharged from hospital to residential aged care) and was supported
22
23 385 by a National Health and Medical Research Council Australia Partnerships for Better
24
25 386 Health grant (Award number: APP1056128; Title: Improving the Mental Health
26
27 387 Outcomes of People with an Intellectual Disability).
28
29
30

31 388
32
33 389 **Competing interests:** Dr Di Winkler is Chief Executive Officer of the Summer
34
35 390 Foundation. No other disclosures.
36
37
38 391

39
40 392 **Author contributions:** RCC led the drafting and finalisation of this manuscript, and
41
42 393 contributed to the overall project direction and interpretation of results; TRW led the
43
44 394 statistical analyses, and contributed to the overall project direction, interpretation of
45
46 395 results, and drafting and finalisation of this manuscript; ARW led consultations with
47
48 396 the Lived Experience Advisory Group, contributed to the overall project direction,
49
50 397 interpretation of results, and drafting and finalisation of this manuscript; PS
51
52 398 contributed to the statistical analyses, and contributed to the overall project direction,
53
54 399 interpretation of results, and drafting and finalisation of this manuscript; SR, BD, AW,
55
56
57
58
59
60

1
2
3 400 DW, IH, DM, and JNT all contributed to the overall project direction, interpretation of
4
5 401 results, and drafting and finalisation of this manuscript.
6
7
8 402

9
10 403 **Data sharing statement:** Datasets used in this project cannot be shared publicly
11
12 404 due to the data usage agreement between the Department of Developmental
13
14 405 Disability Neuropsychiatry, The University of New South Wales Sydney, and the data
15
16 406 custodians who provide access to this data.
17
18

19 407
20
21 408 **Ethics approval:** This study was approved by the NSW Population & Health
22
23 409 Services Research Ethics Committee (CINSW 2013/02/445, AU RED reference:
24
25 410 HREC/13/CIPHS/7, substudy number 2019UMB0601). Ethics approval included a
26
27 411 waiver of consent.
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

412 References

- 413 1. Australian Institute of Health and Welfare. GEN Aged Care Data: People using
414 aged care; 2022 [cited 18th May 2022]. Available from: URL: [https://www.gen-
415 agedcaredata.gov.au/Topics/People-using-aged-
416 care#Aged%20care%20use%20and%20age](https://www.gen-agedcaredata.gov.au/Topics/People-using-aged-care#Aged%20care%20use%20and%20age).
- 417 2. Australian Institute of Health and Welfare. Younger People in Residential Aged
418 Care- GEN Aged Care Data. Available from: URL: [https://www.gen-
419 agedcaredata.gov.au/Resources/Younger-people-in-residential-aged-care](https://www.gen-agedcaredata.gov.au/Resources/Younger-people-in-residential-aged-care).
- 420 3. Winkler DF, Farnworth L, Sloan S. People under 60 living in aged care facilities
421 in Victoria. Australian Health Review 2006; 30(1):100–8.
- 422 4. Cameron C, Pirozzo S, Tooth L. Long-term care of people below age 65 with
423 severe acquired brain injury: appropriateness of aged care facilities. Health and
424 Health Care 2001; 25(3):261–4.
- 425 5. McMillan TM, Laurie M. Young adults with acquired brain injury in nursing homes
426 in Glasgow. Clin Rehabil 2004; 18(2):132–8.
- 427 6. Tracey R, Briggs L. Royal Commission into Aged Care Quality and Safety:
428 Interim report. Royal Commission into Aged Care Quality and Safety; 2019.
429 Available from: URL:
430 <https://agedcare.royalcommission.gov.au/publications/Pages/interim-report.aspx>.
- 431 7. Winkler DF, Farnworth LJ, Sloan SM, Brown T. Young people in aged care:
432 progress of the current national program. Aust Health Rev 2011; 35(3):320–6.
- 433 8. Royal Commission into Aged Care Quality and Safety. Final Report: Care,
434 Dignity and Respect. Commonwealth of Australia; 2021. Available from: URL:
435 <https://agedcare.royalcommission.gov.au/publications/final-report>.

- 1
2
3 436 9. Reppermund S, Heintze T, Srasuebkul P, Reeve R, Dean K, Smith M et al.
4
5 437 Health and wellbeing of people with intellectual disability in New South Wales,
6
7 438 Australia: a data linkage cohort. *BMJ Open* 2019; 9(9):e031624.
9
10 439 10. Gmatch: SAS macro. <http://bioinformaticstools.mayo.edu/research/gmatch/>;
11
12 440 2007.
13
14 441 11. Australian Institute of Health and Welfare. Pathways of younger people entering
15
16 442 permanent residential aged care. Canberra: AIHW; 2019 Cat. no. AGE 89.
17
18 443 Available from: URL: [https://www.gen-agedcaredata.gov.au/Resources/Reports-](https://www.gen-agedcaredata.gov.au/Resources/Reports-and-publications/2019/July/Pathways-of-younger-people-entering-permanent-resi.)
19
20 444 [and-publications/2019/July/Pathways-of-younger-people-entering-permanent-](https://www.gen-agedcaredata.gov.au/Resources/Reports-and-publications/2019/July/Pathways-of-younger-people-entering-permanent-resi.)
21
22 445 [resi.](https://www.gen-agedcaredata.gov.au/Resources/Reports-and-publications/2019/July/Pathways-of-younger-people-entering-permanent-resi.)
23
24
25 446 12. Australian Institute of Health and Welfare. Australian Burden of Disease Study:
26
27 447 Methods and supplementary material 2015; 2019. Available from: URL:
28
29 448 [https://www.aihw.gov.au/getmedia/a99468c5-4048-4ee9-972e-](https://www.aihw.gov.au/getmedia/a99468c5-4048-4ee9-972e-d76b9fb65a88/aihw-bod-23.pdf)
30
31 449 [d76b9fb65a88/aihw-bod-23.pdf](https://www.aihw.gov.au/getmedia/a99468c5-4048-4ee9-972e-d76b9fb65a88/aihw-bod-23.pdf).
32
33
34 450 13. Greenland S, Mansournia MA, Altman DG. Sparse data bias: A problem hiding in
35
36 451 plain sight. *BMJ* 2016; 352:i1981.
37
38
39 452 14. Westreich DJ, Greenland S. The Table 2 Fallacy: Presenting and Interpreting
40
41 453 Confounder and Modifier Coefficients. *American Journal of Epidemiology* 2013;
42
43 454 177(4):292–8.
44
45
46 455 15. Mak MK, Wong-Yu IS, Shen X, Chung CL. Long-term effects of exercise and
47
48 456 physical therapy in people with Parkinson disease. *Nat Rev Neurol* 2017;
49
50 457 13(11):689–703.
51
52
53 458 16. Hale LA, Mirfin-Veitch BF, Treharne GJ. Prevention of falls for adults with
54
55 459 intellectual disability (PROFAID): a feasibility study. *Disabil Rehabil* 2016;
56
57 460 38(1):36–44.
58
59
60

- 1
2
3 461 17. McKenzie K, Ouellette-Kuntz H, Martin L. Frailty as a Predictor of
4
5 462 Institutionalization Among Adults With Intellectual and Developmental
6
7 463 Disabilities. *Intellectual and Developmental Disabilities* 2016; 54(2):123–35.
8
9
10 464 18. Latt N, Dore G. Thiamine in the treatment of Wernicke encephalopathy in
11
12 465 patients with alcohol use disorders. *Intern Med J* 2014; 44(9):911–5.
13
14 466 19. Saposnik G, Cote R, Rochon PA, Mamdani M, Liu Y, Raptis S et al. Care and
15
16 467 outcomes in patients with ischemic stroke with and without preexisting dementia.
17
18 468 *Neurology* 2011; 77(18):1664.
19
20
21 469 20. Mizrahi E-H, Arad M, Adunsky A. Pre-stroke dementia does not affect the post-
22
23 470 acute care functional outcome of old patients with ischemic stroke. *Geriatr*
24
25 471 *Gerontol Int* 2016; 16(8):928–33.
26
27
28 472 21. Prime Minister of Australia. Response to Aged Care Royal Commission Interim
29
30 473 Report: Media Release; 2019. Available from: URL:
31
32 474 [https://www.pm.gov.au/media/response-aged-care-royal-commission-interim-](https://www.pm.gov.au/media/response-aged-care-royal-commission-interim-report)
33
34 475 [report](https://www.pm.gov.au/media/response-aged-care-royal-commission-interim-report).
35
36
37 476 22. Australian Government Department of Health. Australian Government response
38
39 477 to the final report of the Royal Commission into Aged Care Quality and Safety;
40
41 478 2021. Available from: URL:
42
43 479 [https://www.health.gov.au/sites/default/files/documents/2021/05/australian-](https://www.health.gov.au/sites/default/files/documents/2021/05/australian-government-response-to-the-final-report-of-the-royal-commission-into-aged-care-quality-and-safety.pdf)
44
45 480 [government-response-to-the-final-report-of-the-royal-commission-into-aged-](https://www.health.gov.au/sites/default/files/documents/2021/05/australian-government-response-to-the-final-report-of-the-royal-commission-into-aged-care-quality-and-safety.pdf)
46
47 481 [care-quality-and-safety.pdf](https://www.health.gov.au/sites/default/files/documents/2021/05/australian-government-response-to-the-final-report-of-the-royal-commission-into-aged-care-quality-and-safety.pdf).
48
49
50 482 23. Australian Government Department of Health. Transition Care Programme; 2022
51
52 483 [cited 18th May 2022]. Available from: URL: [https://www.health.gov.au/initiatives-](https://www.health.gov.au/initiatives-and-programs/transition-care-programme)
53
54 484 [and-programs/transition-care-programme](https://www.health.gov.au/initiatives-and-programs/transition-care-programme).
55
56
57
58
59
60

- 1
2
3 485 24. Australian Government Department of Health. Health Care Homes; 2021 [cited
4
5 486 18th May 2022]. Available from: URL:
6
7 487 10 488 homes">homes.
11
12 489 25. National Disability Insurance Agency. What is the NDIS?; 2021 [cited 18th May
13
14 490 2022]. Available from: URL: <https://www.ndis.gov.au/understanding/what-ndis>.
15
16
17 491 26. The Royal Australian & New Zealand College of Psychiatrists. General issues
18
19 492 around the implementation and performance of the NDIS Submission 21; 2020.
20
21 493 Available from: URL:
22
23 494 26 495 ability_Insurance_Scheme/GeneralIssues/Submissions">ability_Insurance_Scheme/GeneralIssues/Submissions.
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

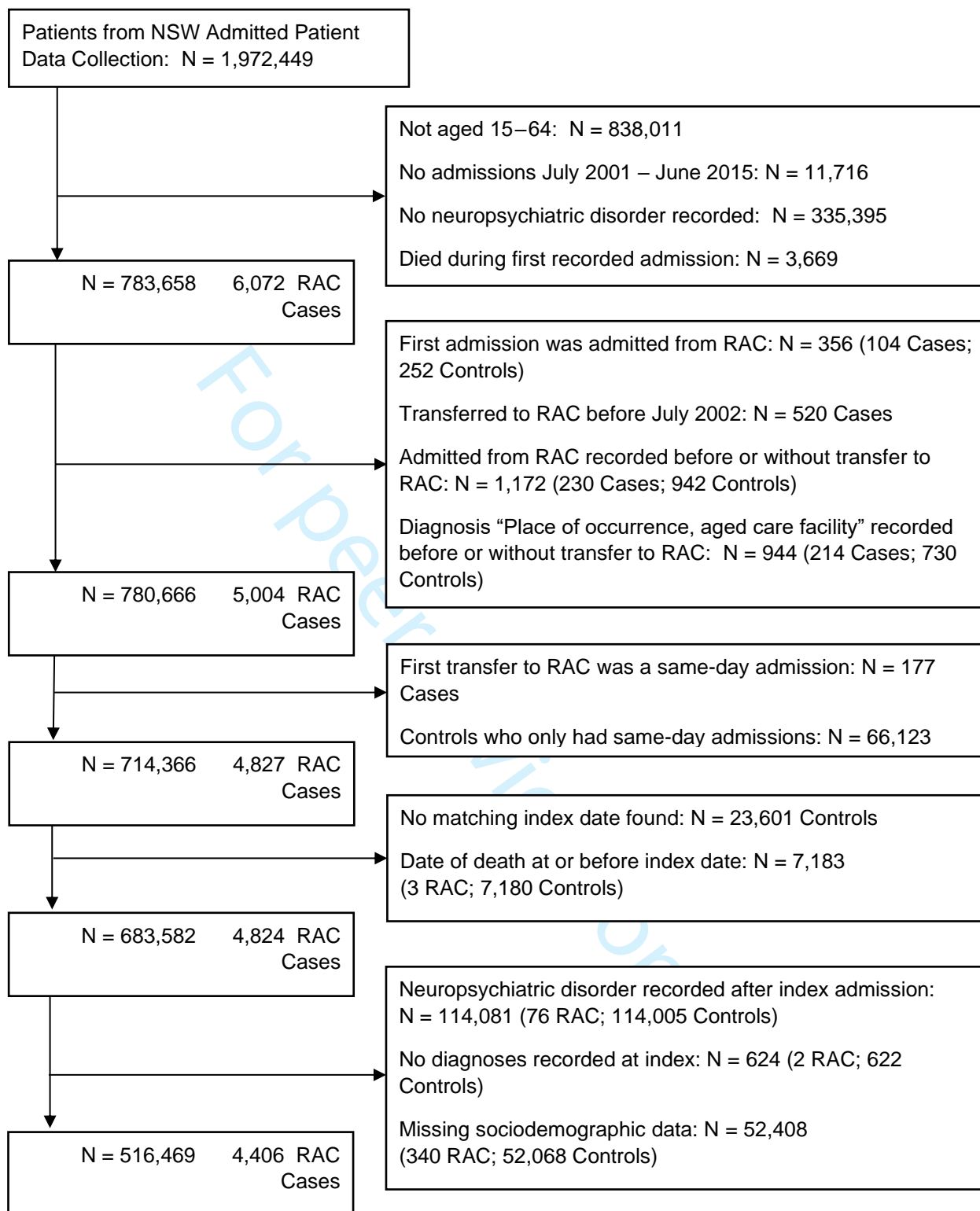


Figure 1. Selection of cases and controls. RAC= residential aged care.

Supplementary Tables

Supplementary Table A. Diagnostic categories

Collapsed diagnosis group	ICD-10 codes
Infections	A, B (not B18), G00-G07, J0-J2, J85, J86, Y95, Z22
Primary malignant cancers	C0-C6, C70-C76, C8-C9
Secondary malignant cancers	C77-C79
Other cancers	D0-D4
Blood disorders	D55-D59, D6-D9
Other endocrine, nutritional and metabolic diseases	D50-D53, E0, E12 (not E12.2), E15, E16, E2-E5 (not E51.2), E60, E61, E63-E68, E7, E8, E9
Diabetes	E10 (not E10.2), E11 (not E11.2), E13 (not E13.2), E14 (not E14.2), O24
Wernicke's encephalopathy	E51.2
Dementia	F00, F01, F02, F03, G30, G31.0, G31.3
Delirium	F05
Secondary mental disorders	F06, F07, F09
Alcohol, substance and other mental disorders	F04, F1, F38, F44, F45, F48, F5 (not F50), F6, F8 (not F84), F9
Schizophrenia	F2
Other common mental disorders	F30-F33, F34 (not F34.0), F39, F40-F43, F50
Autism spectrum disorders	F84
Huntington's disease	G10
Motor neurone disease	G12.2
Parkinson disease	G20
Multiple sclerosis	G35
Epilepsy	G40, G41
Other neurological conditions	G08, G09, G11, G12 (not G12.2), G13, G14, G2 (not G20), G3 (not G30, G31.0, G31.3, G35), G43, G44, G47, G5-G7, G81-G83, G9
Cerebral palsy	G80
Diseases of eyes and ears	H (not H0.00)
Coronary heart disease	I20-I25
Stroke	I6
Other circulatory system disorders	G45, G46, I0, I10, I11, I13, I15, I26-I28, I3, I4, I50-I52, I7, I8 (not I85), I9
Asthma	J45, J46
Chronic respiratory diseases	J40-J44, J47, J6, J7, J80-J84, J9
Upper respiratory diseases	J3 (not J34.0)
Dental caries	K02, K04
Other oral disorders	K00, K01, K03, K05-K09, K1
Chronic liver disease	B18, I85, K70-K76
Diseases of the digestive system	K2-K5, K6 (not K62.2, K62.3) K77, K8, K9
Skin disease	A46, B08, B86, H00.0, H60, J34.0, L0-L7, L8 (not L89), L90-L95, L98 (not L98.4), L99
Pressure injury and ulcers	L89, L97, L98.4
Musculoskeletal	M
Acute and chronic renal disease	E10.2, E11.2, E12.2, E13.2, E14.2, I12, N0 (not N00, N01), N1, N20-N28, N35, N36, N37, N39.1, N39.2, Q61

Supplementary Tables

1		
2		
3		
4	Other genitourinary diseases	D25, K62.2, K62.3, N30-N32, N34, "N39", N39.0, N39.3, N39.4, N4, N50, N6, N7, N8, N9, O94, R15, R32
5	Other symptoms and signs	R00, R02, R20-R23, R30, R31, R33-R39, R47-R49, R50-R55, R57-R65
6		
7	Neurological symptoms and signs	R25-R29, R40-R44, R56
8		
9	Gastrointestinal symptoms and signs	R10-R14, R16-R19
10		
11	Circulatory and respiratory symptoms and signs	R01, R03-R09
12		
13	Behavioural and emotional symptoms and signs	R45, R46
14		
15	Traumatic brain injury	"S02", S02.0, S02.1, S02.7, S02.9, S06
16	Spinal cord injury	"S14", S14.0, S14.1, S14.7, 'S24', S24.0, S24.1, S24.7, "S34", S34.0, S34.1, S34.7, T06.0, T06.1, T09.3
17		
18	Fractures	S02.2-S02.6, S02.8, S12, S22, S32, S42, S49, S52, S59.7, S62, S69, S72, S82, S92, T02, T08, T10, T12, T14.2
19		
20		S00, S01, S03-S05, S07, S08, S09, S10, S11, S13, S14.2-
21		S14.6, S15, S16, S17, S18, S19, S20, S21, S23, S24.2-S24.6,
22		S25, S26, S27, S28, S29, S30, S31, S33, S34.2-S34.6, S34.8,
23		S35-S41, S43-S48, S50, S51, S53-S58, "S59", S59.7, S59.8,
24		S59.9, S60, S61, S63-S68, S69.8, S69.9, S70, S71, S73-S78,
25	Other injuries	S80, S81, S83-S91, S93-S99, T00, T01, T03-T05, T06.2-T06.8, T07, "T09", T09.0-T09.2, T09.4-T09.9, T11, T13, "T14", T14.0, T14.1, T14.3-T14.9, T15-T19, T2, T3, T4, T5, T6, T70-T74, T75 (not T75.1), T79, T80, T81, T88, T89, V (not V90, V92), W2-W6, W70, W73-W79, W8, W9, X0-X5, X85-X89, X9, Y0, Y35, Y36, Y4-Y7, Y80-Y86, Y87 (not 87.0), Y88, Y89
26		
27		
28		
29		
30		
31	Falls	W0, W1
32	Intentional self-harm	X6, X7, X80-X84, Y87.0
33	Rehabilitation, convalescence and respite	Z50, Z54, Z75.5
34		
35	Housing and living situation	Z59-Z65
36	Palliative care	Z51.5
37		
38	Mobility and personal care	Z74, Z75.0, "Z99", Z99.3, Z99.8, Z99.9
39		
40	Other Z codes	Y93, Y96, Y98, Z00-Z07, Z11-Z13, Z20, Z21, Z28, Z29, Z4, "Z51", Z51.0-Z51.4, Z51.6, Z51.81, Z51.88, Z51.9, Z52, Z53, Z55-Z59, Z71-Z73, "Z75", Z75.1-Z75.4, Z75.8, Z75.9, Z76, Z8, Z90, Z91 (not Z91.7), Z92-Z98, Z99.0-Z99.2
41		
42		
43		
44		
45		
46		
47		
48		
49		
50		
51		
52		
53		
54		
55		
56		
57		
58		
59		
60		

Supplementary Tables

Supplementary Table B. Diagnostic predictors of transfer from hospital to RAC on discharge using diagnoses recorded during hospital admissions in the 365 days prior to the index admission

Diagnosis variable	Cases ^a n=4,406	Controls ^b n=512,063	Unadjusted Odds ratio (95%CI)	Partially adjusted Odds ratio ^d (95% CI)	Full model Odds ratio ^c (95% CI)
Huntington disease	87 (2.0%)	187 (0.0%)	55.14 (42.68–71.23)	30.84 (22.81–41.67)	33.41 (23.56–47.37)
Dementia	621 (14.1%)	1,131 (0.2%)	74.12 (66.87–82.16)	18.26 (16.28–20.56)	13.39 (11.66–15.37)
Multiple sclerosis	199 (4.5%)	3,067 (0.6%)	7.85 (6.78–9.09)	7.67 (6.52–9.04)	6.71 (5.54–8.12)
Wernicke's encephalopathy	70 (1.6%)	239 (0.0%)	34.57 (26.44–45.20)	7.81 (5.73–10.65)	5.91 (4.14–8.42)
Need for palliative care	471 (10.7%)	2,567 (0.5%)	23.76 (21.43–26.34)	7.53 (6.72–8.44)	4.99 (4.24–5.87)
Motor neurone disease	58 (1.3%)	562 (0.1%)	12.14 (9.25–15.94)	6.53 (4.86–8.79)	4.74 (3.34–6.71)
Parkinson's disease	149 (3.4%)	1,255 (0.2%)	14.25 (11.99–16.93)	5.33 (4.39–6.46)	4.57 (3.61–5.77)
Intellectual disability	700 (15.9%)	17,257 (3.4%)	5.42 (4.99–5.88)	3.89 (3.52–4.30)	3.51 (3.12–3.95)
Stroke	1,063 (24.1%)	14,373 (2.8%)	11.01 (10.26–11.82)	3.65 (3.38–3.96)	2.86 (2.57–3.18)
Problems with mobility and personal care	1,063 (24.1%)	5,308 (1.0%)	30.36 (28.19–32.69)	7.99 (7.33–8.71)	2.73 (2.47–3.01)
Other genitourinary diseases	2,195 (49.8%)	41,614 (8.1%)	11.22 (10.57–11.92)	5.48 (5.13–5.87)	2.35 (2.17–2.55)
Cerebral palsy	90 (2.0%)	2,182 (0.4%)	4.87 (3.94–6.03)	5.89 (4.62–7.52)	2.32 (1.77–3.05)
Pressure injury and ulcers	1,007 (22.9%)	6,728 (1.3%)	22.25 (20.66–23.97)	4.32 (3.96–4.72)	2.17 (1.96–2.41)
Falls	1,165 (26.4%)	25,109 (4.9%)	6.97 (6.51–7.46)	2.77 (2.57–2.99)	1.70 (1.52–1.89)
Epilepsy	508 (11.5%)	15,652 (3.1%)	4.13 (3.76–4.54)	3.31 (2.98–3.68)	1.64 (1.45–1.86)
Neurological symptoms and signs	1,837 (41.7%)	36,962 (7.2%)	9.19 (8.65–9.77)	4.06 (3.80–4.34)	1.62 (1.49–1.76)

Supplementary Tables

1						
2						
3						
4	Primary malignant cancers	711 (16.1%)	18,282 (3.6%)	5.20 (4.79–5.64)	2.16 (1.98–2.36)	1.57 (1.35–1.82)
5	Secondary mental disorders	228 (5.2%)	2,285 (0.4%)	12.17 (10.59–14.00)	3.31 (2.79–3.92)	1.45 (1.20–1.76)
6						
7	Other factors influencing health status					
8	and contact with health services	3,608 (81.9%)	270,761 (52.9%)	4.03 (3.73–4.35)	1.91 (1.76–2.07)	1.40 (1.28–1.54)
9						
10	Chronic liver disease	539 (12.2%)	16,403 (3.2%)	4.21 (3.84–4.62)	1.84 (1.67–2.04)	1.38 (1.22–1.56)
11	Infections	2,550 (57.9%)	83,614 (16.3%)	7.04 (6.63–7.48)	2.95 (2.76–3.15)	1.37 (1.26–1.50)
12						
13	Delirium	417 (9.5%)	4,707 (0.9%)	11.27 (10.15–12.51)	3.14 (2.79–3.54)	1.32 (1.15–1.53)
14						
15	Gastrointestinal symptoms and signs	1,368 (31.0%)	44,335 (8.7%)	4.75 (4.45–5.07)	2.73 (2.54–2.93)	1.32 (1.21–1.44)
16						
17	Chronic respiratory diseases	1,179 (26.8%)	26,339 (5.1%)	6.74 (6.30–7.21)	1.87 (1.74–2.02)	1.31 (1.19–1.43)
18	Other neurological conditions	2,203 (50.0%)	148,120 (28.9%)	2.46 (2.32–2.61)	2.21 (2.07–2.36)	1.30 (1.20–1.42)
19						
20	Other endocrine, nutritional and					
21	metabolic diseases	2,463 (55.9%)	84,603 (16.5%)	6.40 (6.03–6.80)	2.19 (2.06–2.34)	1.24 (1.14–1.35)
22						
23	Problems related to housing,					
24	economic and social situation	995 (22.6%)	57,548 (11.2%)	2.30 (2.15–2.47)	1.47 (1.36–1.59)	1.23 (1.12–1.35)
25						
26	Behavioural and emotional symptoms					
27	and signs	502 (11.4%)	23,666 (4.6%)	2.65 (2.42–2.91)	1.83 (1.64–2.04)	1.22 (1.07–1.39)
28						
29	Dental caries	92 (2.1%)	3,123 (0.6%)	3.48 (2.82–4.29)	1.60 (1.25–2.06)	1.20 (0.91–1.59)
30						
31	Diabetes	983 (22.3%)	35,856 (7.0%)	3.81 (3.55–4.10)	1.37 (1.26–1.48)	1.20 (1.09–1.31)
32						
33	Other symptoms and signs	2,153 (48.9%)	73,456 (14.3%)	5.71 (5.38–6.06)	2.71 (2.53–2.89)	1.13 (1.04–1.23)
34						
35	Traumatic brain injury	215 (4.9%)	12,094 (2.4%)	2.12 (1.85–2.44)	1.57 (1.34–1.84)	1.13 (0.94–1.36)
36						
37	Alcohol, substance and other mental					
38	disorders	1,457 (33.1%)	153,056 (29.9%)	1.16 (1.09–1.23)	1.06 (0.99–1.14)	1.07 (0.98–1.17)
39						
40	Skin disease	981 (22.3%)	28,613 (5.6%)	4.84 (4.50–5.20)	1.83 (1.68–1.99)	1.07 (0.97–1.17)
41						
42	Diseases of eyes and ears	761 (17.3%)	20,568 (4.0%)	4.99 (4.61–5.40)	1.85 (1.69–2.02)	1.06 (0.96–1.18)
43						
44						
45						
46						

Supplementary Tables

Other injuries	2,332 (52.9%)	134,307 (26.2%)	3.16 (2.98–3.36)	1.80 (1.69–1.92)	1.02 (0.93–1.10)
Diseases of the digestive system	1,778 (40.4%)	83,648 (16.3%)	3.47 (3.26–3.68)	1.59 (1.49–1.70)	0.99 (0.92–1.07)
Secondary malignant cancers	350 (7.9%)	6,874 (1.3%)	6.34 (5.67–7.09)	2.61 (2.32–2.94)	0.98 (0.81–1.19)
Fractures	612 (13.9%)	28,682 (5.6%)	2.72 (2.49–2.96)	1.48 (1.35–1.63)	0.97 (0.85–1.10)
Other circulatory system disorders	2,323 (52.7%)	88,989 (17.4%)	5.30 (5.00–5.63)	1.57 (1.47–1.68)	0.95 (0.87–1.03)
Circulatory and respiratory symptoms and signs	610 (13.8%)	33,924 (6.6%)	2.26 (2.08–2.47)	1.16 (1.06–1.27)	0.92 (0.83–1.03)
Other common mental disorders	1,099 (24.9%)	136,978 (26.8%)	0.91 (0.85–0.97)	0.85 (0.79–0.92)	0.92 (0.84–1.00)
Schizophrenia	464 (10.5%)	34,839 (6.8%)	1.61 (1.46–1.78)	0.41 (0.36–0.46)	0.90 (0.79–1.03)
Other oral disorders	166 (3.8%)	6,828 (1.3%)	2.90 (2.48–3.39)	1.40 (1.17–1.69)	0.87 (0.71–1.06)
Rehabilitation, convalescence and respite	1,484 (33.7%)	22,958 (4.5%)	10.82 (10.15–11.53)	2.38 (2.20–2.58)	0.85 (0.77–0.94)
Acute and chronic renal disease	744 (16.9%)	20,147 (3.9%)	4.96 (4.58–5.37)	1.39 (1.27–1.52)	0.85 (0.76–0.95)
Musculoskeletal	1,861 (42.2%)	105,794 (20.7%)	2.81 (2.64–2.98)	1.48 (1.38–1.58)	0.85 (0.77–0.92)
Asthma	107 (2.4%)	10,767 (2.1%)	1.16 (0.96–1.41)	0.81 (0.66–1.00)	0.84 (0.67–1.05)
Other cancers	203 (4.6%)	15,683 (3.1%)	1.53 (1.33–1.76)	0.92 (0.79–1.07)	0.75 (0.63–0.89)
Blood disorders	827 (18.8%)	20,929 (4.1%)	5.42 (5.02–5.86)	1.58 (1.44–1.72)	0.73 (0.65–0.81)
Coronary heart disease	326 (7.4%)	18,079 (3.5%)	2.18 (1.95–2.45)	0.69 (0.61–0.77)	0.62 (0.54–0.71)
Intentional self-harm	93 (2.1%)	29,150 (5.7%)	0.36 (0.29–0.44)	0.45 (0.36–0.56)	0.59 (0.46–0.75)
Upper respiratory diseases	65 (1.5%)	12,798 (2.5%)	0.58 (0.46–0.75)	0.73 (0.56–0.95)	0.56 (0.42–0.76)
Spinal cord injury	25 (0.6%)	775 (0.2%)	3.76 (2.53–5.61)	0.32 (0.20–0.51)	0.29 (0.18–0.47)

Reporting checklist for cohort study.

Based on the STROBE cohort guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the STROBE cohort reporting guidelines, and cite them as:

von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening of Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies.

			Page Number
Title and abstract			
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	3
Introduction			
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	6
Objectives	#3	State specific objectives, including any prespecified hypotheses	7
Methods			
Study design	#4	Present key elements of study design early in the paper	7
Setting	#5	Describe the setting, locations, and relevant dates, including periods	7

		of recruitment, exposure, follow-up, and data collection	
1			
2	Eligibility criteria	#6a Give the eligibility criteria, and the sources and methods of selection	7
3		of participants. Describe methods of follow-up.	
4			
5	Eligibility criteria	#6b For matched studies, give matching criteria and number of exposed	8
6		and unexposed	
7			
8	Variables	#7 Clearly define all outcomes, exposures, predictors, potential	9
9		confounders, and effect modifiers. Give diagnostic criteria, if	
10		applicable	
11			
12	Data sources /	#8 For each variable of interest give sources of data and details of	9
13	measurement	methods of assessment (measurement). Describe comparability of	
14		assessment methods if there is more than one group. Give information	
15		separately for for exposed and unexposed groups if applicable.	
16			
17	Bias	#9 Describe any efforts to address potential sources of bias	10
18			
19	Study size	#10 Explain how the study size was arrived at	7
20			
21	Quantitative	#11 Explain how quantitative variables were handled in the analyses. If	10
22	variables	applicable, describe which groupings were chosen, and why	
23			
24	Statistical	#12a Describe all statistical methods, including those used to control for	
25	methods	confounding	
26			
27	10		
28	Statistical	#12b Describe any methods used to examine subgroups and interactions	10
29	methods		
30			
31	Statistical	#12c Explain how missing data were addressed	9
32	methods		
33			
34	Statistical	#12d If applicable, explain how loss to follow-up was addressed	N/A
35	methods		
36			
37	Statistical	#12e Describe any sensitivity analyses	
38	methods		
39			
40	10		
41	Results		
42			
43	Participants	#13a Report numbers of individuals at each stage of study—eg numbers	11
44		potentially eligible, examined for eligibility, confirmed eligible,	
45			
46			

included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.

1				
2				
3				
4				
5	Participants	#13b	Give reasons for non-participation at each stage	11
6				
7	Participants	#13c	Consider use of a flow diagram	
8				
9				
10	11			
11				
12	Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	12
13				
14				
15				
16				
17				
18				
19	Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	
20				
21				
22				
23	N/A			
24				
25	Descriptive data	#14c	Summarise follow-up time (eg, average and total amount)	
26				
27				
28	7			
29				
30	Outcome data	#15	Report numbers of outcome events or summary measures over time. Give information separately for exposed and unexposed groups if applicable.	
31				
32				
33				
34				
35	12			
36				
37	Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	15
38				
39				
40				
41				
42				
43				
44	Main results	#16b	Report category boundaries when continuous variables were categorized	N/A
45				
46				
47				
48	Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
49				
50				
51				
52	N/A			
53				
54	Other analyses	#17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	14
55				
56				
57				
58	Discussion			
59				
60				

1	Key results	#18	Summarise key results with reference to study objectives	21
2				
3	Limitations	#19	Discuss limitations of the study, taking into account sources of	24
4			potential bias or imprecision. Discuss both direction and magnitude of	
5			any potential bias.	
6				
7				
8	Interpretation	#20	Give a cautious overall interpretation considering objectives,	24
9			limitations, multiplicity of analyses, results from similar studies, and	
10			other relevant evidence.	
11				
12				
13	Generalisability	#21	Discuss the generalisability (external validity) of the study results	24
14				
15				
16	Other			
17	Information			
18				
19				
20	Funding	#22	Give the source of funding and the role of the funders for the present	25
21			study and, if applicable, for the original study on which the present	
22			article is based	
23				
24				

The STROBE checklist is distributed under the terms of the Creative Commons Attribution License CC-BY.

This checklist was completed on 22. June 2022 using <https://www.goodreports.org/>, a tool made by the

[EQUATOR Network](#) in collaboration with [Penelope.ai](#)

BMJ Open

Factors associated with discharge from hospital to residential aged care for younger people with neuropsychiatric disorders: An exploratory case-control study in New South Wales, Australia

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2022-065982.R1
Article Type:	Original research
Date Submitted by the Author:	27-Sep-2022
Complete List of Authors:	Cvejic, Rachael; UNSW Sydney, Department of Developmental Disability Neuropsychiatry Watkins, Tim; UNSW Sydney, Department of Developmental Disability Neuropsychiatry Walker, Adrian; UNSW Sydney, Department of Developmental Disability Neuropsychiatry Reppermund, Simone; UNSW Sydney, Department of Developmental Disability Neuropsychiatry; UNSW Sydney, Centre for Healthy Brain Ageing Srasuebkul, Preeyaporn; UNSW Sydney, Department of Developmental Disability Neuropsychiatry Draper, Brian; Prince of Wales Hospital, Eastern Suburbs Older Persons Mental Health Service Withall, Adrienne; UNSW Sydney, School of Population Health Winkler, Di; Summer Foundation; La Trobe University, Living with Disability Research Centre Honan, Ingrid; Cerebral Palsy Alliance Mackechnie, Deidre; MS Australia Trollor, Julian; University of New South Wales, Department of Developmental Disability Neuropsychiatry; UNSW Sydney, Centre for Healthy Brain Ageing
Primary Subject Heading:	Epidemiology
Secondary Subject Heading:	Rehabilitation medicine
Keywords:	NEUROLOGY, PSYCHIATRY, EPIDEMIOLOGY

SCHOLARONE™
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

1
2
3 **1 Factors associated with discharge from hospital to residential aged**
4
5
6 **2 care for younger people with neuropsychiatric disorders: An**
7
8 **3 exploratory case-control study in New South Wales, Australia**
9
10

11
12
13
14 5 Rachael C Cvejic^{1*}, Tim R Watkins^{1*}, Adrian R Walker¹, Simone Reppermund^{1, 2},
15
16 6 Preeyaporn Srasuebku¹, Brian Draper^{2, 3}, Adrienne Withall⁴, Di Winkler^{5, 6}, Ingrid
17
18 7 Honan⁷, Deidre Mackechnie⁸, Julian N Trollor^{1, 2}
19
20
21
22
23
24

25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
8 * Joint first author

11 ¹ The Department of Developmental Disability Neuropsychiatry, Discipline of
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
¹ The Department of Developmental Disability Neuropsychiatry, Discipline of
Psychiatry and Mental Health, School of Clinical Medicine, Faculty of Medicine and
Health, UNSW Sydney, Australia

² Centre for Healthy Brain Ageing, Discipline of Psychiatry & Mental Health, School
of Clinical Medicine, Faculty of Medicine and Health, UNSW Sydney, Australia

³ Eastern Suburbs Older Persons Mental Health Service, Prince of Wales Hospital,
Randwick, Australia

⁴ School of Population Health, Faculty of Medicine and Health, UNSW Sydney,
Australia

⁵ Summer Foundation, Box Hill, Victoria, Australia

⁶ Living with Disability Research Centre, La Trobe University, Melbourne, Victoria,
Australia

⁷ Cerebral Palsy Alliance, Allambie Heights, New South Wales, Australia

⁸ MS Australia, North Sydney, New South Wales, Australia

1
2
3 26 Corresponding Author: Professor Julian Trollor
4

5 27 Email: J.Trollor@unsw.edu.au,
6

7 28 Phone: +61 (2) 9065 8076
8
9

10 29 Address: The Department of Developmental Disability Neuropsychiatry, School of
11

12 30 Psychiatry, UNSW Sydney, NSW 2052, Australia
13
14
15 31

16
17 32 **Word count:** 3,120
18
19 33

20
21 34 **Key words:** Neurology; Psychiatry; Epidemiology
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 **35 Abstract**
4

5 **36 Objectives:** To examine the sociodemographic and diagnostic factors associated
6
7
8 **37** with a discharge from hospital to residential aged care (RAC) for younger people
9
10 **38** (aged 15–64 years) with neuropsychiatric disorders.
11

12 **39**
13
14 **40 Design:** An exploratory case-control study using a historic cohort of people with
15
16
17 **41** neuropsychiatric disorders. Cases were people transferred to RAC on hospital
18
19 **42** discharge during the study period. Controls were people not transferred to RAC on
20
21 **43** discharge during the study period.
22

23 **44**
24
25
26 **45 Setting:** Public and private hospital admissions in New South Wales (NSW),
27
28 **46** Australia.
29

30 **47**
31
32
33 **48 Participants:** People aged 15–64 years with a neuropsychiatric disorder hospitalised
34
35 **49** in NSW between July 2002 and June 2015 (n=516,469).
36

37 **50**
38
39
40 **51 Outcome measures:** The main outcome was transfer to RAC on discharge from
41
42 **52** hospital. We calculated odds ratios for sociodemographic and diagnostic factors to
43
44 **53** determine factors that may impact discharge to RAC.
45

46 **54**
47
48
49 **55 Results:** During the period of data capture, 4,406 people were discharged from
50
51 **56** hospitals to RAC. Discharge to RAC was most strongly associated with diagnoses of
52
53 **57** progressive neurological and cognitive disorders. Acute precipitants of RAC transfer
54
55 **58** included a broad range of conditions and injuries (e.g. Wernicke's encephalopathy,
56
57 **59** stroke, falls) in the context of issues such as older age, not being partnered (married
58
59
60

1
2
3 60 or de facto), living in areas of lower socioeconomic status, functional issues, and the
4
5 61 need for palliative care.
6
7
8 62

9
10 63 *Conclusions:* There are multiple intersecting and interacting pathways culminating in
11
12 64 discharge from hospital to RAC among younger people with neuropsychiatric
13
14 65 disorders. Improved capacity for interdisciplinary home care and alternative housing
15
16
17 66 and support options for people with high support needs are required.
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

67 **Article Summary**

68 Strengths and limitations

- 69 • This study utilises a large, linked dataset that includes information from all
70 hospital admissions in NSW, Australia, for people with recorded diagnoses of
71 neuropsychiatric disorders over a period of 14 years.
- 72 • The study was completed in consultation with an advisory group comprising
73 people with lived experience of being, or supporting, a younger person in
74 RAC.
- 75 • The cohort included all people hospitalised with a recorded neuropsychiatric
76 diagnosis; other related diagnoses (e.g., traumatic brain injury, stroke) were
77 not used to derive the cohort and as such only a subpopulation of younger
78 people discharged to RAC were included.
- 79 • We used a lookback period and excluded persons with any indication of
80 previous placement in RAC but we could not confirm that index admissions for
81 cases reflected the first ever transfer to RAC.
- 82 • Some information relevant to the risk of transfer to RAC was not available in
83 the datasets used, including the reasons for placement in RAC, time since
84 diagnoses were first made, and information about functional abilities and
85 availability of informal care.

86 Introduction

87 Residential aged care (RAC) facilities in Australia provide accommodation and
88 personal care (including access to nursing and health services) to older adults who
89 are not able to continue living within their own homes. Although most people living in
90 RAC in Australia are over 65 years of age, people aged under 65 years (hereafter
91 “younger people”) may also be placed in RAC, largely due to a lack of access to age-
92 appropriate community-based accommodation and supports.(1) Over 3,400 younger
93 people were living in RAC in Australia as of 31 December 2021, with over 600 new
94 RAC placements in this age group occurring in the preceding year.(2) Younger
95 people living in RAC typically have high clinical needs and experience activity
96 limitations as a result of disability, e.g. due to intellectual and developmental
97 disability, physical disability (e.g. paraplegia), acquired brain injury, and progressive
98 neurological disorders (e.g. dementia, multiple sclerosis and Huntington disease).(3)
99 It is known that younger people living in RAC experience a range of negative
100 outcomes, including a lack of appropriate recreational activities and medical and
101 rehabilitation services, loss of function, and experiences of grief, hopelessness, and
102 neglect.(3–9) Further, many RAC facilities are not equipped to adequately meet the
103 specific and complex health and rehabilitation needs of younger people with
104 disability.(4, 10)

105
106 The placement of younger people into RAC in Australia has previously been targeted
107 through the Younger People with Disability in Residential Aged Care Initiative.
108 However, a review showed that this was unlikely to result in a sustainable reduction
109 in younger people entering RAC.(11) The prevention of the placement of younger
110 people into RAC has since been identified as an area for immediate action by the

1
2
3 111 Australian Royal Commission into Aged Care Quality and Safety;(6, 12) in particular,
4
5 112 stopping the “pipeline” from hospital to RAC. Using a large, linked dataset of younger
6
7 113 people with neuropsychiatric disorders admitted to hospital in New South Wales
8
9 114 (NSW), Australia, this study aims to identify sociodemographic and diagnostic factors
10
11 115 that may be associated with a transfer to RAC upon discharge from hospital.
12
13 116 Identification of these factors will inform the development of strategies to prevent or
14
15 117 delay the transfer of younger people from hospital to RAC.
16
17
18
19
20
21

22

119 **Methods**

120 *Study design and data sources*

23
24
25 121 This exploratory case-control study used data from a large linkage study of people
26
27 122 with neuropsychiatric disorders, including mental health disorders, neurological
28
29 123 disorders, and intellectual and developmental disabilities.(13) The primary dataset
30
31 124 used in the current study was the NSW Admitted Patient Data Collection (1 July
32
33 125 2001-30 June 2015), which contains information recorded during all admissions to
34
35 126 NSW hospitals and psychiatric facilities. This includes admission/discharge dates
36
37 127 and up to 51 diagnoses (coded according to the International Statistical
38
39 128 Classification of Diseases and Related Health Problems; 10th revision, Australian
40
41 129 modification (ICD-10-AM)) for each episode.
42
43
44
45
46
47
48

49

131 *Study population*

50
51 132 We defined our study population as people aged 15–64 years with a
52
53 133 neuropsychiatric disorder who were admitted to a hospital in NSW between 1 July
54
55 134 2001 and 30 June 2015. Neuropsychiatric disorders were determined by any of the
56
57 135 following: i) diagnosis of intellectual disability recorded in any dataset from the
58
59
60

1
2
3 136 broader linkage study previously described,(13); ii) ICD-10-AM diagnoses of mental
4
5 137 and behavioural disorders ('F00-F99', 'S06'), disorders of the nervous system ('G00-
6
7 138 G99'), or intellectual and developmental disability ('P04.3', 'Q86.0', 'Q87.0', 'Q87.1',
8
9
10 139 'Q87.2', 'Q87.3', 'Q87.5', 'Q87.8', 'Q89.8', 'Q90', 'Q91', 'Q93', 'Q99.2') recorded
11
12 140 during a hospital admission; iii) an admission to a psychiatric unit, indicated where
13
14 141 unit type on admission was one of 'Psychiatric Acute', 'Psychiatric Rehabilitation',
15
16 142 'Psychiatric Secure', 'Brain Injury Rehabilitation', 'Psychiatric Intensive Care', 'Post
17
18 143 Natal Depression', 'Psychiatric Extended Care', 'Neuro-Psychiatry', 'Psychiatric
19
20 144 Medium Secure', 'Psychiatric Emergency', or where days in a psychiatric unit were
21
22
23
24 145 >0.
25

146

26
27
28 147 Cases were people transferred to RAC on discharge from hospital during the study
29
30 148 (i.e., mode of hospital separation was 'Transfer to Nursing Home'). Controls were
31
32 149 people with hospital admissions but no recorded transfers to RAC. The index
33
34 150 admission for cases was defined as the date of the first transfer to RAC from hospital
35
36 151 occurring in the study period. To obtain a similar distribution of control index
37
38 152 admission dates across the study period to that of the cases, index admissions for
39
40 153 controls were randomly selected by matching eligible control hospital discharge
41
42 154 dates to case index dates using the SAS macro 'gmatch' greedy matching
43
44 155 algorithm.(14)
45
46
47
48

156

49
50
51 157 Individuals were excluded if they died at their index hospital admission (i.e., mode of
52
53 158 separation of their index admission was 'Death with Autopsy' or 'Death without
54
55 159 Autopsy'). To minimise the chance of previous transfer to RAC, individuals were
56
57
58 160 excluded if: they were transferred to RAC on discharge from hospital before 1 July
59
60

1
2
3 161 2002; the source of referral was 'Nursing Home/RAC' at or before the index
4
5 162 admission; the diagnosis "Place of occurrence, aged care facility" was recorded at or
6
7 163 before the index admission. Individuals were also excluded if the index admission
8
9 164 was a same-day admission or if diagnostic or sociodemographic data were missing.
10
11
12
13
14

15 166 *Sociodemographic and other non-diagnosis variables*

16
17 167 Sex, Aboriginal and/or Torres Strait Islander status, country of birth (Australia or
18
19 168 overseas), Index of Relative Socioeconomic Disadvantage (IRSD) quintiles,
20
21 169 remoteness of area of residence categories and date of death were obtained from
22
23 170 multiple datasets as previously described.(13) Marital Status was sourced from the
24
25 171 Admitted Patient Data Collection at the index admission and, if missing, we used
26
27 172 Last Observation Carried Forward if recorded in a previous admission. Age at the
28
29 173 index admission was analysed using five-year age groups to allow for a non-linear
30
31 174 association with the outcome. We also calculated the year of the index date, and the
32
33 175 total admission length of stay (days) over all admissions within a lookback period of
34
35 176 365 days prior to the index date.
36
37
38
39
40
41
42

43 178 *Diagnosis group variables*

44
45 179 We extracted all ICD-10-AM diagnosis codes recorded during the index admission
46
47 180 and collapsed these into broad but meaningful groupings. We initially grouped
48
49 181 diagnoses based on two previous reports.(15, 16) Conditions that were deemed
50
51 182 unlikely to affect the chance of RAC transfer (e.g., those relating to pregnancy and
52
53 183 birth) were excluded. To avoid sparse data bias,(17) diagnosis groups with less than
54
55 184 20 cases were also removed. This process resulted in 224 diagnostic groupings.
56
57
58
59
60

1
2
3 185 Following this, the groupings were further collapsed into 57 general diagnostic
4
5 186 categories (see Supplementary Table A).
6
7
8 187

9
10 188 *Statistical analysis*

11
12 189 We used logistic regression models to estimate the effect of sociodemographic and
13
14 190 diagnostic factors on transfer to RAC. For sociodemographic factors we report both
15
16 191 the unadjusted effects and full model results, as while the individual models do not
17
18 192 adjust for confounding factors, adjusting for mediators in the full model would
19
20 193 potentially bias the estimates.(18) Likewise, it is likely that some diagnosis groups
21
22 194 share overlapping causal pathways and, hence, odds ratio estimates from our full
23
24 195 logistic model might be affected by overadjustment bias.(17) For diagnostic factors,
25
26 196 estimates were also produced using a separate logistic model for each diagnosis
27
28 197 group that adjusted for sociodemographic/non-diagnosis variables only. While this
29
30 198 approach does not adjust for confounding by other diagnostic variables, it is less
31
32 199 likely to exhibit overadjustment bias.
33
34
35
36
37
38
39

40 201 *Supplementary analyses utilising the lookback period*

41
42 202 The above analyses utilise data solely from the index admission and so only include
43
44 203 diagnostic factors recorded at the time of discharge to RAC (i.e., the acute
45
46 204 precipitants of transfer to RAC on discharge from hospital). To determine whether
47
48 205 inclusion of diagnoses recorded in the 365 days preceding the index admission
49
50 206 impacted the effect estimates of variables that may be associated with transfer to
51
52 207 RAC, we repeated the above analyses using all diagnoses received at hospital
53
54 208 admissions occurring during the look-back period. Results of these analyses are
55
56 209 presented in Supplementary Table B.
57
58
59
60

1
2
3 210
4

5 211 Analyses were conducted using SAS 9.4 (SAS Institute) and Stata 15.1 (StataCorp).
6
7

8 212
9

10 213 *Patient and Public Involvement: Consultation with Lived Experience Advisory Group*
11

12 214 We established an advisory group comprising nine people with lived experience of
13
14 215 being, or supporting, a younger person living in RAC and consulted with them about
15
16 216 the aims, methods, and findings of the research.
17
18

19 217
20

21 218 *Ethics approval*
22

23
24 219 This study was approved by the NSW Population & Health Services Research Ethics
25
26 220 Committee (CINSW 2013/02/445, AU RED reference: HREC/13/CIPHS/7, substudy
27
28 221 number 2019UMB0601). Ethics approval included a waiver of consent.
29
30

31 222
32

33 223 **Results**

34 224 *Cohort characteristics*
35

36 225 Details of the selection process for cases and controls are shown in Figure 1.
37
38

39 226 Sociodemographic characteristics are provided in Table 1.
40
41

42 227
43

44 228 [Figure 1 about here]
45

46 229
47

48 230 LEGEND: Figure 1. Selection of cases and controls.
49
50
51
52
53
54
55
56
57
58
59
60

231 Table 1. Sociodemographic characteristics of cohort

Variable	Cases (n=4,406)	Controls (n=512,063)	p (X ²)
Sex			< 0.001
Male	2,586 (58.7%)	271,636 (53.0%)	
Female	1,820 (41.3%)	240,427 (47.0%)	
Age (grouped)			< 0.001
15-19	18 (0.4%)	37,345 (7.3%)	
20-24	29 (0.7%)	41,765 (8.2%)	
25-29	47 (1.1%)	45,252 (8.8%)	
30-34	63 (1.4%)	52,919 (10.3%)	
35-39	100 (2.3%)	54,086 (10.6%)	
40-44	203 (4.6%)	54,187 (10.6%)	
45-49	359 (8.1%)	53,575 (10.5%)	
50-55	678 (15.4%)	55,677 (10.9%)	
55-59	1,250 (28.4%)	59,401 (11.6%)	
60-64	1,659 (37.7%)	57,856 (11.3%)	
Remoteness of area of residence			0.001
Major Cities	3,180 (72.2%)	361,626 (70.6%)	
Inner Regional	932 (21.2%)	110,864 (21.7%)	
Outer Regional	281 (6.4%)	35,747 (7.0%)	
Remote	13 (0.3%)	3,826 (0.7%)	
Index of Relative Socioeconomic Disadvantage			< 0.001
1 (Most disadvantaged)	1,068 (24.2%)	111,963 (21.9%)	
2	912 (20.7%)	99,973 (19.5%)	
3	958 (21.7%)	102,797 (20.1%)	
4	818 (18.6%)	91,313 (17.8%)	
5 (Least disadvantaged)	650 (14.8%)	106,017 (20.7%)	
Marital status			< 0.001
Married or de facto	1,295 (29.4%)	245,387 (47.9%)	
Never married	1,779 (40.4%)	201,768 (39.4%)	
Widowed	277 (6.3%)	9,155 (1.8%)	
Separated or divorced	1,055 (23.9%)	55,753 (10.9%)	
Born in Australia			0.021
Yes	3,457 (78.5%)	408,941 (79.9%)	
No	949 (21.5%)	103,122 (20.1%)	
Year of index admission, median (IQR)	2009 (2006-2012)	2009 (2006-2013)	0.007
Total length of stay (days), median (IQR)	62 (28-116)	4 (2-12)	< 0.001
Hospital type			< 0.001
Public	4,245 (96.3%)	387,607 (75.7%)	
Private	161 (3.7%)	124,456 (24.3%)	

232 ^aDe facto= in a relationship and living together but not legally married

233

1
2
3 234 *Predictors of transfer to RAC on discharge from hospital*
4

5 235 Predictors of transfer to RAC on discharge are shown in Tables 2 (sociodemographic
6 variables) and 3 (diagnosis variables). Accounting for all covariates, the odds of
7
8 236 transfer to RAC increased with advancing age; ORs range from 2.18 (95% CI=1.16-
9
10 237 4.10) for people aged 20-24 years to 82.50 (95% CI=49.51-137.47) for people aged
11
12 238 60-64 years. People living in regional and remote areas were less likely to be
13
14 239 transferred to RAC than people living in major cities (inner regional OR=0.89, 95%
15
16 240 CI=0.81-0.98, outer regional OR=0.80, 95% CI=0.69-0.93, remote OR=0.28, 95%
17
18 241 CI=0.15, 0.53). People living in the most disadvantaged areas were slightly more
19
20 242 likely to be discharged to RAC than those living in the least disadvantaged areas
21
22 243 (OR=1.15, 95% CI=1.02-1.30). Individuals who were never married (OR=2.76, 95%
23
24 244 CI=2.51-3.04), widowed (OR=2.60, 95% CI=2.22-3.05), or separated/divorced
25
26 245 (OR=2.61, 95% CI=2.37-2.88) were more likely to be transferred to RAC on
27
28 246 discharge than individuals who were currently partnered (married or de facto).
29
30 247
31
32
33
34
35
36
37

38 249 For diagnosis group predictors, adjusting for all variables, people with Huntington
39
40 250 disease had the greatest likelihood of transfer to RAC on discharge (OR=29.97, 95%
41
42 251 CI=20.88-43.01), followed by people living with dementia (OR=15.14, 95% CI=13.10-
43
44 252 17.51), multiple sclerosis (OR=8.43, 95% CI=6.96-10.22), Wernicke's
45
46 253 encephalopathy (OR=6.58, 95% CI=4.40-9.83), motor neurone disease (OR=5.62,
47
48 254 95% CI=3.93-8.03), Parkinson's disease (OR=5.55, 95% CI=4.33-7.11), a need for
49
50 255 palliative care (OR=5.32, 95% CI=4.48-6.33), intellectual disability (OR=3.72, 95%
51
52 256 CI=3.31-4.19), stroke (OR=3.08, 95% CI=2.75-3.46), and mobility and personal care
53
54 257 issues (OR=2.87, 95% CI=2.57-3.22). When adjusting only for sociodemographic
55
56 258 and other non-diagnosis variables the same diagnoses emerged as the strongest
57
58
59
60

1
2
3 259 predictors though in a slightly different order; diagnoses of Huntington disease
4
5 260 (OR=30.23, 95% CI=22.26-41.05), dementia (OR=19.78, 95% CI=17.44-22.43), and
6
7 261 Wernicke's encephalopathy (OR=9.03, 95% CI=6.41-12.71) conferred the greatest
8
9 262 likelihood of transfer to RAC on discharge from hospital, followed by a need for
10
11 263 palliative care (OR=8.47, 95% CI=7.50-9.56), multiple sclerosis (OR=8.21, 95%
12
13 264 CI=6.94-9.71), and difficulties with mobility and personal care (OR=7.72, 95%
14
15 265 CI=7.01-8.51). Similar results were obtained when utilising diagnostic variables
16
17 266 available from hospital admissions occurring during the lookback period (365 days
18
19 267 preceding the index admission; Supplementary Table B).
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

268 Table 2. Sociodemographic and other non-diagnosis predictors of transfer from hospital to RAC on
 269 discharge

Variable	Unadjusted Odds ratio (95% CI)	Full model ^a Odds ratio (95% CI)
Sex		
Male	Reference	Reference
Female	0.80 (0.75–0.84)	0.92 (0.85–0.99)
Age (grouped)		
15-19	Reference	Reference
20-24	1.44 (0.80–2.59)	2.18 (1.16–4.10)
25-29	2.15 (1.25–3.71)	3.87 (2.16–6.95)
30-34	2.47 (1.46–4.17)	5.06 (2.87–8.92)
35-39	3.84 (2.32–6.34)	7.56 (4.39–13.03)
40-44	7.77 (4.80–12.59)	13.65 (8.08–23.06)
45-49	13.90 (8.66–22.32)	22.79 (13.58–38.23)
50-55	25.26 (15.82–40.35)	39.80 (23.85–66.41)
55-59	43.66 (27.41–69.53)	66.59 (39.98–110.91)
60-64	59.49 (37.38–94.67)	82.50 (49.51–137.47)
Remoteness		
Major cities	Reference	Reference
Inner regional	0.96 (0.89–1.03)	0.89 (0.81–0.98)
Outer regional	0.89 (0.79–1.01)	0.80 (0.69–0.93)
Remote	0.39 (0.22–0.67)	0.28 (0.15–0.53)
Index of Relative Social Disadvantage		
5 Least disadvantaged	Reference	Reference
4	1.46 (1.32–1.62)	1.10 (0.97–1.24)
3	1.52 (1.38–1.68)	1.13 (1.00–1.28)
2	1.49 (1.34–1.65)	1.09 (0.96–1.23)
1 Most disadvantaged	1.56 (1.41–1.72)	1.15 (1.02–1.30)
Marital status		
Married or de facto	Reference	Reference
Never married	1.67 (1.55–1.80)	2.76 (2.51–3.04)
Widowed	5.73 (5.03–6.54)	2.60 (2.22–3.05)
Separated or divorced	3.59 (3.30–3.89)	2.61 (2.37–2.88)
Born in Australia		
Yes	Reference	Reference
No	1.09 (1.01–1.17)	0.86 (0.79–0.94)
Year of index admission	0.98 (0.97–0.99)	0.96 (0.95–0.97)
Total length of stay	1.01 (1.01–1.01)	1.01 (1.01–1.01)
Hospital type		
Public	Reference	Reference
Private	0.12 (0.10–0.14)	0.30 (0.25–0.36)

^aModel output was dependent on the collapsed diagnosis groups included in the full model (reported in Table 3)

272 Table 3. Diagnostic predictors of transfer from hospital to RAC on discharge

Diagnosis variable	Cases n=4,406	Controls n=512,063	Unadjusted Odds ratio (95% CI)	Partially adjusted Odds ratio ^a (95% CI)	Full model Odds ratio ^b (95% CI)
Huntington disease	84 (1.9%)	181 (0.0%)	54.96 (42.36–71.32)	30.23 (22.26–41.05)	29.97 (20.88–43.01)
Dementia	561 (12.7%)	951 (0.2%)	78.42 (70.31–87.45)	19.78 (17.46–22.43)	15.14 (13.10–17.51)
Multiple sclerosis	189 (4.3%)	2,752 (0.5%)	8.29 (7.14–9.64)	8.21 (6.94–9.71)	8.43 (6.96–10.22)
Wernicke's encephalopathy	58 (1.3%)	177 (0.0%)	38.58 (28.64–51.97)	9.03 (6.41–12.71)	6.58 (4.40–9.83)
Motor neurone disease	52 (1.2%)	516 (0.1%)	11.84 (8.89–15.77)	6.54 (4.79–8.93)	5.62 (3.93–8.03)
Parkinson's disease	130 (3.0%)	1,084 (0.2%)	14.33 (11.92–17.23)	5.55 (4.52–6.82)	5.55 (4.33–7.11)
Need for palliative care	421 (9.6%)	2,032 (0.4%)	26.52 (23.77–29.59)	8.47 (7.50–9.56)	5.32 (4.48–6.33)
Intellectual disability	700 (15.9%)	17,257 (3.4%)	5.42 (4.99–5.88)	3.89 (3.52–4.30)	3.72 (3.31–4.19)
Stroke	929 (21.1%)	12,094 (2.4%)	11.05 (10.25–11.90)	3.72 (3.42–4.04)	3.08 (2.75–3.46)
Difficulties with mobility and personal care	797 (18.1%)	3,860 (0.8%)	29.08 (26.76–31.59)	7.72 (7.01–8.51)	2.87 (2.57–3.22)
Other genitourinary diseases	1,810 (41.1%)	26,785 (5.2%)	12.63 (11.88–13.43)	5.93 (5.53–6.36)	2.65 (2.43–2.90)
Cerebral palsy	78 (1.8%)	1,925 (0.4%)	4.78 (3.80–6.00)	5.82 (4.48–7.56)	2.52 (1.89–3.37)
Pressure injury and ulcers	811 (18.4%)	4,844 (0.9%)	23.62 (21.78–25.62)	4.74 (4.36–5.22)	2.35 (2.09–2.64)
Primary malignant cancers	635 (14.4%)	14,552 (2.8%)	5.76 (5.28–6.27)	2.47 (2.25–2.71)	1.88 (1.59–2.21)
Epilepsy	377 (8.6%)	12,843 (2.5%)	3.64 (3.27–4.05)	3.08 (2.73–3.47)	1.78 (1.54–2.05)
Neurological symptoms and signs	1,371 (31.1%)	26,414 (5.2%)	8.31 (7.78–8.86)	3.81 (3.54–4.10)	1.77 (1.61–1.93)
Falls	785 (17.8%)	18,284 (3.6%)	5.85 (5.41–6.33)	2.47 (2.26–2.70)	1.76 (1.55–2.00)
Chronic liver disease	433 (9.8%)	12,884 (2.5%)	4.22 (3.82–4.67)	1.95 (1.75–2.18)	1.67 (1.46–1.91)
Chronic respiratory diseases	919 (20.9%)	19,644 (3.8%)	6.61 (6.13–7.11)	1.95 (1.79–2.11)	1.48 (1.35–1.64)
Gastrointestinal symptoms and signs	978 (22.2%)	25,828 (5.0%)	5.37 (5.00–5.77)	3.07 (2.83–3.32)	1.43 (1.29–1.58)
Other factors influencing health status and contact with health services	3,140 (71.3%)	230,981 (45.1%)	3.02 (2.83–3.22)	1.62 (1.51–1.74)	1.35 (1.25–1.47)
Secondary mental disorders	150 (3.4%)	1,674 (0.3%)	10.75 (9.07–12.73)	3.02 (2.46–3.70)	1.34 (1.06–1.70)
Delirium	289 (6.6%)	3,439 (0.7%)	10.38 (9.17–11.75)	3.29 (2.86–3.79)	1.32 (1.12–1.57)
Other neurological conditions	1,806 (41.0%)	125,113 (24.4%)	2.15 (2.02–2.28)	2.21 (2.06–2.36)	1.31 (1.20–1.43)
Diabetes	886 (20.1%)	31,542 (6.2%)	3.83 (3.56–4.13)	1.38 (1.27–1.50)	1.30 (1.18–1.43)
Other endocrine, nutritional and metabolic diseases	1,941 (44.1%)	63,638 (12.4%)	5.55 (5.23–5.89)	2.03 (1.90–2.17)	1.26 (1.15–1.37)
Infections	1,968 (44.7%)	60,793 (11.9%)	5.99 (5.64–6.36)	2.61 (2.44–2.79)	1.21 (1.11–1.32)

1						
2						
3	Behavioural and emotional symptoms					
4	and signs	355 (8.1%)	17,421 (3.4%)	2.49 (2.23–2.78)	1.81 (1.59–2.05)	1.17 (1.00–1.36)
5	Traumatic brain injury	153 (3.5%)	9,652 (1.9%)	1.87 (1.59–2.20)	1.47 (1.22–1.76)	1.14 (0.92–1.42)
6	Other symptoms and signs	1,616 (36.7%)	53,259 (10.4%)	4.99 (4.69–5.31)	2.60 (2.43–2.79)	1.14 (1.04–1.24)
7	Problems related to housing,					
8	economic and social situation	653 (14.8%)	45,332 (8.9%)	1.79 (1.65–1.95)	1.27 (1.15–1.39)	1.13 (1.01–1.26)
9	Dental caries	54 (1.2%)	1,597 (0.3%)	3.97 (3.02–5.21)	1.45 (1.04–2.02)	1.10 (0.75–1.60)
10	Skin disease	678 (15.4%)	19,168 (3.7%)	4.68 (4.30–5.08)	1.84 (1.67–2.02)	1.09 (0.97–1.22)
11	Alcohol, substance and other mental					
12	disorders	1,158 (26.3%)	132,886 (26.0%)	1.02 (0.95–1.09)	1.02 (0.95–1.10)	1.05 (0.96–1.15)
13	Secondary malignant cancers	324 (7.4%)	5,743 (1.1%)	7.00 (6.23–7.86)	2.90 (2.57–3.28)	1.01 (0.83–1.23)
14	Diseases of eyes and ears	527 (12.0%)	13,616 (2.7%)	4.97 (4.53–5.46)	1.90 (1.71–2.12)	1.00 (0.88–1.13)
15	Acute and chronic renal disease	565 (12.8%)	14,548 (2.8%)	5.03 (4.60–5.50)	1.38 (1.25–1.53)	0.99 (0.88–1.12)
16	Other injuries	1,691 (38.4%)	104,213 (20.4%)	2.44 (2.29–2.59)	1.53 (1.43–1.63)	0.97 (0.89–1.05)
17	Diseases of the digestive system	1,192 (27.1%)	53,957 (10.5%)	3.15 (2.94–3.37)	1.51 (1.40–1.62)	0.95 (0.87–1.04)
18	Fractures	392 (8.9%)	22,140 (4.3%)	2.16 (1.95–2.40)	1.26 (1.13–1.42)	0.91 (0.78–1.07)
19	Other circulatory system disorders	1,838 (41.7%)	69,117 (13.5%)	4.59 (4.32–4.87)	1.44 (1.34–1.54)	0.90 (0.82–0.98)
20	Musculoskeletal	1,465 (33.3%)	82,920 (16.2%)	2.58 (2.42–2.75)	1.52 (1.41–1.62)	0.88 (0.80–0.97)
21	Other common mental disorders	767 (17.4%)	116,898 (22.8%)	0.71 (0.66–0.77)	0.75 (0.69–0.82)	0.86 (0.78–0.95)
22	Other cancers	116 (2.6%)	8,165 (1.6%)	1.67 (1.39–2.01)	1.01 (0.83–1.25)	0.77 (0.61–0.97)
23	Circulatory and respiratory symptoms					
24	and signs	303 (6.9%)	21,903 (4.3%)	1.65 (1.47–1.86)	0.91 (0.80–1.03)	0.74 (0.64–0.86)
25	Asthma	58 (1.3%)	7,585 (1.5%)	0.89 (0.68–1.15)	0.67 (0.51–0.88)	0.72 (0.53–0.97)
26	Blood disorders	554 (12.6%)	14,237 (2.8%)	5.03 (4.59–5.51)	1.55 (1.40–1.72)	0.69 (0.61–0.79)
27	Schizophrenia	372 (8.4%)	31,106 (6.1%)	1.43 (1.28–1.59)	0.32 (0.28–0.37)	0.65 (0.56–0.76)
28	Other oral disorders	98 (2.2%)	3,420 (0.7%)	3.38 (2.76–4.14)	1.26 (0.99–1.61)	0.65 (0.50–0.86)
29	Intentional self-harm	51 (1.2%)	22,161 (4.3%)	0.26 (0.20–0.34)	0.36 (0.26–0.48)	0.57 (0.41–0.79)
30	Coronary heart disease	196 (4.4%)	13,550 (2.6%)	1.71 (1.48–1.98)	0.59 (0.51–0.69)	0.55 (0.46–0.65)
31	Rehabilitation, convalescence and					
32	respite	1,089 (24.7%)	18,829 (3.7%)	8.60 (8.02–9.22)	1.85 (1.70–2.02)	0.51 (0.46–0.57)
33	Upper respiratory diseases	39 (0.9%)	9,763 (1.9%)	0.46 (0.34–0.63)	0.65 (0.46–0.92)	0.46 (0.31–0.68)
34	Spinal cord injury	21 (0.5%)	638 (0.1%)	3.84 (2.48–5.94)	0.35 (0.21–0.59)	0.21 (0.12–0.36)

273 ^a Partially adjusted odds ratios were calculated using a model adjusting only for sociodemographic/non-diagnosis variables shown in Table 2.

274 ^b Adjusted odds ratios were calculated using a model adjusting for all diagnosis and sociodemographic/non-diagnosis variables (sociodemographic/non-
275 diagnosis variables are shown in Table 2).

276 Discussion

277 This study investigated multiple factors that may lead to transfer from hospital to
278 RAC for younger people with neuropsychiatric disorders in NSW, Australia. Within
279 this cohort, people at greatest risk of transfer from hospital to RAC were those with
280 progressive cognitive and neurological disorders. People with neurodevelopmental
281 disorders (e.g., intellectual disability and cerebral palsy) were also at increased risk.
282 Contributing factors recorded at the time of transfer from hospital to RAC included a
283 range of medical conditions (e.g., Wernicke's encephalopathy, stroke, and cancer) in
284 the context of issues such as older age, not being partnered, living in areas of lower
285 socioeconomic status, functional issues related to mobility and personal care, and
286 the need for palliative care. These findings highlight opportunities for interventions
287 that might prevent or delay placement of younger people in RAC, including reducing
288 preventable causes of disability, the development of hospital discharge protocols,
289 rapid intensive and responsive support in the home, alternative high support housing
290 options, and alternative palliative care pathways.

291
292 Our findings indicate that specific conditions and acute health events are major
293 factors associated with greater odds of transfer from hospital to RAC for younger
294 people with neuropsychiatric disorders. We found a substantial risk of discharge to
295 RAC specifically amongst people with Huntington disease and people living with
296 young onset dementia. This likely reflects the significant motor impairments
297 associated with Huntington disease, and impact of cognitive decline and
298 neuropsychiatric symptoms among people with young onset dementia, all of which
299 have been previously shown to predict placement in RAC.(19–22) Indicators of
300 increasing support needs that were associated with discharge to RAC in our study

1
2
3 301 included difficulties with mobility and personal care, injuries (e.g. falls, pressure
4
5 302 injuries and ulcers), and a need for palliative care. Our findings indicate that
6
7
8 303 increasing support needs may be exacerbated by personal circumstances, such as
9
10 304 older age, not being partnered (married or de facto), and living in areas of lower
11
12 305 socioeconomic status. Collectively, these findings are in line with those reported by
13
14 306 previous studies examining sociodemographic and clinical risk factors for
15
16 307 institutionalisation of people of all ages, including advancing age,(23–25) being
17
18 308 unmarried or living alone,(21, 25-28) experiencing problems with living
19
20 309 conditions,(28) greater functional dependency and difficulties with activities of daily
21
22 310 living.(20, 24, 25, 27, 28)
23
24
25
26 311

27
28 312 The cohort discharged from hospital to RAC in this study represents a group of
29
30 313 individuals with chronic neuropsychiatric disorders and unmet therapeutic and
31
32 314 rehabilitative needs. While different neuropsychiatric disorders can be similarly
33
34 315 characterised by severe alterations (e.g., cognitive, behavioural and motor) that
35
36 316 impact autonomy, it is important to note that some of the primary drivers of transfer
37
38 317 from hospital to RAC identified in this study are preventable, or amenable to
39
40 318 intervention. In particular, provision of personalised and specific therapeutic and
41
42 319 rehabilitation programs may mitigate the need for placement in RAC facilities, which
43
44 320 are typically not equipped to meet the complex support needs of younger people with
45
46 321 chronic and disabling conditions.(4, 10) Potential prevention strategies include
47
48 322 minimising fall risk amongst people with progressive cognitive and neurological
49
50 323 disorders (e.g., Parkinson's disease) through individualised exercise, physical
51
52 324 therapy, and falls prevention programs.(29) The development and evaluation of
53
54 325 individualised falls prevention and balance programs for people with intellectual
55
56
57
58
59
60

1
2
3 326 disability is needed to improve functional outcomes and reduce fall risk in this
4
5 327 prematurely frail group.(30, 31) Additionally, long-term neurocognitive disability due
6
7 328 to Wernicke's encephalopathy (Korsakoff syndrome) should be prevented with rapid
8
9 329 treatment with thiamine, and addressing issues such as alcohol abuse and
10
11 330 malnutrition.(32) An increased emphasis on rehabilitation following acute health
12
13 331 events may also lead to improved outcomes, including addressing barriers to post-
14
15 332 stroke rehabilitation among people with cognitive disabilities. People with cognitive
16
17 333 disabilities typically experience poorer outcomes post-stroke including
18
19 334 institutionalisation (33) and are often considered unlikely to benefit from
20
21 335 rehabilitation, however demonstrate functional improvements when appropriate
22
23 336 rehabilitation is provided.(34)
24
25
26
27
28
29
30

31 338 In November 2019, the then Prime Minister of Australia declared that no younger
32
33 339 people should be living in RAC by 2025.(35) A number of specific actions required to
34
35 340 meet this commitment were outlined by the Royal Commission into Aged Care
36
37 341 Quality and Safety (Recommendation 74),(12) which have since been accepted but
38
39 342 not necessarily funded by the Australian Government.(36) Our findings highlight the
40
41 343 need to prioritise the funding and development of health and disability support
42
43 344 pathways as alternatives to RAC, including hospital discharge protocols to prevent
44
45 345 younger people being discharged into RAC and, alternative housing and support
46
47 346 options for younger people at risk of entering RAC.(12, 37) Potential hospital
48
49 347 discharge protocols could include a trial and evaluation of a short-term specialised
50
51 348 transition disability care model (e.g. 12 weeks; similar to the Australian Transition
52
53 349 Care Programme for eligible older people leaving hospital) (38) to be implemented
54
55 350 prior to consideration of RAC, as well as alternative palliative care pathways for
56
57
58
59
60

1
2
3 351 younger people with life-limiting conditions. Alternative housing and support options
4
5 352 could include the establishment of high-support needs community living options
6
7 353 through expansion of intensive disability supports and home in-reach programs from
8
9 354 health and allied health professionals, and extending trials of “Health care homes” to
10
11 355 target those at risk.(39)

12
13
14 356

15
16
17 357 Further actions relate to Australia’s National Disability Insurance Scheme (NDIS),
18
19 358 which provides individualised funding packages for disability supports and services
20
21 359 to eligible individuals with permanent and significant disability (e.g. intellectual,
22
23 360 cognitive, neurological, sensory, physical or psychosocial disability).(40) Potential
24
25 361 actions include improving capacity for the NDIS to enable health and disability
26
27 362 systems to provide interdisciplinary care, echoing the recommendations of the Royal
28
29 363 Australian and New Zealand College of Psychiatrists to the Joint Standing
30
31 364 Committee of the NDIS.(41) This could include the development of a system for
32
33 365 rapid crisis response in the case of a new or deteriorating primary condition, a
34
35 366 medical comorbidity that affects functioning, or when a person requires palliative
36
37 367 care. This would entail ensuring a joint response from health and disability services
38
39 368 with rapid response to assessment of new and emerging support needs, timely
40
41 369 provision of funding to meet those needs, and finally, establishing a pipeline of
42
43 370 available alternative high support housing options.(10, 37)

44
45
46
47
48
49 371

50
51 372 Although our study was set in Australia, the issue of inappropriate placement of
52
53 373 younger people in RAC is one of international significance.(5, 8, 42). While policy
54
55 374 contexts and models of health and disability service delivery differ across countries,
56
57 375 our findings do highlight opportunities for international enhancements to support the
58
59
60

1
2
3 376 development and provision of age-appropriate care and rehabilitation pathways for
4
5 377 younger people at risk of transfer to RAC. This may include the development and
6
7 378 implementation of routine minimum datasets to enable capture of the number of
8
9 379 younger people living in RAC, their diagnoses, and their health and support
10
11
12 380 needs.(43) Capture and reporting of this data would assist with advocacy, policy and
13
14 381 service enhancements, to better meet the needs of younger people with
15
16 382 neuropsychiatric disorders within community-based care settings.
17
18
19 383
20
21 384 Strengths of our study include the use of a large dataset including all hospital
22
23 385 admissions in NSW over a period of 14 years. Furthermore, our study was done in
24
25 386 consultation with a Lived Experience Advisory Group who provided feedback on our
26
27 387 interpretation of the results, ensuring that our research was relevant to the needs
28
29 388 and experiences of younger people living in RAC. Limitations include the restricted
30
31 389 cohort, which only included people hospitalised in NSW, Australia, with a recorded
32
33 390 neuropsychiatric diagnosis. Diagnoses used for cohort formation in the broader data
34
35 391 linkage on which this study is based did not include other related diagnoses (e.g.,
36
37 392 traumatic brain injury and stroke). As such, the findings must be interpreted in the
38
39 393 context of younger people with neuropsychiatric disorders (who represent a
40
41 394 substantial proportion of younger people living in RAC in Australia),(3) but not the
42
43 395 entire population of younger people at risk of transfer to RAC. Further, we could not
44
45 396 confirm that index admissions for cases reflected the first ever transfer to RAC,
46
47 397 though we attempted to do this by using a lookback period and excluding persons
48
49 398 with any indication of previous placement in RAC. Finally, other information relevant
50
51 399 to the risk of transfer to RAC was not available in the datasets used, including
52
53 400 reason for placement in RAC (e.g., respite, residential, or palliative care), time since
54
55
56
57
58
59
60

1
2
3 401 diagnosis, detailed information about functional abilities, and information about
4
5 402 informal care.
6
7
8 403

9
10 404 Our study has identified sociodemographic and diagnostic factors associated with
11
12 405 transfer to RAC on discharge from hospital for younger people with neuropsychiatric
13
14 406 disorders in NSW, Australia. Significant investment in health and disability support
15
16 407 pathways as alternatives to RAC, as well as cross-sector support to rapidly respond
17
18 408 to escalating needs, may prevent the movement of younger people from hospital to
19
20 409 RAC.
21
22
23

24 410
25
26 411 **Acknowledgements:** We thank the Lived Experience Advisory Group (including
27
28 412 Imelda Gilmore, Chanelle McKenna, Lisa Corcoran, Denis Cavanagh, Andrew
29
30 413 Wallner, Paulene Bates, Helen Burt, and others) for their continued input into this
31
32 414 study. We also thank Andrew Giles (National Policy Manager, MS Australia) for his
33
34 415 ongoing contributions to this project.
35
36
37

38 416
39
40 417 **Funding statement:** This project was funded by the Summer Foundation (award
41
42 418 number: N/A; Title: Understanding the health and support needs of younger people
43
44 419 with disabilities discharged from hospital to residential aged care) and was supported
45
46 420 by a National Health and Medical Research Council Australia Partnerships for Better
47
48 421 Health grant (Award number: APP1056128; Title: Improving the Mental Health
49
50 422 Outcomes of People with an Intellectual Disability).
51
52
53

54 423
55
56 424 **Competing interests:** Dr Di Winkler is Chief Executive Officer of the Summer
57
58 425 Foundation. No other disclosures.
59
60

1
2
3 426

4
5 427 **Author contributions:** RCC led the drafting and finalisation of this manuscript, and
6
7
8 428 contributed to the overall project direction and interpretation of results; TRW led the
9
10 429 statistical analyses, and contributed to the overall project direction, interpretation of
11
12 430 results, and drafting and finalisation of this manuscript; ARW led consultations with
13
14 431 the Lived Experience Advisory Group, contributed to the overall project direction,
15
16 432 interpretation of results, and drafting and finalisation of this manuscript; PS
17
18 433 contributed to the statistical analyses, and contributed to the overall project direction,
19
20 434 interpretation of results, and drafting and finalisation of this manuscript; SR, BD, AW,
21
22 435 DW, IH, DM, and JNT all contributed to the overall project direction, interpretation of
23
24 436 results, and drafting and finalisation of this manuscript.

25
26
27
28 437

29
30 438 **Data sharing statement:** Datasets used in this project cannot be shared publicly
31
32 439 due to the data usage agreement between the Department of Developmental
33
34 440 Disability Neuropsychiatry, The University of New South Wales Sydney, and the data
35
36 441 custodians who provide access to this data.

37
38
39
40 442

41
42 443 **Ethics approval:** This study was approved by the NSW Population & Health
43
44 444 Services Research Ethics Committee (CINSW 2013/02/445, AU RED reference:
45
46 445 HREC/13/CIPHS/7, substudy number 2019UMB0601). Ethics approval included a
47
48 446 waiver of consent.

49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 447 **References**
4

- 5 448 1. Australian Institute of Health and Welfare. GEN Aged Care Data: People using
6 aged care; 2022 [cited 18th May 2022]. Available from: URL: [https://www.gen-
9 agedcaredata.gov.au/Topics/People-using-aged-
10 care#Aged%20care%20use%20and%20age](https://www.gen-
7 agedcaredata.gov.au/Topics/People-using-aged-
8 care#Aged%20care%20use%20and%20age).
11
12 451
13
14 452 2. Australian Institute of Health and Welfare. Younger People in Residential Aged
15 Care- GEN Aged Care Data; 2022 [cited 18th May 2022]. Available from: URL:
16 [https://www.gen-agedcaredata.gov.au/Resources/Younger-people-in-residential-
18 aged-care](https://www.gen-agedcaredata.gov.au/Resources/Younger-people-in-residential-
17 aged-care).
19 454
20
21 455
22
23 456 3. Winkler DF, Farnworth L, Sloan S. People under 60 living in aged care facilities
24 in Victoria. Australian Health Review 2006; 30(1):100–8.
25
26 457
27
28 458 4. Cameron C, Pirozzo S, Tooth L. Long-term care of people below age 65 with
29 severe acquired brain injury: appropriateness of aged care facilities. Australian
30 and New Zealand Journal of Public Health, 2001; 25(3):261–4.
31 459
32
33 460
34
35 461 5. McMillan TM, Laurie M. Young adults with acquired brain injury in nursing homes
36 in Glasgow. Clin Rehabil 2004; 18(2):132–8.
37 462
38
39 463 6. Tracey R, Briggs L. Royal Commission into Aged Care Quality and Safety:
40 Interim report. Royal Commission into Aged Care Quality and Safety; 2019 [cited
41 464 18th May 2022]. Available from: URL:
42 465 <https://agedcare.royalcommission.gov.au/publications/Pages/interim-report.aspx>.
43 466
44
45 467 7. Persson DI, Ostwald SK. Younger residents in nursing homes. Journal of
46 Gerontological Nursing 2009; 35(10):22–31.
47 468
48
49 469 8. Dwyer A, Heary C, Ward M, MacNeela P. Adding insult to brain injury: young
50 adults' experiences of residing in nursing homes following acquired brain injury.
51 Disabil Rehabil 2019; 41(1):33–43.
52 470
53
54 471
55
56
57
58
59
60

- 1
2
3 472 9. Smith, B., Caddick, N. The Impact of living in a care home on the health and
4
5 473 wellbeing of spinal cord injured people. *International Journal of Environmental*
6
7 474 *Research and Public Health* 2015; 12(4):4185–202.
- 8
9
10 475 10. Oliver S, Gosden-Kaye EZ, Jarman H, Winkler D, Douglas JM. A scoping review
11
12 476 to explore the experiences and outcomes of younger people with disabilities in
13
14 477 residential aged care facilities. *Brain Inj* 2020; 34(11):1446–60.
- 15
16
17 478 11. Winkler DF, Farnworth LJ, Sloan SM, Brown T. Young people in aged care:
18
19 479 progress of the current national program. *Aust Health Rev* 2011; 35(3):320–6.
- 20
21 480 12. Royal Commission into Aged Care Quality and Safety. Final Report: Care,
22
23 481 Dignity and Respect. Commonwealth of Australia; 2021 [cited 18th May 2022].
24
25 482 Available from: URL: [https://agedcare.royalcommission.gov.au/publications/final-](https://agedcare.royalcommission.gov.au/publications/final-report)
26
27 483 [report](https://agedcare.royalcommission.gov.au/publications/final-report).
- 28
29
30 484 13. Reppermund S, Heintze T, Srasuebku P, Reeve R, Dean K, Smith M et al.
31
32 485 Health and wellbeing of people with intellectual disability in New South Wales,
33
34 486 Australia: a data linkage cohort. *BMJ Open* 2019; 9(9):e031624.
- 35
36
37 487 14. Gmatch: SAS macro. <http://bioinformaticstools.mayo.edu/research/gmatch/>;
38
39 488 2007.
- 40
41
42 489 15. Australian Institute of Health and Welfare. Pathways of younger people entering
43
44 490 permanent residential aged care. Canberra: AIHW; 2019 Cat. no. AGE 89 [cited
45
46 491 18th May 2022]. Available from: URL: <https://www.gen->
47
48 492 [agedcaredata.gov.au/Resources/Reports-and-publications/2019/July/Pathways-](https://www.gen-)
49
50 493 [of-younger-people-entering-permanent-resi.](https://www.gen-)
- 51
52
53 494 16. Australian Institute of Health and Welfare. Australian Burden of Disease Study:
54
55 495 Methods and supplementary material 2015; 2019 [cited 18th May 2022].
- 56
57
58
59
60

- 1
2
3 496 Available from: URL: [https://www.aihw.gov.au/getmedia/a99468c5-4048-4ee9-](https://www.aihw.gov.au/getmedia/a99468c5-4048-4ee9-972e-d76b9fb65a88/aihw-bod-23.pdf)
4
5 497 [972e-d76b9fb65a88/aihw-bod-23.pdf](https://www.aihw.gov.au/getmedia/a99468c5-4048-4ee9-972e-d76b9fb65a88/aihw-bod-23.pdf).
6
7
8 498 17. Greenland S, Mansournia MA, Altman DG. Sparse data bias: A problem hiding in
9 plain sight. *BMJ* 2016; 352:i1981.
10
11
12 500 18. Westreich DJ, Greenland S. The Table 2 Fallacy: Presenting and Interpreting
13 Confounder and Modifier Coefficients. *American Journal of Epidemiology* 2013;
14 501 177(4):292–8.
15
16
17 502
18
19 503 19. Wheelock VL, Tempkin T, Marder K, Nance M, Myers RH, Zhao H, Kayson E,
20 Orme, C, Shoulson I, the Huntington Study Group. Predictors of nursing home
21 504 placement in Huntington disease. *Neurology* 2003; 60(6):998–1001.
22
23
24 505
25
26 506 20. Rosenblatt A, Kumar BV, Margolis RL, Welsh CS, Ross CA. Factors contributing
27 to institutionalization in patients with Huntington's disease. *Mov Disord* 2011;
28 507 26(9):1711–6.
29
30
31 508
32
33 509 21. Bakker C, Vugt ME de, van Vliet D, Verhey FRJ, Pijnenburg YA, Vernooij-
34 Dassen MJFJ, Koopmans RTCM. Predictors of the time to institutionalization in
35 510 young- versus late-onset dementia: results from the Needs in Young Onset
36 511 Dementia (NeedYD) study. *J Am Med Dir Assoc* 2013; 14(4):248–53.
37
38
39
40 512
41
42 513 22. Fisher F, Andrews S, Churchyard A, Mathers S. Home or Residential Care? The
43 514 Role of Behavioral and Psychosocial Factors in Determining Discharge
44 Outcomes for Inpatients with Huntington's Disease. *Journal of Huntington's*
45 515 *Disease* 2012; 1:187–93.
46
47
48
49 516
50
51 517 23. Luppá M, Luck T, Brähler E, König H-H, Riedel-Heller SG. Prediction of
52 Institutionalisation in Dementia. *Dement Geriatr Cogn Disord* 2008; 26(1):65–78.
53
54
55
56 519 24. Harrison JK, Walesby KE, Hamilton L, Armstrong C, Starr JM, Reynish EL,
57 MacLullich AMJ, Quinn TJ, Shenkin SD. Predicting discharge to institutional
58 520
59
60

- 1
2
3 521 long-term care following acute hospitalisation: a systematic review and meta-
4
5 522 analysis. *Age Ageing* 2017; 46(4):547–58.
6
7
8 523 25. Burton JK, Ferguson EEC, Barugh AJ, Walesby KE, MacLulich AMJ, Shenkin
9
10 524 SD, Quinn TJ. Predicting Discharge to Institutional Long-Term Care After Stroke:
11
12 525 A Systematic Review and Metaanalysis. *J Am Geriatr Soc* 2018; 66(1):161–9.
13
14
15 526 26. Banerjee S, Murray J, Foley B, Atkins L, Schneider J, Mann A. Predictors of
16
17 527 institutionalisation in people with dementia. *Journal of Neurology, Neurosurgery*
18
19 528 & *Psychiatry* 2003; 74(9):1315.
20
21
22 529 27. Brown RT, Diaz-Ramirez LG, Boscardin WJ, Lee SJ, Williams BA, Steinman MA.
23
24 530 Association of Functional Impairment in Middle Age With Hospitalization, Nursing
25
26 531 Home Admission, and Death. *JAMA Intern Med* 2019; 179(5):668–75.
27
28
29 532 28. Knapp M, Chua K-C, Broadbent M, Chang C-K, Fernandez J-L, Milea D, Romeo
30
31 533 R, Lovestone S, Spencer M, Thompson G, Stewart R, Hayes RD. Predictors of
32
33 534 care home and hospital admissions and their costs for older people with
34
35 535 Alzheimer’s disease: findings from a large London case register. *BMJ Open*
36
37 536 2016; 6(11):e013591.
38
39
40 537 29. Mak MK, Wong-Yu IS, Shen X, Chung CL. Long-term effects of exercise and
41
42 538 physical therapy in people with Parkinson disease. *Nat Rev Neurol* 2017;
43
44 539 13(11):689–703.
45
46
47 540 30. Hale LA, Mirfin-Veitch BF, Treharne GJ. Prevention of falls for adults with
48
49 541 intellectual disability (PROFAID): a feasibility study. *Disabil Rehabil* 2016;
50
51 542 38(1):36–44.
52
53
54 543 31. McKenzie K, Ouellette-Kuntz H, Martin L. Frailty as a Predictor of
55
56 544 Institutionalization Among Adults With Intellectual and Developmental
57
58 545 Disabilities. *Intellectual and Developmental Disabilities* 2016; 54(2):123–35.
59
60

- 1
2
3 546 32. Latt N, Dore G. Thiamine in the treatment of Wernicke encephalopathy in
4
5 547 patients with alcohol use disorders. *Intern Med J* 2014; 44(9):911–5.
6
7 548 33. Saposnik G, Cote R, Rochon PA, Mamdani M, Liu Y, Raptis S et al. Care and
8
9 549 outcomes in patients with ischemic stroke with and without preexisting dementia.
10
11 550 *Neurology* 2011; 77(18):1664.
12
13 551 34. Mizrahi E-H, Arad M, Adunsky A. Pre-stroke dementia does not affect the post-
14
15 552 acute care functional outcome of old patients with ischemic stroke. *Geriatr*
16
17 553 *Gerontol Int* 2016; 16(8):928–33.
18
19 554 35. Prime Minister of Australia. Response to Aged Care Royal Commission Interim
20
21 555 Report: Media Release; 2019 [cited 18th May 2022]. Available from: URL:
22
23 556 [https://www.pm.gov.au/media/response-aged-care-royal-commission-interim-](https://www.pm.gov.au/media/response-aged-care-royal-commission-interim-report)
24
25 557 [report](https://www.pm.gov.au/media/response-aged-care-royal-commission-interim-report).
26
27 558 36. Australian Government Department of Health. Australian Government response
28
29 559 to the final report of the Royal Commission into Aged Care Quality and Safety;
30
31 560 2021 [cited 18th May 2022]. Available from: URL:
32
33 561 [https://www.health.gov.au/sites/default/files/documents/2021/05/australian-](https://www.health.gov.au/sites/default/files/documents/2021/05/australian-government-response-to-the-final-report-of-the-royal-commission-into-aged-care-quality-and-safety.pdf)
34
35 562 [government-response-to-the-final-report-of-the-royal-commission-into-aged-](https://www.health.gov.au/sites/default/files/documents/2021/05/australian-government-response-to-the-final-report-of-the-royal-commission-into-aged-care-quality-and-safety.pdf)
36
37 563 [care-quality-and-safety.pdf](https://www.health.gov.au/sites/default/files/documents/2021/05/australian-government-response-to-the-final-report-of-the-royal-commission-into-aged-care-quality-and-safety.pdf).
38
39 564 37. Cubis L, Ramme R, Roseingrave E, Minter E, Winkler D, Douglass J. Evaluating
40
41 565 the discharge planning process: Barriers, challenges, and facilitators of timely
42
43 566 and effective discharge for people with disability and complex needs. Melbourne,
44
45 567 Australia: Summer Foundation; 2022 [cited 23rd May 2022]. Available from: URL:
46
47 568 <https://apo.org.au/sites/default/files/resource-files/2022-05/apo-nid317909.pdf>.
48
49
50
51
52
53
54
55
56
57
58
59
60

- 1
2
3 569 38. Australian Government Department of Health. Transition Care Programme; 2022
4
5 570 [cited 18th May 2022]. Available from: URL: <https://www.health.gov.au/initiatives->
6
7 [and-programs/transition-care-programme](https://www.health.gov.au/initiatives-and-programs/transition-care-programme).
8 571
9
10 572 39. Australian Government Department of Health. Health Care Homes; 2021 [cited
11
12 573 18th May 2022]. Available from: URL:
13
14 574 <https://www1.health.gov.au/internet/main/publishing.nsf/Content/health-care->
15
16 [homes](https://www1.health.gov.au/internet/main/publishing.nsf/Content/health-care-homes).
17 575
18
19 576 40. National Disability Insurance Agency. What is the NDIS?; 2021 [cited 18th May
20
21 577 2022]. Available from: URL: <https://www.ndis.gov.au/understanding/what-ndis>.
22
23
24 578 41. The Royal Australian & New Zealand College of Psychiatrists. General issues
25
26 579 around the implementation and performance of the NDIS Submission 21; 2020
27
28 580 [cited 18th May 2022]. Available from: URL:
29
30 581 [https://www.aph.gov.au/Parliamentary_Business/Committees/Joint/National_Dis](https://www.aph.gov.au/Parliamentary_Business/Committees/Joint/National_Disability_Insurance_Scheme/GeneralIssues/Submissions)
31
32 [ability_Insurance_Scheme/GeneralIssues/Submissions](https://www.aph.gov.au/Parliamentary_Business/Committees/Joint/National_Disability_Insurance_Scheme/GeneralIssues/Submissions).
33 582
34
35 583 42. Ritter AZ, Freed S, Coe NB. Younger Individuals Increase Their Use of Nursing
36
37 584 Homes Following ACA Medicaid Expansion. *J Am Med Dir Assoc* 2022;
38
39 585 23(5):852-857.e5.
40
41
42 586 43. Burton JK, Wolters AT, Towers A-M, Jones L, Meyer J, Gordon AL et al.
43
44 587 Developing a minimum data set for older adult care homes in the UK: exploring
45
46 588 the concept and defining early core principles. *The Lancet Healthy Longevity*
47
48 589 2022; 3(3):e186-e193
49
50
51
52
53
54
55
56
57
58
59
60

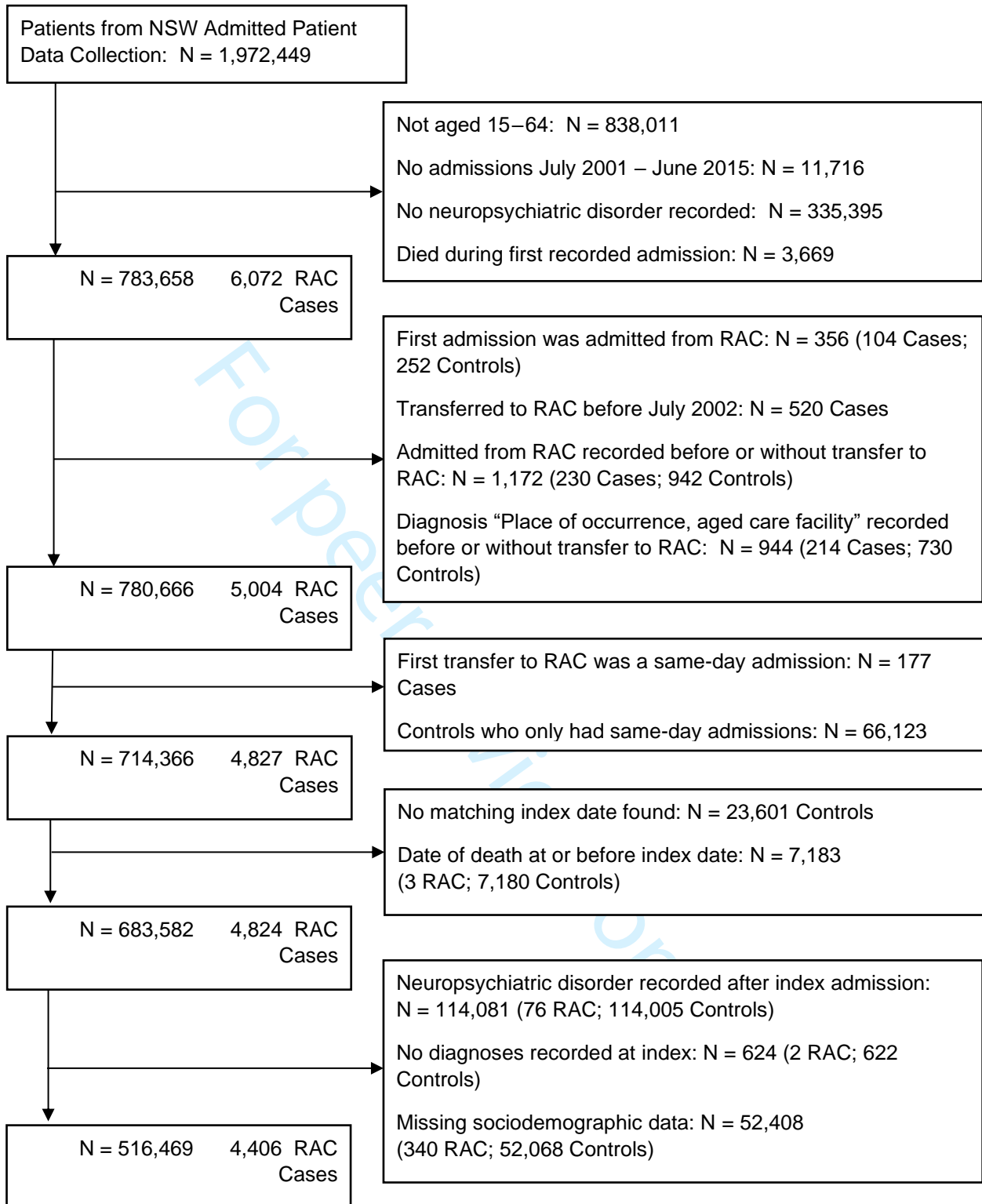


Figure 1. Selection of cases and controls. RAC= residential aged care.

Supplementary Tables

Supplementary Table A. Diagnostic categories

Collapsed diagnosis group	ICD-10 codes
Infections	A, B (not B18), G00-G07, J0-J2, J85, J86, Y95, Z22
Primary malignant cancers	C0-C6, C70-C76, C8-C9
Secondary malignant cancers	C77-C79
Other cancers	D0-D4
Blood disorders	D55-D59, D6-D9
Other endocrine, nutritional and metabolic diseases	D50-D53, E0, E12 (not E12.2), E15, E16, E2-E5 (not E51.2), E60, E61, E63-E68, E7, E8, E9
Diabetes	E10 (not E10.2), E11 (not E11.2), E13 (not E13.2), E14 (not E14.2), O24
Wernicke's encephalopathy	E51.2
Dementia	F00, F01, F02, F03, G30, G31.0, G31.3
Delirium	F05
Secondary mental disorders	F06, F07, F09
Alcohol, substance and other mental disorders	F04, F1, F38, F44, F45, F48, F5 (not F50), F6, F8 (not F84), F9
Schizophrenia	F2
Other common mental disorders	F30-F33, F34 (not F34.0), F39, F40-F43, F50
Autism spectrum disorders	F84
Huntington's disease	G10
Motor neurone disease	G12.2
Parkinson disease	G20
Multiple sclerosis	G35
Epilepsy	G40, G41
Other neurological conditions	G08, G09, G11, G12 (not G12.2), G13, G14, G2 (not G20), G3 (not G30, G31.0, G31.3, G35), G43, G44, G47, G5-G7, G81-G83, G9
Cerebral palsy	G80
Diseases of eyes and ears	H (not H0.00)
Coronary heart disease	I20-I25
Stroke	I6
Other circulatory system disorders	G45, G46, I0, I10, I11, I13, I15, I26-I28, I3, I4, I50-I52, I7, I8 (not I85), I9
Asthma	J45, J46
Chronic respiratory diseases	J40-J44, J47, J6, J7, J80-J84, J9
Upper respiratory diseases	J3 (not J34.0)
Dental caries	K02, K04
Other oral disorders	K00, K01, K03, K05-K09, K1
Chronic liver disease	B18, I85, K70-K76
Diseases of the digestive system	K2-K5, K6 (not K62.2, K62.3) K77, K8, K9
Skin disease	A46, B08, B86, H00.0, H60, J34.0, L0-L7, L8 (not L89), L90-L95, L98 (not L98.4), L99
Pressure injury and ulcers	L89, L97, L98.4
Musculoskeletal	M
Acute and chronic renal disease	E10.2, E11.2, E12.2, E13.2, E14.2, I12, N0 (not N00, N01), N1, N20-N28, N35, N36, N37, N39.1, N39.2, Q61

Supplementary Tables

1		
2		
3		
4	Other genitourinary diseases	D25, K62.2, K62.3, N30-N32, N34, "N39", N39.0, N39.3, N39.4, N4, N50, N6, N7, N8, N9, O94, R15, R32
5	Other symptoms and signs	R00, R02, R20-R23, R30, R31, R33-R39, R47-R49, R50-R55, R57-R65
6		
7	Neurological symptoms and signs	R25-R29, R40-R44, R56
8		
9	Gastrointestinal symptoms and signs	R10-R14, R16-R19
10		
11	Circulatory and respiratory symptoms and signs	R01, R03-R09
12		
13	Behavioural and emotional symptoms and signs	R45, R46
14		
15	Traumatic brain injury	"S02", S02.0, S02.1, S02.7, S02.9, S06
16	Spinal cord injury	"S14", S14.0, S14.1, S14.7, 'S24', S24.0, S24.1, S24.7, "S34", S34.0, S34.1, S34.7, T06.0, T06.1, T09.3
17		
18	Fractures	S02.2-S02.6, S02.8, S12, S22, S32, S42, S49, S52, S59.7, S62, S69, S72, S82, S92, T02, T08, T10, T12, T14.2
19		
20		S00, S01, S03-S05, S07, S08, S09, S10, S11, S13, S14.2-
21		S14.6, S15, S16, S17, S18, S19, S20, S21, S23, S24.2-S24.6,
22		S25, S26, S27, S28, S29, S30, S31, S33, S34.2-S34.6, S34.8,
23		S35-S41, S43-S48, S50, S51, S53-S58, "S59", S59.7, S59.8,
24		S59.9, S60, S61, S63-S68, S69.8, S69.9, S70, S71, S73-S78,
25	Other injuries	S80, S81, S83-S91, S93-S99, T00, T01, T03-T05, T06.2-T06.8, T07, "T09", T09.0-T09.2, T09.4-T09.9, T11, T13, "T14", T14.0, T14.1, T14.3-T14.9, T15-T19, T2, T3, T4, T5, T6, T70-T74, T75 (not T75.1), T79, T80, T81, T88, T89, V (not V90, V92), W2-W6, W70, W73-W79, W8, W9, X0-X5, X85-X89, X9, Y0, Y35, Y36, Y4-Y7, Y80-Y86, Y87 (not 87.0), Y88, Y89
26		
27		
28		
29		
30		
31	Falls	W0, W1
32	Intentional self-harm	X6, X7, X80-X84, Y87.0
33	Rehabilitation, convalescence and respite	Z50, Z54, Z75.5
34		
35	Housing and living situation	Z59-Z65
36	Palliative care	Z51.5
37		
38	Mobility and personal care	Z74, Z75.0, "Z99", Z99.3, Z99.8, Z99.9
39		
40	Other Z codes	Y93, Y96, Y98, Z00-Z07, Z11-Z13, Z20, Z21, Z28, Z29, Z4, "Z51", Z51.0-Z51.4, Z51.6, Z51.81, Z51.88, Z51.9, Z52, Z53, Z55-Z59, Z71-Z73, "Z75", Z75.1-Z75.4, Z75.8, Z75.9, Z76, Z8, Z90, Z91 (not Z91.7), Z92-Z98, Z99.0-Z99.2
41		
42		
43		
44		
45		
46		
47		
48		
49		
50		
51		
52		
53		
54		
55		
56		
57		
58		
59		
60		

Supplementary Tables

Supplementary Table B. Diagnostic predictors of transfer from hospital to RAC on discharge using diagnoses recorded during hospital admissions in the 365 days prior to the index admission

Diagnosis variable	Cases ^a n=4,406	Controls ^b n=512,063	Unadjusted Odds ratio (95%CI)	Partially adjusted Odds ratio ^d (95% CI)	Full model Odds ratio ^c (95% CI)
Huntington disease	87 (2.0%)	187 (0.0%)	55.14 (42.68–71.23)	30.84 (22.89–41.67)	33.41 (23.56–47.37)
Dementia	621 (14.1%)	1,131 (0.2%)	74.12 (66.87–82.16)	18.26 (16.28–20.56)	13.39 (11.66–15.37)
Multiple sclerosis	199 (4.5%)	3,067 (0.6%)	7.85 (6.78–9.09)	7.67 (6.52–9.04)	6.71 (5.54–8.12)
Wernicke's encephalopathy	70 (1.6%)	239 (0.0%)	34.57 (26.44–45.20)	7.81 (5.73–10.65)	5.91 (4.14–8.42)
Need for palliative care	471 (10.7%)	2,567 (0.5%)	23.76 (21.43–26.34)	7.53 (6.72–8.44)	4.99 (4.24–5.87)
Motor neurone disease	58 (1.3%)	562 (0.1%)	12.14 (9.25–15.94)	6.53 (4.86–8.79)	4.74 (3.34–6.71)
Parkinson's disease	149 (3.4%)	1,255 (0.2%)	14.25 (11.99–16.93)	5.33 (4.39–6.46)	4.57 (3.61–5.77)
Intellectual disability	700 (15.9%)	17,257 (3.4%)	5.42 (4.99–5.88)	3.89 (3.52–4.30)	3.51 (3.12–3.95)
Stroke	1,063 (24.1%)	14,373 (2.8%)	11.01 (10.26–11.82)	3.65 (3.38–3.96)	2.86 (2.57–3.18)
Problems with mobility and personal care	1,063 (24.1%)	5,308 (1.0%)	30.36 (28.19–32.69)	7.99 (7.33–8.71)	2.73 (2.47–3.01)
Other genitourinary diseases	2,195 (49.8%)	41,614 (8.1%)	11.22 (10.57–11.92)	5.48 (5.13–5.87)	2.35 (2.17–2.55)
Cerebral palsy	90 (2.0%)	2,182 (0.4%)	4.87 (3.94–6.03)	5.89 (4.62–7.52)	2.32 (1.77–3.05)
Pressure injury and ulcers	1,007 (22.9%)	6,728 (1.3%)	22.25 (20.66–23.97)	4.32 (3.96–4.72)	2.17 (1.96–2.41)
Falls	1,165 (26.4%)	25,109 (4.9%)	6.97 (6.51–7.46)	2.77 (2.57–2.99)	1.70 (1.52–1.89)
Epilepsy	508 (11.5%)	15,652 (3.1%)	4.13 (3.76–4.54)	3.31 (2.98–3.68)	1.64 (1.45–1.86)
Neurological symptoms and signs	1,837 (41.7%)	36,962 (7.2%)	9.19 (8.65–9.77)	4.06 (3.80–4.34)	1.62 (1.49–1.76)

Supplementary Tables

Primary malignant cancers	711 (16.1%)	18,282 (3.6%)	5.20 (4.79–5.64)	2.16 (1.98–2.36)	1.57 (1.35–1.82)
Secondary mental disorders	228 (5.2%)	2,285 (0.4%)	12.17 (10.59–14.00)	3.31 (2.79–3.92)	1.45 (1.20–1.76)
Other factors influencing health status and contact with health services	3,608 (81.9%)	270,761 (52.9%)	4.03 (3.73–4.35)	1.91 (1.76–2.07)	1.40 (1.28–1.54)
Chronic liver disease	539 (12.2%)	16,403 (3.2%)	4.21 (3.84–4.62)	1.84 (1.67–2.04)	1.38 (1.22–1.56)
Infections	2,550 (57.9%)	83,614 (16.3%)	7.04 (6.63–7.48)	2.95 (2.76–3.15)	1.37 (1.26–1.50)
Delirium	417 (9.5%)	4,707 (0.9%)	11.27 (10.15–12.51)	3.14 (2.79–3.54)	1.32 (1.15–1.53)
Gastrointestinal symptoms and signs	1,368 (31.0%)	44,335 (8.7%)	4.75 (4.45–5.07)	2.73 (2.54–2.93)	1.32 (1.21–1.44)
Chronic respiratory diseases	1,179 (26.8%)	26,339 (5.1%)	6.74 (6.30–7.21)	1.87 (1.74–2.02)	1.31 (1.19–1.43)
Other neurological conditions	2,203 (50.0%)	148,120 (28.9%)	2.46 (2.32–2.61)	2.21 (2.07–2.36)	1.30 (1.20–1.42)
Other endocrine, nutritional and metabolic diseases	2,463 (55.9%)	84,603 (16.5%)	6.40 (6.03–6.80)	2.19 (2.06–2.34)	1.24 (1.14–1.35)
Problems related to housing, economic and social situation	995 (22.6%)	57,548 (11.2%)	2.30 (2.15–2.47)	1.47 (1.36–1.59)	1.23 (1.12–1.35)
Behavioural and emotional symptoms and signs	502 (11.4%)	23,666 (4.6%)	2.65 (2.42–2.91)	1.83 (1.64–2.04)	1.22 (1.07–1.39)
Dental caries	92 (2.1%)	3,123 (0.6%)	3.48 (2.82–4.29)	1.60 (1.25–2.06)	1.20 (0.91–1.59)
Diabetes	983 (22.3%)	35,856 (7.0%)	3.81 (3.55–4.10)	1.37 (1.26–1.48)	1.20 (1.09–1.31)
Other symptoms and signs	2,153 (48.9%)	73,456 (14.3%)	5.71 (5.38–6.06)	2.71 (2.53–2.89)	1.13 (1.04–1.23)
Traumatic brain injury	215 (4.9%)	12,094 (2.4%)	2.12 (1.85–2.44)	1.57 (1.34–1.84)	1.13 (0.94–1.36)
Alcohol, substance and other mental disorders	1,457 (33.1%)	153,056 (29.9%)	1.16 (1.09–1.23)	1.06 (0.99–1.14)	1.07 (0.98–1.17)
Skin disease	981 (22.3%)	28,613 (5.6%)	4.84 (4.50–5.20)	1.83 (1.68–1.99)	1.07 (0.97–1.17)
Diseases of eyes and ears	761 (17.3%)	20,568 (4.0%)	4.99 (4.61–5.40)	1.85 (1.69–2.02)	1.06 (0.96–1.18)

Supplementary Tables

Other injuries	2,332 (52.9%)	134,307 (26.2%)	3.16 (2.98–3.36)	1.80 (1.69–1.92)	1.02 (0.93–1.10)
Diseases of the digestive system	1,778 (40.4%)	83,648 (16.3%)	3.47 (3.26–3.68)	1.59 (1.49–1.70)	0.99 (0.92–1.07)
Secondary malignant cancers	350 (7.9%)	6,874 (1.3%)	6.34 (5.67–7.09)	2.61 (2.32–2.94)	0.98 (0.81–1.19)
Fractures	612 (13.9%)	28,682 (5.6%)	2.72 (2.49–2.96)	1.48 (1.35–1.63)	0.97 (0.85–1.10)
Other circulatory system disorders	2,323 (52.7%)	88,989 (17.4%)	5.30 (5.00–5.63)	1.57 (1.47–1.68)	0.95 (0.87–1.03)
Circulatory and respiratory symptoms and signs	610 (13.8%)	33,924 (6.6%)	2.26 (2.08–2.47)	1.16 (1.06–1.27)	0.92 (0.83–1.03)
Other common mental disorders	1,099 (24.9%)	136,978 (26.8%)	0.91 (0.85–0.97)	0.85 (0.79–0.92)	0.92 (0.84–1.00)
Schizophrenia	464 (10.5%)	34,839 (6.8%)	1.61 (1.46–1.78)	0.41 (0.36–0.46)	0.90 (0.79–1.03)
Other oral disorders	166 (3.8%)	6,828 (1.3%)	2.90 (2.48–3.39)	1.40 (1.17–1.69)	0.87 (0.71–1.06)
Rehabilitation, convalescence and respite	1,484 (33.7%)	22,958 (4.5%)	10.82 (10.15–11.53)	2.38 (2.20–2.58)	0.85 (0.77–0.94)
Acute and chronic renal disease	744 (16.9%)	20,147 (3.9%)	4.96 (4.58–5.37)	1.39 (1.27–1.52)	0.85 (0.76–0.95)
Musculoskeletal	1,861 (42.2%)	105,794 (20.7%)	2.81 (2.64–2.98)	1.48 (1.38–1.58)	0.85 (0.77–0.92)
Asthma	107 (2.4%)	10,767 (2.1%)	1.16 (0.96–1.41)	0.81 (0.66–1.00)	0.84 (0.67–1.05)
Other cancers	203 (4.6%)	15,683 (3.1%)	1.53 (1.33–1.76)	0.92 (0.79–1.07)	0.75 (0.63–0.89)
Blood disorders	827 (18.8%)	20,929 (4.1%)	5.42 (5.02–5.86)	1.58 (1.44–1.72)	0.73 (0.65–0.81)
Coronary heart disease	326 (7.4%)	18,079 (3.5%)	2.18 (1.95–2.45)	0.69 (0.61–0.77)	0.62 (0.54–0.71)
Intentional self-harm	93 (2.1%)	29,150 (5.7%)	0.36 (0.29–0.44)	0.45 (0.36–0.56)	0.59 (0.46–0.75)
Upper respiratory diseases	65 (1.5%)	12,798 (2.5%)	0.58 (0.46–0.75)	0.73 (0.56–0.95)	0.56 (0.42–0.76)
Spinal cord injury	25 (0.6%)	775 (0.2%)	3.76 (2.53–5.61)	0.32 (0.20–0.51)	0.29 (0.18–0.47)

Reporting checklist for cohort study.

Based on the STROBE cohort guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the STROBE cohort reporting guidelines, and cite them as:

von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening of Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies.

			Page Number
Title and abstract			
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	3
Introduction			
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	6
Objectives	#3	State specific objectives, including any prespecified hypotheses	7
Methods			
Study design	#4	Present key elements of study design early in the paper	7
Setting	#5	Describe the setting, locations, and relevant dates, including periods	7

		of recruitment, exposure, follow-up, and data collection	
1			
2	Eligibility criteria	#6a Give the eligibility criteria, and the sources and methods of selection	7
3		of participants. Describe methods of follow-up.	
4			
5			
6	Eligibility criteria	#6b For matched studies, give matching criteria and number of exposed	8
7		and unexposed	
8			
9			
10	Variables	#7 Clearly define all outcomes, exposures, predictors, potential	9
11		confounders, and effect modifiers. Give diagnostic criteria, if	
12		applicable	
13			
14			
15	Data sources /	#8 For each variable of interest give sources of data and details of	9
16	measurement	methods of assessment (measurement). Describe comparability of	
17		assessment methods if there is more than one group. Give information	
18		separately for for exposed and unexposed groups if applicable.	
19			
20			
21			
22	Bias	#9 Describe any efforts to address potential sources of bias	10
23			
24	Study size	#10 Explain how the study size was arrived at	7
25			
26			
27	Quantitative	#11 Explain how quantitative variables were handled in the analyses. If	10
28	variables	applicable, describe which groupings were chosen, and why	
29			
30			
31	Statistical	#12a Describe all statistical methods, including those used to control for	
32	methods	confounding	
33			
34	10		
35			
36			
37	Statistical	#12b Describe any methods used to examine subgroups and interactions	10
38	methods		
39			
40			
41	Statistical	#12c Explain how missing data were addressed	9
42	methods		
43			
44	Statistical	#12d If applicable, explain how loss to follow-up was addressed	N/A
45	methods		
46			
47			
48	Statistical	#12e Describe any sensitivity analyses	
49	methods		
50			
51			
52	10		
53			
54	Results		
55			
56	Participants	#13a Report numbers of individuals at each stage of study—eg numbers	11
57		potentially eligible, examined for eligibility, confirmed eligible,	
58			
59			
60			

included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.

1			
2			
3			
4			
5	Participants	#13b	Give reasons for non-participation at each stage
6			11
7	Participants	#13c	Consider use of a flow diagram
8			
9			
10	11		
11			
12	Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.
13			12
14			
15			
16			
17			
18			
19	Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest
20			
21			
22			
23	N/A		
24			
25	Descriptive data	#14c	Summarise follow-up time (eg, average and total amount)
26			
27			
28	7		
29			
30	Outcome data	#15	Report numbers of outcome events or summary measures over time. Give information separately for exposed and unexposed groups if applicable.
31			
32			
33			
34			
35	12		
36			
37	Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
38			15
39			
40			
41			
42			
43			
44	Main results	#16b	Report category boundaries when continuous variables were categorized
45			N/A
46			
47			
48	Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
49			
50			
51			
52	N/A		
53			
54	Other analyses	#17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
55			14
56			
57			
58	Discussion		
59			
60			

1	Key results	#18	Summarise key results with reference to study objectives	21
2				
3	Limitations	#19	Discuss limitations of the study, taking into account sources of	24
4			potential bias or imprecision. Discuss both direction and magnitude of	
5			any potential bias.	
6				
7				
8	Interpretation	#20	Give a cautious overall interpretation considering objectives,	24
9			limitations, multiplicity of analyses, results from similar studies, and	
10			other relevant evidence.	
11				
12				
13	Generalisability	#21	Discuss the generalisability (external validity) of the study results	24
14				
15				
16	Other			
17	Information			
18				
19				
20	Funding	#22	Give the source of funding and the role of the funders for the present	25
21			study and, if applicable, for the original study on which the present	
22			article is based	
23				
24				

The STROBE checklist is distributed under the terms of the Creative Commons Attribution License CC-BY.

This checklist was completed on 22. June 2022 using <https://www.goodreports.org/>, a tool made by the

[EQUATOR Network](#) in collaboration with [Penelope.ai](#)