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# 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

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## ABSTRACT

**Objectives** To examine the sociodemographic and diagnostic factors associated with a discharge from hospital to residential aged care (RAC) for younger people (aged 15–64 years) with neuropsychiatric disorders.

**Design** An exploratory case–control study using a historic cohort of people with neuropsychiatric disorders. Cases were people transferred to RAC on hospital discharge during the study period. Controls were people not transferred to RAC on discharge during the study period.

**Setting** Public and private hospital admissions in New South Wales (NSW), Australia.

**Participants** People aged 15–64 years with a neuropsychiatric disorder hospitalised in NSW between July 2002 and June 2015 (n=5 16 469).

**Outcome measures** The main outcome was transferred to RAC on discharge from hospital. We calculated ORs for sociodemographic and diagnostic factors to determine factors that may impact discharge to RAC.

**Results** During the period of data capture, 4406 people were discharged from hospitals to RAC. Discharge to RAC was most strongly associated with diagnoses of progressive neurological and cognitive disorders. Acute precipitants of RAC transfer included a broad range of conditions and injuries (eg, Wernicke's encephalopathy, stroke, falls) in the context of issues such as older age, not being partnered (married or de facto), living in areas of lower socioeconomic status, functional issues and the need for palliative care.

**Conclusions** There are multiple intersecting and interacting pathways culminating in discharge from hospital to RAC among younger people with neuropsychiatric disorders. Improved capacity for interdisciplinary home care and alternative housing and support options for people with high support needs are required.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This study uses a large, linked data set that includes information from all hospital admissions in New South Wales, Australia, for people with recorded diagnoses of neuropsychiatric disorders over a period of 14 years.
⇒ The study was completed in consultation with an advisory group comprising people with lived experience of being, or supporting, a younger person in residential aged care (RAC).
⇒ The cohort included all people hospitalised with a recorded neuropsychiatric diagnosis; other related diagnoses (eg, traumatic brain injury, stroke) were not used to derive the cohort and as such only a subpopulation of younger people discharged to RAC were included.
⇒ We used a lookback period and excluded persons with any indication of previous placement in RAC, but we could not confirm that index admissions for cases reflected the first ever transfer to RAC.
⇒ Some information relevant to the risk of transfer to RAC was not available in the data sets used, including the reasons for placement in RAC, time since diagnoses were first made and information about functional abilities and availability of informal care.

## INTRODUCTION

Residential aged care (RAC) facilities in Australia provide accommodation and personal care (including access to nursing and health services) to older adults who are not able to continue living within their own homes. Although most people living in RAC in Australia are over 65 years of age, people aged under 65 years (hereafter 'younger people') may also be placed in RAC, largely due to a lack of access to age-appropriate community-based accommodation and supports.[1] Over 3400 younger people were living in RAC in Australia as of 31 December 2021, with over 600 new RAC placements in

this age group occurring in the preceding year.[2] Younger people living in RAC typically have high clinical needs and experience activity limitations as a result of disability, eg, due to intellectual and developmental disability, physical disability (eg, paraplegia), acquired brain injury and progressive neurological disorders (eg, dementia, multiple sclerosis and Huntington disease).[3] It is known that younger people living in RAC experience a range of negative outcomes, including a lack of appropriate recreational activities and medical and rehabilitation services, loss of function and experiences of grief, hopelessness and neglect.[3–9] Furthermore, many RAC facilities are not equipped to adequately meet the specific and complex health and rehabilitation needs of younger people with disability.[4 10]

The placement of younger people into RAC in Australia has previously been targeted through the Younger People with Disability in Residential Aged Care Initiative. However, a review showed that this was unlikely to result in a sustainable reduction in younger people entering RAC.[11] The prevention of the placement of younger people into RAC has since been identified as an area for immediate action by the Australian Royal Commission into Aged Care Quality and Safety[6 12]; in particular, stopping the 'pipeline' from hospital to RAC. Using a large, linked data set of younger people with neuropsychiatric disorders admitted to hospital in New South Wales (NSW), Australia, this study aims to identify sociodemographic and diagnostic factors that may be associated with a transfer to RAC on discharge from hospital. Identification of these factors will inform the development of strategies to prevent or delay the transfer of younger people from hospital to RAC.

## METHODS

### Study design and data sources

This exploratory case–control study used data from a large linkage study of people with neuropsychiatric disorders, including mental health disorders, neurological disorders and intellectual and developmental disabilities.[13] The primary data set used in the current study was the NSW Admitted Patient Data Collection (1 July 2001–30 June 2015), which contains information recorded during all admissions to NSW hospitals and psychiatric facilities. This includes admission/discharge dates and up to 51 diagnoses (coded according to the International Statistical Classification of Diseases and Related Health Problems; 10th revision, Australian modification (ICD-10-AM)) for each episode.

### Study population

We defined our study population as people aged 15–64 years with a neuropsychiatric disorder who were admitted to a hospital in NSW between 1 July 2001 and 30 June 2015. Neuropsychiatric disorders were determined by any of the following: (1) diagnosis of intellectual disability recorded in any data set from the broader linkage study previously described,[13] (2) ICD-10-AM diagnoses of mental and behavioural disorders ('F00-F99', 'S06'), disorders of the nervous system ('G00–G99') or intellectual and developmental disability ('P04.3', 'Q86.0', 'Q87.0', 'Q87.1', 'Q87.2', 'Q87.3', 'Q87.5', 'Q87.8', 'Q89.8', 'Q90', 'Q91', 'Q93', 'Q99.2') recorded during a hospital admission, (3) an admission to a psychiatric unit, indicated where unit type on admission was one of 'Psychiatric Acute', 'Psychiatric Rehabilitation', 'Psychiatric Secure', 'Brain Injury Rehabilitation', 'Psychiatric Intensive Care', 'Post Natal Depression', 'Psychiatric Extended Care', 'Neuro-Psychiatry', 'Psychiatric Medium Secure', 'Psychiatric Emergency' or where days in a psychiatric unit were >0.

Cases were people transferred to RAC on discharge from hospital during the study (ie, mode of hospital separation was 'Transfer to Nursing Home'). Controls were people with hospital admissions but no recorded transfers to RAC. The index admission for cases was defined as the date of the first transfer to RAC from hospital occurring in the study period. To obtain a similar distribution of control index admission dates across the study period to that of the cases, index admissions for controls were randomly selected by matching eligible control hospital discharge dates to case index dates using the SAS macro 'gmatch' greedy matching algorithm.[14]

Individuals were excluded if they died at their index hospital admission (ie, mode of separation of their index admission was 'Death with Autopsy' or 'Death without Autopsy'). To minimise the chance of previous transfer to RAC, individuals were excluded if they were transferred to RAC on discharge from hospital before 1 July 2002; the source of referral was 'Nursing Home/RAC' at or before the index admission; the diagnosis 'Place of occurrence, aged care facility' was recorded at or before the index admission. Individuals were also excluded if the index admission was a same-day admission or if diagnostic or sociodemographic data were missing.

### Sociodemographic and other non-diagnosis variables

Sex, Aboriginal and/or Torres Strait Islander status, country of birth (Australia or overseas), Index of Relative Socioeconomic Disadvantage quintiles, remoteness of area of residence categories and date of death were obtained from multiple data sets as previously described.[13] Marital status was sourced from the Admitted Patient Data Collection at the index admission and, if missing, we used Last Observation Carried Forward if recorded in a previous admission. Age at the index admission was analysed using 5-year age groups to allow for a non-linear association with the outcome. We also calculated the year of index date and the total admission length of stay (days) over all admissions within a lookback period of 365 days prior to the index date.

### Diagnosis group variables

We extracted all ICD-10-AM diagnosis codes recorded during the index admission and collapsed these into broad but meaningful groupings. We initially grouped

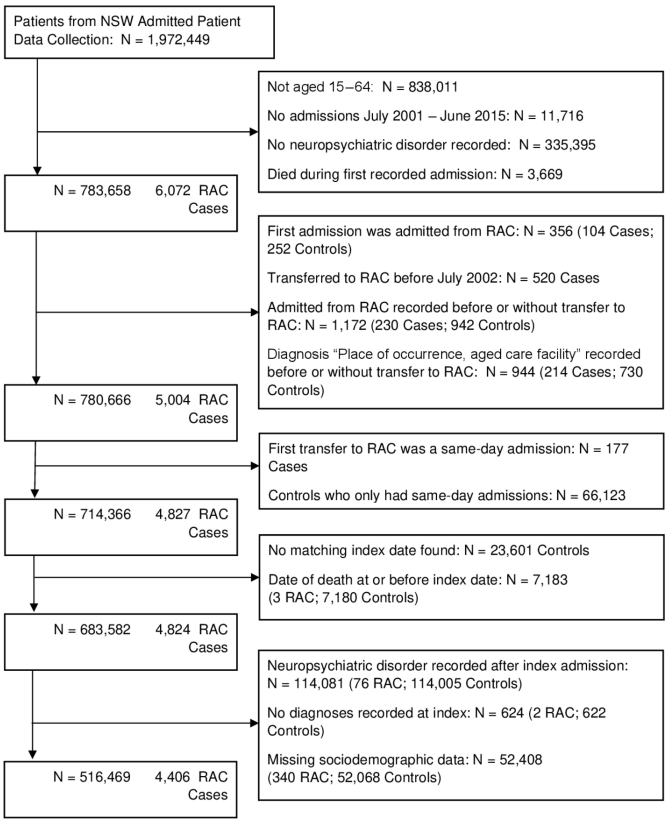


**Figure 1** Selection of cases and controls. RAC, residential aged care.

diagnoses based on two previous reports.[15 16] Conditions that were deemed unlikely to affect the chance of RAC transfer (eg, those relating to pregnancy and birth) were excluded. To avoid sparse data bias,[17] diagnosis groups with less than 20 cases were also removed. This process resulted in 224 diagnostic groupings. Following this, the groupings were further collapsed into 57 general diagnostic categories (see online supplemental table A).

### Statistical analysis

We used logistic regression models to estimate the effect of sociodemographic and diagnostic factors on transfer to RAC. For sociodemographic factors, we report both the unadjusted effects and full model results, as while the individual models do not adjust for confounding factors, adjusting for mediators in the full model would potentially bias the estimates.[18] Likewise, it is likely that some diagnosis groups share overlapping causal pathways and, hence, OR estimates from our full logistic model might be affected by overadjustment bias.[17] For diagnostic factors, estimates were also produced using a separate logistic model for each diagnosis group that adjusted for sociodemographic/non-diagnosis variables only. While this approach does not adjust for confounding by other diagnostic variables, it is less likely to exhibit overadjustment bias.

### Supplementary analyses using the lookback period

The above analyses use data solely from the index admission and so only include diagnostic factors recorded at the time of discharge to RAC (ie, the acute precipitants of transfer to RAC on discharge from hospital). To determine whether inclusion of diagnoses recorded in the 365 days preceding the index admission impacted the effect estimates of variables that may be associated with transfer to RAC, we repeated the above analyses using all diagnoses received at hospital admissions occurring during the lookback period. Results of these analyses are presented in online supplemental table B.

Analyses were conducted using SAS V.9.4 (SAS Institute) and Stata V.15.1 (StataCorp).

### Patient and public involvement: consultation with lived experience advisory group

We established an advisory group comprising nine people with lived experience of being, or supporting, a younger person living in RAC and consulted with them about the aims, methods and findings of the research.

## RESULTS

### Cohort characteristics

Details of the selection process for cases and controls are shown in figure 1. Sociodemographic characteristics are provided in table 1.

### Predictors of transfer to RAC on discharge from hospital

Predictors of transfer to RAC on discharge are shown in tables 2 and 3 (sociodemographic variables) (diagnosis variables). Accounting for all covariates, the odds of transfer to RAC increased with advancing age; ORs range from 2.18 (95% CI 1.16 to 4.10) for people aged 20–24 years to 82.50 (95% CI 49.51 to 137.47) for people aged 60–64 years. People living in regional and remote areas were less likely to be transferred to RAC than people living in major cities (inner regional OR=0.89, 95% CI 0.81 to 0.98, outer regional OR=0.80, 95% CI 0.69 to 0.93, remote OR=0.28, 95% CI 0.15 to 0.53). People living in the most disadvantaged areas were slightly more likely to be discharged to RAC than those living in the least disadvantaged areas (OR=1.15, 95% CI 1.02 to 1.30). Individuals who were never married (OR=2.76, 95% CI 2.51 to 3.04), widowed (OR=2.60, 95% CI 2.22 to 3.05) or separated/divorced (OR=2.61, 95% CI 2.37 to 2.88) were more likely to be transferred to RAC on discharge than individuals who were currently partnered (married or de facto).

For diagnosis group predictors, adjusting for all variables, people with Huntington disease had the greatest likelihood of transfer to RAC on discharge (OR=29.97, 95% CI 20.88 to 43.01), followed by people living with dementia (OR=15.14, 95% CI 13.10 to 17.51), multiple sclerosis (OR=8.43, 95% CI 6.96 to 10.22), Wernicke's encephalopathy (OR=6.58, 95% CI 4.40 to 9.83), motor neuron disease (OR=5.62, 95% CI 3.93 to 8.03),

Table 1 Sociodemographic characteristics of cohort

| Variable | Cases (n=4406) | Controls (n=512 063) | P ($X^2$) |
|---|---|---|---|
| Sex | | | < 0.001 |
| Male | 2586 (58.7%) | 271 636 (53.0%) | |
| Female | 1820 (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 | 1250 (28.4%) | 59 401 (11.6%) | |
| 60–64 | 1659 (37.7%) | 57 856 (11.3%) | |
| Remoteness of area of residence | | | 0.001 |
| Major cities | 3180 (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%) | 3826 (0.7%) | |
| Index of relative socioeconomic disadvantage | | | < 0.001 |
| 1 (Most disadvantaged) | 1068 (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 | 1295 (29.4%) | 245 387 (47.9%) | |
| Never married | 1779 (40.4%) | 201 768 (39.4%) | |
| Widowed | 277 (6.3%) | 9155 (1.8%) | |
| Separated or divorced | 1055 (23.9%) | 55 753 (10.9%) | |
| Born in Australia | | | 0.021 |
| Yes | 3457 (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 | 4245 (96.3%) | 387 607 (75.7%) | |
| Private | 161 (3.7%) | 124 456 (24.3%) | |

De facto, in a relationship and living together but not legally married.

Parkinson's disease (OR=5.55, 95% CI 4.33 to 7.11), a need for palliative care (OR=5.32, 95% CI 4.48 to 6.33), intellectual disability (OR=3.72, 95% CI 3.31 to 4.19), stroke (OR=3.08, 95% CI 2.75 to 3.46) and mobility and personal care issues (OR=2.87, 95% CI 2.57 to 3.22). When adjusting only for sociodemographic and other non-diagnosis variables, the same diagnoses emerged as the strongest predictors though in a slightly different order; diagnoses of Huntington disease (OR=30.23, 95% CI 22.26 to 41.05), dementia (OR=19.78, 95% CI 17.44 to 22.43) and Wernicke's encephalopathy (OR=9.03, 95% CI 6.41 to 12.71) conferred the greatest likelihood of transfer to RAC on discharge from hospital, followed by a need for palliative care (OR=8.47, 95% CI 7.50 to 9.56), multiple sclerosis (OR=8.21, 95% CI 6.94 to 9.71) and difficulties with mobility and personal care (OR=7.72,

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

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

*Model output was dependent on the collapsed diagnosis groups included in the full model (reported in table 3).
RAC, residential aged care.

95% CI 7.01 to 8.51). Similar results were obtained when using diagnostic variables available from hospital admissions occurring during the lookback period (365 days preceding the index admission; online supplemental table B).

## DISCUSSION

This study investigated multiple factors that may lead to transfer from hospital to RAC for younger people with neuropsychiatric disorders in NSW, Australia. Within this cohort, people at greatest risk of transfer from hospital to RAC were those with progressive cognitive and

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

| Diagnosis variable | Cases n=4406 | Controls n=512063 | Unadjusted OR (95% CI) | Partially adjusted OR* (95% CI) | Full model OR† (95% CI) |
|---|---|---|---|---|---|
| Huntington disease | 84 (1.9%) | 181 (0.0%) | 54.96 (42.36 to 71.32) | 30.23 (22.26 to 41.05) | 29.97 (20.88 to 43.01) |
| Dementia | 561 (12.7%) | 951 (0.2%) | 78.42 (70.31 to 87.45) | 19.78 (17.44 to 22.43) | 15.14 (13.10 to 17.51) |
| Multiple sclerosis | 189 (4.3%) | 2752 (0.5%) | 8.29 (7.14 to 9.64) | 8.21 (6.94 to 9.71) | 8.43 (6.96 to 10.22) |
| Wernicke's encephalopathy | 58 (1.3%) | 177 (0.0%) | 38.58 (28.64 to 51.97) | 9.03 (6.41 to 12.71) | 6.58 (4.40 to 9.83) |
| Motor neuron disease | 52 (1.2%) | 516 (0.1%) | 11.84 (8.89 to 15.77) | 6.54 (4.79 to 8.93) | 5.62 (3.93 to 8.03) |
| Parkinson's disease | 130 (3.0%) | 1084 (0.2%) | 14.33 (11.92 to 17.23) | 5.55 (4.52 to 6.82) | 5.55 (4.33 to 7.11) |
| Need for palliative care | 421 (9.6%) | 2032 (0.4%) | 26.52 (23.77 to 29.59) | 8.47 (7.50 to 9.56) | 5.32 (4.48 to 6.33) |
| Intellectual disability | 700 (15.9%) | 17257 (3.4%) | 5.42 (4.99 to 5.88) | 3.89 (3.52 to 4.30) | 3.72 (3.31 to 4.19) |
| Stroke | 929 (21.1%) | 12094 (2.4%) | 11.05 (10.25 to 11.90) | 3.72 (3.42 to 4.04) | 3.08 (2.75 to 3.46) |
| Difficulties with mobility and personal care | 797 (18.1%) | 3860 (0.8%) | 29.08 (26.76 to 31.59) | 7.72 (7.01 to 8.51) | 2.87 (2.57 to 3.22) |
| Other genitourinary diseases | 1810 (41.1%) | 26785 (5.2%) | 12.63 (11.88 to 13.43) | 5.93 (5.53 to 6.36) | 2.65 (2.43 to 2.90) |
| Cerebral palsy | 78 (1.8%) | 1925 (0.4%) | 4.78 (3.80 to 6.00) | 5.82 (4.48 to 7.56) | 2.52 (1.89 to 3.37) |
| Pressure injury and ulcers | 811 (18.4%) | 4844 (0.9%) | 23.62 (21.78 to 25.62) | 4.74 (4.30 to 5.22) | 2.35 (2.09 to 2.64) |
| Primary malignant cancers | 635 (14.4%) | 14552 (2.8%) | 5.76 (5.28 to 6.27) | 2.47 (2.25 to 2.71) | 1.88 (1.59 to 2.21) |
| Epilepsy | 377 (8.6%) | 12843 (2.5%) | 3.64 (3.27 to 4.05) | 3.08 (2.73 to 3.47) | 1.78 (1.54 to 2.05) |
| Neurological symptoms and signs | 1371 (31.1%) | 26414 (5.2%) | 8.31 (7.78 to 8.86) | 3.81 (3.54 to 4.10) | 1.77 (1.61 to 1.93) |
| Falls | 785 (17.8%) | 18284 (3.6%) | 5.85 (5.41 to 6.33) | 2.47 (2.26 to 2.70) | 1.76 (1.55 to 2.00) |
| Chronic liver disease | 433 (9.8%) | 12884 (2.5%) | 4.22 (3.82 to 4.67) | 1.95 (1.75 to 2.18) | 1.67 (1.46 to 1.91) |
| Chronic respiratory diseases | 919 (20.9%) | 19644 (3.8%) | 6.61 (6.13 to 7.11) | 1.95 (1.79 to 2.11) | 1.48 (1.35 to 1.64) |
| Gastrointestinal symptoms and signs | 978 (22.2%) | 25828 (5.0%) | 5.37 (5.00 to 5.77) | 3.07 (2.83 to 3.32) | 1.43 (1.29 to 1.58) |
| Other factors influencing health status and contact with health services | 3140 (71.3%) | 230981 (45.1%) | 3.02 (2.83 to 3.22) | 1.62 (1.51 to 1.74) | 1.35 (1.25 to 1.47) |
| Secondary mental disorders | 150 (3.4%) | 1674 (0.3%) | 10.75 (9.07 to 12.73) | 3.02 (2.46 to 3.70) | 1.34 (1.06 to 1.70) |
| Delirium | 289 (6.6%) | 3439 (0.7%) | 10.38 (9.17 to 11.75) | 3.29 (2.86 to 3.79) | 1.32 (1.12 to 1.57) |
| Other neurological conditions | 1806 (41.0%) | 125113 (24.4%) | 2.15 (2.02 to 2.28) | 2.21 (2.06 to 2.36) | 1.31 (1.20 to 1.43) |
| Diabetes | 886 (20.1%) | 31542 (6.2%) | 3.83 (3.56 to 4.13) | 1.38 (1.27 to 1.50) | 1.30 (1.18 to 1.43) |
| Other endocrine, nutritional and metabolic diseases | 1941 (44.1%) | 63638 (12.4%) | 5.55 (5.23 to 5.89) | 2.03 (1.90 to 2.17) | 1.26 (1.15 to 1.37) |
| Infections | 1968 (44.7%) | 60793 (11.9%) | 5.99 (5.64 to 6.36) | 2.61 (2.44 to 2.79) | 1.21 (1.11 to 1.32) |
| Behavioural and emotional symptoms and signs | 355 (8.1%) | 17421 (3.4%) | 2.49 (2.23 to 2.78) | 1.81 (1.59 to 2.05) | 1.17 (1.00 to 1.36) |

Continued

**Table 3** Continued

| Diagnosis variable | Cases n=4406 | Controls n=512063 | Unadjusted OR (95% CI) | Partially adjusted OR* (95% CI) | Full model OR† (95% CI) |
|---|---|---|---|---|---|
| Traumatic brain injury | 153 (3.5%) | 9652 (1.9%) | 1.87 (1.59 to 2.20) | 1.47 (1.22 to 1.76) | 1.14 (0.92 to 1.42) |
| Other symptoms and signs | 1616 (36.7%) | 53259 (10.4%) | 4.99 (4.69 to 5.31) | 2.60 (2.43 to 2.79) | 1.14 (1.04 to 1.24) |
| Problems related to housing, economic and social situation | 653 (14.8%) | 45332 (8.9%) | 1.79 (1.65 to 1.95) | 1.27 (1.15 to 1.39) | 1.13 (1.01 to 1.26) |
| Dental caries | 54 (1.2%) | 1597 (0.3%) | 3.97 (3.02 to 5.21) | 1.45 (1.04 to 2.02) | 1.10 (0.75 to 1.60) |
| Skin disease | 678 (15.4%) | 19168 (3.7%) | 4.68 (4.30 to 5.08) | 1.84 (1.67 to 2.02) | 1.09 (0.97 to 1.22) |
| Alcohol, substance and other mental disorders | 1158 (26.3%) | 132886 (26.0%) | 1.02 (0.95 to 1.09) | 1.02 (0.95 to 1.10) | 1.05 (0.96 to 1.15) |
| Secondary malignant cancers | 324 (7.4%) | 5743 (1.1%) | 7.00 (6.23 to 7.86) | 2.90 (2.57 to 3.28) | 1.01 (0.83 to 1.23) |
| Diseases of eyes and ears | 527 (12.0%) | 13616 (2.7%) | 4.97 (4.53 to 5.46) | 1.90 (1.71 to 2.12) | 1.00 (0.88 to 1.13) |
| Acute and chronic renal disease | 565 (12.8%) | 14548 (2.8%) | 5.03 (4.60 to 5.50) | 1.38 (1.25 to 1.53) | 0.99 (0.88 to 1.12) |
| Other injuries | 1691 (38.4%) | 104213 (20.4%) | 2.44 (2.29 to 2.59) | 1.53 (1.43 to 1.63) | 0.97 (0.89 to 1.05) |
| Diseases of the digestive system | 1192 (27.1%) | 53957 (10.5%) | 3.15 (2.94 to 3.37) | 1.51 (1.40 to 1.62) | 0.95 (0.87 to 1.04) |
| Fractures | 392 (8.9%) | 22140 (4.3%) | 2.16 (1.95 to 2.40) | 1.26 (1.13 to 1.42) | 0.91 (0.78 to 1.07) |
| Other circulatory system disorders | 1838 (41.7%) | 69117 (13.5%) | 4.59 (4.32 to 4.87) | 1.44 (1.34 to 1.54) | 0.90 (0.82 to 0.98) |
| Musculoskeletal | 1465 (33.3%) | 82920 (16.2%) | 2.58 (2.42 to 2.75) | 1.52 (1.41 to 1.62) | 0.88 (0.80 to 0.97) |
| Other common mental disorders | 767 (17.4%) | 116898 (22.8%) | 0.71 (0.66 to 0.77) | 0.75 (0.69 to 0.82) | 0.86 (0.78 to 0.95) |
| Other cancers | 116 (2.6%) | 8165 (1.6%) | 1.67 (1.39 to 2.01) | 1.01 (0.83 to 1.25) | 0.77 (0.61 to 0.97) |
| Circulatory and respiratory symptoms and signs | 303 (6.9%) | 21903 (4.3%) | 1.65 (1.47 to 1.86) | 0.91 (0.80 to 1.03) | 0.74 (0.64 to 0.86) |
| Asthma | 58 (1.3%) | 7585 (1.5%) | 0.89 (0.68 to 1.15) | 0.67 (0.51 to 0.88) | 0.72 (0.53 to 0.97) |
| Blood disorders | 554 (12.6%) | 14237 (2.8%) | 5.03 (4.59 to 5.51) | 1.55 (1.40 to 1.72) | 0.69 (0.61 to 0.79) |
| Schizophrenia | 372 (8.4%) | 31106 (6.1%) | 1.43 (1.28 to 1.59) | 0.32 (0.28 to 0.37) | 0.65 (0.56 to 0.76) |
| Other oral disorders | 98 (2.2%) | 3420 (0.7%) | 3.38 (2.76 to 4.14) | 1.26 (0.99 to 1.61) | 0.65 (0.50 to 0.86) |
| Intentional self-harm | 51 (1.2%) | 22161 (4.3%) | 0.26 (0.20 to 0.34) | 0.36 (0.26 to 0.48) | 0.57 (0.41 to 0.79) |
| Coronary heart disease | 196 (4.4%) | 13550 (2.6%) | 1.71 (1.48 to 1.98) | 0.59 (0.51 to 0.69) | 0.55 (0.46 to 0.65) |
| Rehabilitation, convalescence and respite | 1089 (24.7%) | 18829 (3.7%) | 8.60 (8.02 to 9.22) | 1.85 (1.70 to 2.02) | 0.51 (0.46 to 0.57) |
| Upper respiratory diseases | 39 (0.9%) | 9763 (1.9%) | 0.46 (0.34 to 0.63) | 0.65 (0.46 to 0.92) | 0.46 (0.31 to 0.68) |
| Spinal cord injury | 21 (0.5%) | 638 (0.1%) | 3.84 (2.48 to 5.94) | 0.35 (0.21 to 0.59) | 0.21 (0.12 to 0.36) |

*Partially adjusted ORs were calculated using a model adjusting only for sociodemographic/non-diagnosis variables shown in table 2.
†Adjusted ORs were calculated using a model adjusting for all diagnosis and sociodemographic/non-diagnosis variables (sociodemographic/non-diagnosis variables are shown in table 2).
RAC, residential aged care.

neurological disorders. People with neurodevelopmental disorders (eg, intellectual disability and cerebral palsy) were also at increased risk. Contributing factors recorded at the time of transfer from hospital to RAC included a range of medical conditions (eg, Wernicke's encephalopathy, stroke and cancer) in the context of issues such as older age, not being partnered, living in areas of lower socioeconomic status, functional issues related to mobility and personal care and the need for palliative care. These findings highlight opportunities for interventions that might prevent or delay placement of younger people in RAC, including reducing preventable causes of disability, the development of hospital discharge protocols, rapid intensive and responsive support in the home, alternative high support housing options and alternative palliative care pathways.

Our findings indicate that specific conditions and acute health events are major factors associated with greater odds of transfer from hospital to RAC for younger people with neuropsychiatric disorders. We found a substantial risk of discharge to RAC specifically among people with Huntington disease and people living with young onset dementia. This likely reflects the significant motor impairments associated with Huntington disease and impact of cognitive decline and neuropsychiatric symptoms among people with young onset dementia, all of which have been previously shown to predict placement in RAC.[19–22] Indicators of increasing support needs that were associated with discharge to RAC in our study included difficulties with mobility and personal care, injuries (eg, falls, pressure injuries and ulcers) and a need for palliative care. Our findings indicate that increasing support needs may be exacerbated by personal circumstances, such as older age, not being partnered (married or de facto), and living in areas of lower socioeconomic status. Collectively, these findings are in line with those reported by previous studies examining sociodemographic and clinical risk factors for institutionalisation of people of all ages, including advancing age,[23–25] being unmarried or living alone,[21 25–28] experiencing problems with living conditions,[28] greater functional dependency and difficulties with activities of daily living.[20 24 25 27 28]

The cohort discharged from hospital to RAC in this study represents a group of individuals with chronic neuropsychiatric disorders and unmet therapeutic and rehabilitative needs. While different neuropsychiatric disorders can be similarly characterised by severe alterations (eg, cognitive, behavioural and motor) that impact autonomy, it is important to note that some of the primary drivers of transfer from hospital to RAC identified in this study are preventable or amenable to intervention. In particular, provision of personalised and specific therapeutic and rehabilitation programmes may mitigate the need for placement in RAC facilities, which are typically not equipped to meet the complex support needs of younger people with chronic and disabling conditions.[4 10] Potential prevention strategies include minimising fall risk among people with progressive cognitive and neurological disorders (eg, Parkinson's disease) through individualised exercise, physical therapy and falls prevention programmes.[29] The development and evaluation of individualised falls prevention and balance programmes for people with intellectual disability is needed to improve functional outcomes and reduce fall risk in this prematurely frail group.[30 31] Additionally, long-term neurocognitive disability due to Wernicke's encephalopathy (Korsakoff syndrome) should be prevented with rapid treatment with thiamine, and addressing issues such as alcohol abuse and malnutrition.[32] An increased emphasis on rehabilitation following acute health events may also lead to improved outcomes, including addressing barriers to poststroke rehabilitation among people with cognitive disabilities. People with cognitive disabilities typically experience poorer outcomes post-stroke including institutionalisation[33] and are often considered unlikely to benefit from rehabilitation, however, demonstrate functional improvements when appropriate rehabilitation is provided.[34]

In November 2019, the Prime Minister of Australia declared that no younger people should be living in RAC by 2025.[35] A number of specific actions required to meet this commitment were outlined by the Royal Commission into Aged Care Quality and Safety (Recommendation 74),[12] which have since been accepted but not necessarily funded by the Australian Government.[36] Our findings highlight the need to prioritise the funding and development of health and disability support pathways as alternatives to RAC, including hospital discharge protocols to prevent younger people being discharged into RAC and alternative housing and support options for younger people at risk of entering RAC.[12 37] Potential hospital discharge protocols could include a trial and evaluation of a short-term specialised transition disability care model (eg, 12 weeks; similar to the Australian Transition Care Programme for eligible older people leaving hospital)[38] to be implemented prior to consideration of RAC as well as alternative palliative care pathways for younger people with life-limiting conditions. Alternative housing and support options could include the establishment of high support needs community living options through expansion of intensive disability supports and home in-reach programmes from health and allied health professionals, and extending trials of "Health care homes' to target those at risk.[39]

Further actions relate to Australia's National Disability Insurance Scheme (NDIS), which provides individualised funding packages for disability supports and services to eligible individuals with permanent and significant disability (eg, intellectual, cognitive, neurological, sensory, physical or psychosocial disability).[40] Potential actions include improving capacity for the NDIS to enable health and disability systems to provide interdisciplinary care, echoing the recommendations of the Royal Australian and New Zealand College of Psychiatrists to the Joint Standing Committee of the NDIS.[41] This could include the development of a system for

rapid crisis response in the case of a new or deteriorating primary condition, a medical comorbidity that affects functioning, or when a person requires palliative care. This would entail ensuring a joint response from health and disability services with rapid response to assessment of new and emerging support needs, timely provision of funding to meet those needs and, finally, establishing a pipeline of available alternative high support housing options.[10 37]

Although our study was set in Australia, the issue of inappropriate placement of younger people in RAC is one of international significance.[5 8 42] While policy contexts and models of health and disability service delivery differ across countries, our findings do highlight opportunities for international enhancements to support the development and provision of age-appropriate care and rehabilitation pathways for younger people at risk of transfer to RAC. This may include the development and implementation of routine minimum data sets to enable capture of the number of younger people living in RAC, their diagnoses and their health and support needs.[43] Capture and reporting of this data would assist with advocacy, policy and service enhancements, to better meet the needs of younger people with neuropsychiatric disorders within community-based care settings.

Strengths of our study include the use of a large data set including all hospital admissions in NSW over a period of 14 years. Furthermore, our study was done in consultation with a Lived Experience Advisory Group who provided feedback on our interpretation of the results, ensuring that our research was relevant to the needs and experiences of younger people living in RAC. Limitations include the restricted cohort, which only included people hospitalised in NSW, Australia with a recorded neuropsychiatric diagnosis. Diagnoses used for cohort formation in the broader data linkage on which this study is based did not include other related diagnoses (eg, traumatic brain injury and stroke). As such, the findings must be interpreted in the context of younger people with neuropsychiatric disorders (who represent a substantial proportion of younger people living in RAC in Australia)[3] but not the entire population of younger people at risk of transfer to RAC. Furthermore, we could not confirm that index admissions for cases reflected the first ever transfer to RAC, though we attempted to do this by using a look-back period and excluding persons with any indication of previous placement in RAC. Finally, other information relevant to the risk of transfer to RAC was not available in the data sets used, including reason for placement in RAC (eg, respite, residential or palliative care), time since diagnosis, detailed information about functional abilities and information about informal care.

Our study has identified sociodemographic and diagnostic factors associated with transfer to RAC on discharge from hospital for younger people with neuropsychiatric disorders in NSW, Australia. Significant investment in health and disability support pathways as alternatives to RAC, as well as cross-sector support to rapidly respond to escalating needs, may prevent the movement of younger people from hospital to RAC.

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## 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

| | |
|---|---|
| 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 |
| Other symptoms and signs | R00, R02, R20-R23, R30, R31, R33-R39, R47-R49, R50-R55, R57-R65 |
| Neurological symptoms and signs | R25-R29, R40-R44, R56 |
| Gastrointestinal symptoms and signs | R10-R14, R16-R19 |
| Circulatory and respiratory symptoms and signs | R01, R03-R09 |
| Behavioural and emotional symptoms and signs | R45, R46 |
| Traumatic brain injury | "S02", S02.0, S02.1, S02.7, S02.9, S06 |
| 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 |
| 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 |
| Other injuries | S00, S01, S03-S05, S07, S08, S09, S10, S11, S13, S14.2-S14.6, S15, S16, S17, S18, S19, S20, S21, S23, S24.2-S24.6, S25, S26, S27, S28, S29, S30, S31, S33, S34.2-S34.6, S34.8, S35-S41, S43-S48, S50, S51, S53-S58, "S59", S59.7, S59.8, S59.9, S60, S61, S63-S68, S69.8, S69.9, S70, S71, S73-S78, 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 |
| Falls | W0, W1 |
| Intentional self-harm | X6, X7, X80-X84, Y87.0 |
| Rehabilitation, convalescence and respite | Z50, Z54, Z75.5 |
| Housing and living situation | Z59-Z65 |
| Palliative care | Z51.5 |
| Mobility and personal care | Z74, Z75.0, "Z99", Z99.3, Z99.8, Z99.9 |
| 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 |

## 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 (22.82–41.67) | 33.41 (23.56–47.37) |
| Dementia | 621 (14.1%) | 1,131 (0.2%) | 74.12 (66.87–82.16) | 18.26 (16.21–20.56) | 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) |

## 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

| | |
|---|---|
| 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 |
| Other symptoms and signs | R00, R02, R20-R23, R30, R31, R33-R39, R47-R49, R50-R55, R57-R65 |
| Neurological symptoms and signs | R25-R29, R40-R44, R56 |
| Gastrointestinal symptoms and signs | R10-R14, R16-R19 |
| Circulatory and respiratory symptoms and signs | R01, R03-R09 |
| Behavioural and emotional symptoms and signs | R45, R46 |
| Traumatic brain injury | "S02", S02.0, S02.1, S02.7, S02.9, S06 |
| 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 |
| 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 |
| Other injuries | S00, S01, S03-S05, S07, S08, S09, S10, S11, S13, S14.2-S14.6, S15, S16, S17, S18, S19, S20, S21, S23, S24.2-S24.6, S25, S26, S27, S28, S29, S30, S31, S33, S34.2-S34.6, S34.8, S35-S41, S43-S48, S50, S51, S53-S58, "S59", S59.7, S59.8, S59.9, S60, S61, S63-S68, S69.8, S69.9, S70, S71, S73-S78, 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 |
| Falls | W0, W1 |
| Intentional self-harm | X6, X7, X80-X84, Y87.0 |
| Rehabilitation, convalescence and respite | Z50, Z54, Z75.5 |
| Housing and living situation | Z59-Z65 |
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| Mobility and personal care | Z74, Z75.0, "Z99", Z99.3, Z99.8, Z99.9 |
| 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 |

## 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

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| 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) |
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| 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

| | | | | | |
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| 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) |
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| 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) |