Received: 30 September 2020 | Revised: 8 July 2022 | Accepted: 13 August 2022

DOI: 10.1111/hsc.14022

Health and Social Care in the community WILEY

ORIGINAL ARTICLE

Do young people with neurological conditions in residential aged care use hospitals differently than those in the community? Evidence from Victorian hospital data, 2014–2017

Jane Banaszak-Holl PhD[1,2] | Renata Morello PhD[1] | Sze-Ee Soh PhD[1,3] | Peter Cameron MD[1] | Mark Brown PhD[4,5] | Virginia Mitsch MOT[6] | Rosemary Moubarak MPH[7] | Dianne Winkler PhD[4,5]

[1]School of Population Health and Preventive Medicine, Monash University, Melbourne, Victoria, Australia

[2]Department of Health Services Administration, School of Health Professions, University of Alabama – Birmingham, Birmingham, Alabama, USA

[3]School of Primary and Allied Health Care, Monash University, Melbourne, Victoria, Australia

[4]Summer Foundation, Melbourne, Victoria, Australia

[5]Living with Disability Research Centre, La Trobe University, Melbourne, Victoria, Australia

[6]Resolution Consulting and Therapy, Albury, New South Wales, Australia

[7]South Western Sydney Local Health District, Liverpool, New South Wales, Australia

Correspondence
Jane Banaszak-Holl, Department of Health Services Administration, School of Health Professions, University of Alabama-Birmingham, Birmingham, Alabama 35294, USA.
Email: jbanasza@uab.edu

Funding information
Summer Foundation of Australia

Abstract

This study describes the duration and reasons for hospitalisation for three cohorts of younger adults with neurological conditions who either used residential aged care (RAC) or lived in the community. Hospitalisations as a clinical event indicate conditions for which younger people in RAC may need support as they move into community-based housing. Data describing 3 years of hospitalisations in Victorian public hospitals and emergency departments were used. The neurological conditions occurring among the three cohorts include (1) Cerebral Vascular Accident (CVA), (2) Traumatic Brain Injury (TBI) and (3) Multiple Sclerosis (MS). Frequency of hospitalisation, length of stay and leading causes of potentially preventable hospitalisations were examined. Two hundred and fifty-two (2.7%) of 9333 patients hospitalised for these neurological conditions subsequently used RAC. Hospitalisations were more frequent for those using RAC compared to those living in the community for cohorts with CVA and TBI (6.26 vs. 2.65 events per person-year for CVA and 4.34 vs. 1.88 for TBI) while hospitalisations were more frequent among those in the community compared to those using RAC for the cohort living with MS (3.62 vs. 5.35 per person-year). However, for all the cohorts, the average length of acute hospital stays was longer among RAC users than among those in the community (19.6 vs. 6.2 days for CVA, 15.5 vs. 4.5 for TBI and 12.2 vs. 7.0 for MS). Leading causes for hospitalisation were complex comorbidities and changes in health status (such as seizures, ulcers, dehydration and cellulitis). Efforts should be made to design supports and proactively manage health needs leading to these hospitalisations.

KEYWORDS
disability, discharge planning, younger residents in aged care

1 | BACKGROUND

As of June 2021, 3899 younger people aged between 18 and 65 years permanently lived in Residential Aged Care (RAC) facilities across Australia (AIHW, 2021). Each year fewer young Australians have entered such facilities, with 712 entering facilities in 2020–2021 compared to 1250 who entered the previous year (NDIS, 2020a), yet younger people continue to enter RAC due to the lack of timely access to alternative housing and support options (Barry et al., 2018; Cameron et al., 2001; Smith & Caddick, 2015). Despite the Australian government setting targets to eliminate placements in RAC, younger people continued to represent a substantial population in this setting (AIHW, 2021), with a range of disabilities and health support needs. At the same time, the vast majority of younger Australians using RAC never return to the community and experience relative social isolation in RAC (Winkler et al., 2010).

Hospitalisation rates can be a key indicator of care quality and unmet health needs for residential care populations (Fan et al., 2016; Ouslander et al., 2014), because hospitalisations may reflect poor management of chronic conditions among RAC users (Dwyer et al., 2014; Dwyer et al., 2015). However, much of the research and interventions designed to reduce unnecessary hospital admissions from RAC have focused on the population over age 65 (Dwyer et al., 2014; Dwyer et al., 2015). This study describes the frequency of and reasons for hospitalisation for younger Australians in RAC and for younger Australians living with the same chronic conditions in the community. The research addresses the need for further research to understand the specific health needs of younger people in RAC to further discussion whether the rate and length of hospitalisations can be reduced in this population.

Current literature indicates that RAC facilities are not designed or resourced to adequately meet the disability and health support needs of younger people with disability (Winkler et al., 2010). By using administrative data on hospitalisation episodes, this study extends previous research by identifying relevant health service use of younger adults using RAC specifically for three chronic neurological conditions: (1) cerebrovascular disease (CVA), (2) traumatic brain injuries (TBI) and (3) the neurodegenerative disease Multiple Sclerosis (MS) (Fries et al., 2005; Winkler et al., 2006, 2010).

The recent Australian Royal Commission into Aged Care Quality and Safety has reported a number of stories of neglect of younger people using RAC in their final report, leading the Australian government to commit to providing alternative housing and support options for younger people in RAC and to prevent new admissions of young people to RAC (Royal Commission into Aged Care Quality and Safety, 2021). Current federal government targets aim to eliminate aged care admissions for those under the age of 65 and furthermore, that no one under the age of 65 will be living in aged care by 2025 unless under exceptional circumstances (NDIS, 2020b). Unfortunately, even if these targets are achieved, hospitalisations remain an important issue and lessons reported here can inform service improvement.

What is known about this topic

- Younger people (those under the age of 65) living with chronic conditions in residential aged care (RAC) settings are less likely to have their needs and preferences met than younger people living in the community.
- Younger people using RAC have comorbidities and complex chronic health problems that may require substantial health services use.

What this paper adds

- This study addressed the need for better information on hospitalisation rates and length of stay for younger adults using residential aged care (RAC) compared to those in the community.
- Younger people living with neurological conditions, who use RAC, experienced a longer total number of days in hospital than those living in the community.
- Leading causes for hospitalisation for younger adults in RAC included complex comorbidities (such as diabetes and congestive heart failure) and substantial changes in health status (such as seizures, ulcers, dehydration and cellulitis).

2 | METHODS

This study used secondary hospital administrative data on three clinically defined cohorts of younger Australians; for all three cohorts, the populations included those between the ages of 18 and 64 years, who were either using RAC or living in the community. These three cohorts were defined by three of the most common conditions impacting younger RAC users, including (1) cerebrovascular disease (CVA), (2) traumatic brain injury (TBI), and (3) Multiple Sclerosis (MS), a neurodegenerative disease that, along with Huntington's Disease, leads to younger people using RAC (Fries et al., 2005; Winkler et al., 2006; Winkler et al., 2010). Whether individuals used RAC or resided in the community and the extent of hospital use within patient cohorts were also identified using the hospital administrative data, as explained below.

2.1 | Data source and study population

De-identified data on all hospital admissions in Victoria for the 3-year period from July 2014 to June 2017 were taken from the Victorian Admitted Episode Dataset (VAED) (State of Victoria, 2015) and the Victorian Emergency Minimum Dataset (VEMD) (State of Victoria, 2015). The VAED and VEMD are administrative databases routinely updated and maintained by the Department of Health and Human Services (DHHS). The use of these data and this study were approved by Monash University Research Ethics Committee. The VAED

provides comprehensive information on every Victorian admitted to public and private hospitals, including rehabilitation centres, extended care facilities and day procedure centres, and the VEMD collects information on emergency presentations at public hospitals with a designated emergency department (ED). This project started with the full VAED and VEMD data sets in order to ensure that all younger adults in Victoria with hospitalisations during the study window were included.

Individuals were identified for the three clinical cohorts if any of the 40 diagnosis codes provided at hospital admission (in the VAED) or the single diagnosis provided upon emergency admission (in the VEMD) matched the International Classification of Diseases codes (ICD-10) for CVA, TBI or MS (for CVA, this included codes I60-I64; for TBI, S061-S069 and for MS, G35). Previous research has identified the clinical conditions in these three cohorts as common among RAC residents under 65 years of age (Winkler et al., 2010). Matches were included across the primary diagnosis (prefix was a 'P'), the associated conditions on admission (prefix 'A') and diagnostic complications at admission (prefix 'C').

In the absence of ways to identify the severity of the CVA or TBI illness using the available data, only those with an initial hospital episode, defined as the index hospitalisation, of greater than 4 days were included in analyses for these cohorts. The clinical experts on the project identified the criteria of stays over 4 days in length as critical for dropping minor hospitalisations related to living with CVA and TBI which was important to comparing outcomes among those using RAC and those in the community with these illnesses. In other words, the index hospitalisation was used to include individuals who had serious illnesses that would put them at risk of needing RAC. Subsequently, RAC users were defined as those admitted to RAC following any hospitalisation, including the index hospitalisation; RAC users included additional individuals discharged to RAC after any subsequent hospitalisation as well. Individuals discharged home following every hospitalisation were defined as belonging to *the community cohort*. Patients were excluded from the study if they did not live in the community prior to their index admission or if their usual residence was listed as 'overseas', which would make the transition to RAC in Australia unlikely.

For the cohort with MS, a neurodegenerative and long-term chronic disease, among whom hospitalisations were quite common, individuals were commonly at risk for both hospitalisation and RAC use prior to any initial admissions in our data set. Consequently, all hospital admissions (and individuals) with MS were included in the analyses. MS admissions were identified when the ICD-10 code G35 was a primary diagnosis (P) or associated condition (A).

This study identified whether a person was an *RAC user* if any hospital admission included either admission from or discharge to the nursing home setting. Using the VAED and VEMD data, it was not possible to determine if RAC was the individual's usual place of residence or whether RAC was only used temporarily for respite care. This definition allowed the identification of those individuals who had received care within RAC during the study period. Otherwise, individuals were identified as *community dwellers* because, for all hospital stays, they were discharged home following hospital admission. Further, individuals were excluded from the analysis if: (1) they were not identified as living at home prior to their index admission, (2) their usual residence was listed as overseas or (3) they died during the index admission.

Inpatient and emergency use data were combined from the VAED and VEMD with little loss of data (96% of original records were retained for analysis). The focus of this study was on characteristics of hospitalisations that included an inpatient stay, and those who experienced solely emergency visits or rehabilitation or geriatric evaluation in the hospital setting but were not admitted to the hospital subsequently were excluded. Emergency presentations prior to the index hospitalisation were also excluded. Observation periods or exposure times were calculated as the time from the date of the index admission through June 2017 for included individuals. Rates and total days as an inpatient following the index admission were estimated. Results are also reported for specific types of hospitalisation that included (1) admission for any reason, including rehabilitation or mental health episodes, (2) acute hospital admissions, (3) overnight hospital admissions in which the patient stayed more than 24 h, (4) emergency admissions following an emergency presentation at the same hospital and (5) fall-related and fracture-related hospitalisations identified by ICD-10 codes for those injuries. The total length of stay was also divided into time spent as a patient in acute medical/surgical care and time spent in rehabilitation or geriatric evaluation and management (GEM).

A number of socio-demographic characteristics, several of which have been recoded, are used to describe the clinical cohorts. First, age was divided into three categories: less than or equal to 34 years, 35–54 years and 55–64 years. The individual's relative socio-economic advantage was measured using the Index of Relative Socioeconomic Advantage and Disadvantage (IRSAD) based on an individual's postcode at index admission (Australian Bureau of Statistics, 2011). IRSAD combines a number of household economic and social measures, including both relative socio-economic advantage and disadvantage, into a summative index grouping postcodes into 10 equal-sized regional deciles with the most disadvantaged region having the lowest score and the least disadvantaged region having the highest score. Comorbidities at an individual's index admission were coded using the Elixhauser method as modified in Quan et al. (2005) and Elixhauser et al. (1998). Potentially preventable hospital admissions were identified as admissions for a condition where the hospitalisation could have potentially been prevented through the provision of appropriate preventative health interventions and early disease management using the Australian Institute of Health and Welfare (AIHW) definition (AIHW, 2015).

2.2 | Data analysis

In this paper, we present descriptive statistics for baseline demographics and hospitalisations of the three clinical cohorts for those using RAC and those in the community.

Length of stay (LOS) in a hospital or ED is reported using the median and interquartile range [IQR], while the number of hospital admissions and ED presentations was presented descriptively for the three cohorts as rates per person-years. All results are meant to be explorative in describing the characteristics of the different cohorts identified within these data.

3 | RESULTS

3.1 | Demographic and clinical characteristics of cohorts (CVA, TBI and MS)

A total of 11,449 unique records for young Australians, aged between 18 and 64 years, with at least one primary admission for CVA ($N = 5411$), TBI ($N = 2419$) or MS ($N = 3675$) between July 2014 and June 2017 were identified. Those individuals experienced a total of 72,056 hospital admissions; of which 60,607 admissions were subsequent to their initial index admissions, with an average observation period for individuals of 20 months since index admission (SD 11 months). Of the 5411 individuals with at least one primary admission for CVA, analyses excluded 1888 (34.9%) who had brief hospitalisation stays under 4 days with a discharge home and 346 (6.4%) who died during their index hospitalisation, leaving a total of 3177 individuals for whom analyses are described. Among those living with TBI, the analytic sample excluded 931 individuals (38.5%) who had brief hospitalisations under 4 days with a discharge home and 160 who died during their index admission, leaving an analytic sample of 1328 individuals living with TBI. Among those living with MS, the sample excluded six individuals who died during their index hospitalisation, leaving a total of 3669 individuals in this cohort. These cohorts included 116 (or 3.7%) RAC users among those living with CVA, 39 (or 2.9%) RAC users among those living with TBI and 97 (or 2.6%) RAC users among those living with MS.

Table 1 describes the demographic and clinical characteristics of the cohorts living with CVA, TBI and MS. Across all three clinical cohorts, a larger proportion of RAC users were more likely to be older, between the ages of 55 and 65, and more likely to be male than those in the community. Among those living with CVA, those using RAC were more likely to be from the least advantaged geographic areas, while for both cohorts living with TBI and MS, those in the community were slightly more likely to come from the least advantaged areas. RAC users were also more likely to have comorbidities than those in the community. Finally, across all three clinical cohorts, RAC users were more likely to be patients in public hospitals than those in the community.

Table 2 presents characteristics of the hospital episodes for RAC users and community dwellers within each cohort. For those living with CVA or TBI, hospital admissions were more frequent among those in RAC; RAC users with CVA experienced a rate of 6.3 hospitalisations per year compared to a rate of 2.7 hospitalisations for those with CVA in the community. Likewise, for TBI, RAC users experienced 4.3 hospitalisations on average per year compared to 1.9 hospitalisations per year for those in the community. For the MS cohort, those in the community had more hospitalisations per year than RAC users (2.6 episodes per year for RAC users compared to 5.3 for those in the community), although very few hospitalisations were either overnight (0.58 for those in the community and 1.97 for RAC users) or emergency admissions (0.36 for those in the community and 1.5 among RAC users).

In all three cohorts, RAC users had more overnight hospitalisations per year (3.2 per year for both CVA and TBI and 2.0 for MS) than those in the community (1.2 per year for CVA and TBI and 0.58 for MS). For acute hospitalisations, those living with CVA or TBI who were RAC users experienced hospitalisations more frequently (4.9 per year for CVA and 3.2 for TBI) than those living in the community (2.2 for CVA and 1.4 for TBI), whereas among those living with MS, those in the community were more likely to have acute hospitalisations (3.2 hospitalisations per year for RAC users and 5.2 for those in the community).

Across all three cohorts, those using RAC were more likely to have adjoining emergency admissions than those in the community. Among those living with CVA, the rate of hospitalisations that included emergency stays was 1.74 among RAC users and 0.62 for those within the community. Within the TBI cohort, the rates for RAC users and those in the community were 2.65 and 0.63 respectively and among those living with MS, the rates were 1.5 and 0.36, respectively, for RAC users and those living in the community. Similarly, for all cohorts, those using RAC were more likely to have fall-related hospitalisations than those in the community although the probability of experiencing a fall-related hospitalisation was relatively low (for those with CVA, 0.44 fall-related events per year occurred among RAC users while 0.06 events per year occurred for those in the community, and the comparison rates for TBI were 1.3 and 0.22 and for MS, 0.12 and 0.03). For the cohorts with CVA and MS, those using RAC also had more fracture-related hospitalisations than those in the community even though these numbers are small in general. Fracture-related hospitalisations occurred at a rate of 0.13 among RAC users vs. 0.02 in the community for those living with CVA; 0.07 among RAC users vs. 0.02 in the community for those living with MS, and among those living with TBI, rates of fracture-related hospitalisations were relatively close---0.28 among RAC users compared to 0.23 for those in the community. It should be noted that hospitalisations attributable to fractures were relatively infrequent across all three cohorts.

The average length of stay during hospitalisation was longer for those using RAC (19.61 days for CVA cohort, 15.49 days for TBI cohort and 12.22 for MS cohort) compared to those in the community (6.16 days, 4.54 days and 7.01 days, respectively). Across all three cohorts, the length of stay for rehabilitation and geriatric evaluation and management also lasted longer for those using RAC than in the community. Finally, those using RAC experienced fewer Emergency Department (ED) presentations than those in the community, although the number of hours spent in ED was longer for those using RAC than for those in the community.

TABLE 1 Baseline characteristics of younger Australians, aged 18–64 years, presenting with a primary diagnosis of CVA, TBI or MS

	CVA		TBI		MS	
	RAC user (*N* = 116)	In community (*N* = 3061)	RAC user (*N* = 39)	In community (*N* = 1289)	RAC user (*N* = 97)	In community (*N* = 3572)
Age category, *n* (%)						
<35 years	1 (0.9)	253 (8.3)	0 (0.0)	456 (35.4)	0 (0.0)	961 (26.9)
35–54	29 (25.0)	1345 (43.9)	14 (35.9)	501 (38.9)	45 (46.4)	2001 (46.4)
55–64	86 (74.1)	1463 (47.8)	25 (64.1)	332 (25.8)	52 (53.6)	610 (17.1)
Female, *n* (%)	43 (37.1)	1280 (41.8)	9 (23.1)	324 (25.1)	59 (60.8)	2644 (74.0)
Prefer English, *n* (%)	108 (93.1)	2752 (89.9)	38 (97.4)	1205 (93.5)	89 (91.8)	3326 (93.8)
Socio-economic status (IRSAD), *n* (%)						
Most disadvantaged	5 (4.3)	198 (6.05)	2 (5.1)	76 (5.9)	8 (8.2)	155 (4.3)
Decile 2	12 (10.3)	177 (5.8)	2 (5.1)	65 (5.0)	8 (8.2)	137 (3.8)
Decile 3	6 (5.2)	108 (3.5)	2 (5.1)	38 (2.9)	6 (6.2)	118 (3.3)
Decile 4	6 (5.2)	140 (4.6)	0 (0.0)	76 (5.9)	2 (2.1)	176 (4.9)
Decile 5	13 (11.2)	310 (10.1)	3 (7.7)	120 (9.3)	7 (7.2)	278 (7.8)
Decile 6	16 (13.8)	329 (10.7)	3 (7.7)	156 (12.1)	12 (12.4)	429 (12.0)
Decile 7	19 (16.4)	520 (17.0)	3 (7.7)	197 (15.3)	15 (15.5)	571 (16.0)
Decile 8	19 (16.4)	423 (13.8)	3 (7.7)	177 (13.7)	10 (10.3)	548 (15.3)
Decile 9	15 (12.9)	511 (16.7)	13 (33.3)	218 (16.9)	18 (18.6)	707 (19.8)
Least disadvantaged	5 (4.3)	336 (11.0)	8 (20.5)	151 (11.7)	11 (11.3)	452 (12.7)
Patient type, *n* (%)						
Public	100 (86.2)	2258 (73.8)	32 (82.1)	646 (50.1)	77 (79.4)	2335 (65.4)
Private	13 (11.2)	709 (23.2)	5 (12.8)	138 (10.7)	18 (18.6)	1136 (31.8)
Compensable	0 (0.0)	33 (1.3)	2 (5.1)	491 (38.1)	1 (1.0)	70 (2.0)
DVA	2 (1.7)	9 (0.3)	0 (0.0)	2 (0.2)	1 (1.0)	18 (0.5)
Ineligible	1 (0.9)	52 (1.7)	0 (0.0)	12 (0.9)	0 (0.0)	13 (0.4)
No. of comorbidities[a], *n* (%)						
0	5 (4.3)	572 (18.7)	4 (10.3)	518 (40.2)	63 (64.9)	3216 (90.0)
1	25 (21.6)	842 (26.9)	8 (20.5)	418 (32.4)	24 (24.7)	280 (7.8)
2	32 (27.6)	776 (25.4)	15 (38.5)	178 (13.8)	3 (3.1)	56 (1.6)
≥3	54 (46.6)	889 (29.0)	12 (30.8)	175 (13.6)	7 (7.2)	20 (0.6)
Most common comorbidities[a], *n* (%)						
Alcohol abuse	18 (15.5)	129 (4.2)	10 (25.6)	187 (14.5)	1 (1.0)	11 (0.3)
Cardiac arrhythmia	22 (19.0)	408 (13.3)	8 (20.5)	153 (11.9)	0 (0.0)	40 (1.1)
Depression	4 (3.4)	73 (2.4)	0 (0.0)	0 (0.0)	6 (6.2)	27 (0.8)
Diabetes, uncomplicated	12 (10.3)	278 (9.1)	5 (12.8)	69 (5.4)	3 (3.1)	51 (1.4)
Diabetes, complicated	27 (23.3)	375 (12.3)	2 (5.1)	55 (4.3)	5 (5.2)	38 (1.1)
Fluid & electrolyte disorder	34 (29.3)	592 (19.3)	16 (41.0)	334 (25.9)	13 (13.4)	92 (2.6)
Liver disease	10 (8.6)	131 (4.3)	13 (33.3)	89 (6.9)	2 (2.1)	18 (0.5)
Hypertension	34 (29.3)	834 (27.2)	0 (0.0)	3 (0.2)	1 (1.0)	25 (0.7)
Other neurological cond	38 (32.8)	686 (22.4)	8 (20.5)	122 (9.5)	NA	NA
Paralysis	65 (56.0)	1276 (41.7)	6 (15.4)	50 (3.9)	10 (10.3)	40 (1.1)
Weight loss	16 (13.8)	116 (3.8)	5 (12.8)	82 (6.4)	2 (2.1)	25 (0.7)

Abbreviation: IRSAD, Index of Relative Socio-economic Advantage and Disadvantage, Department of Veteran Affairs.

[a]Based on the Elixhauser comorbidity method (Quan et al., 2005).

3.2 | Potentially preventable hospital admissions

The most common reasons for potentially preventable hospitalisations among RAC users from all three clinical cohorts are presented in Table 3. There were a total of 1125 potentially preventable admissions for RAC users during the study period. These emergency admissions to the hospital were attributable to 1792 unique individuals. RAC users were disproportionately more likely to experience potentially preventable hospitalisations; while only 3% of those in the clinical cohorts were using RAC, 12.4% of all potentially preventable hospitalisations were among those using RAC. The most common reasons for potentially preventable hospitalisations are listed in Table 3 and illustrate the extent of comorbidities and complexity in the care for the chronic needs of RAC users among younger adults. Several key co-morbid health conditions, such as diabetes, iron deficiencies and congestive heart failure reflect conditions that require regular routine monitoring and management for optimal outcomes, while more immediate health complications, such as seizures, ulcers, dehydration, urinary tract infections and cellulitis reflect changes in health status that should be reviewed carefully for possible treatment in RAC before transfer to the hospital.

4 | DISCUSSION

This study is the first of which we are aware that examines hospitalisation rates and length of stay for younger adults using RAC compared to those in the community. Previous research has examined the use of RAC for specific clinical conditions; for example, those with MS using RAC have had more complex physical needs than those with MS living in the community (Buchanan et al., 2003; Thorpe et al., 2015), while previous research for those

TABLE 2 Hospital utilisation following index admission for younger people (aged 18–64 years) presenting with a primary diagnosis of CVA, TBI or MS

	CVA		TBI		MS	
	RAC user (*N* = 116)	In community (N = 3061)	RAC user (*N* = 39)	*In community* (*N* = 1289)	RAC user (*N* = 97)	*In community* (*N* = 3572)
Observation years	208	4728	74	1869	214	7017
Rate per person year						
Hospital admissions						
Hospital admissions	6.26	2.65	4.34	1.88	3.62	5.34
Total length of stay (in days)	80.58	18.67	83.03	21.24	28.54	8.95
Overnight hospital admissions	3.18	1.17	3.23	1.17	1.97	0.58
Acute hospital admissions	4.91	2.24	3.23	1.37	3.22	5.24
Emergency admissions	1.74	0.62	2.65	0.63	1.50	0.36
Fall related admissions[a]	0.44	0.06	1.32	0.22	0.12	0.03
Fracture related admissions	0.13	0.02	0.23	0.28	0.07	0.02
Total acute length of stay (in days)	19.61	6.16	15.49	4.54	12.22	7.01
Rehab/GEM length of stay (in days)	53.61	11.85	48.43	15.41	5.62	1.84
Emergency department presentations						
Numb. ED presentations	0.96	1.04	0.95	0.44	0.56	0.28
Avg. length of ED stay	0.54 h	0.52 h	1.62 h	1.05 h	19.8 h	7.0 h

Abbreviation: GEM, Geriatric Evaluation and Management Program.

[a]ICD-10-AM codes for history of falls: W00, W01-10, W13-15 W17-19.

TABLE 3 Most common reasons for potentially preventable hospital admissions, for people (aged 18–64 years) who presented with a primary diagnosis of CVA, TBI or MS, during the observation period

Cerebral vascular accident	Traumatic brain injury	Multiple sclerosis
Diabetes	Seizures	Urinary tract infection
Seizures	Diabetes	Dehydration
Ulcer	Other vaccine-preventable conditions	Cellulitis
Dehydration	Ulcer	Ulcer
Urinary tract infection	Iron deficiency	Congestive heart failure
Cellulitis	Cellulitis	Diabetes

living with TBI found that those using RAC were more likely to experience multiple hospitalisations than those in a community setting (Harvey et al., 2017). These existing studies examined overall rates of hospitalisation among younger adults using RAC but did not use data from across clinical cohorts and did not have detailed data on differences in rates and length of stay over time for those using RAC and in the community; these previous studies also have not examined the most common reasons for hospitalisation in these clinical cohorts. This study identified that leading reasons for hospitalisations among younger adults in RAC included complex comorbidities (including diabetes and congestive heart failure) and substantial changes in health status (including seizures, ulcers, dehydration and cellulitis) for which hospitalisations are potentially preventable.

The study identified that among young adults living with CVA and TBI, those using RAC experienced more hospitalisations than those in the community, while among those living with MS, those using RAC had fewer hospitalisations than those living in the community. This contrasts with previous work on hospitalisations for adults with these conditions, which has tended to group all adults together to study reasons for hospital admissions and have not addressed the needs specifically of younger adults using RAC (Büchele et al., 2016). While this could be a focus for future research, our findings suggest that even when comparing hospitalisations among those with the same chronic conditions, the younger adults using RAC require more hospitalisations, for which RAC staff may need to work with acute care providers to address.

We believe that these results can inform development of housing and support options for younger adults currently using RAC by highlighting which complex needs lead to hospitalisations. For those living with MS, the higher rate of hospitalisations among those in the community compared to RAC users, largely for general short-term admissions, probably reflects the fact that MS is a progressive disease and within this cohort, hospitalisations may be used more commonly for treatment and response to exacerbations. The design of health and disability supports needs to be sensitive to the health conditions of these younger adults. Those living with MS appear to have substantially different health needs than those living with either CVA or TBI. Those living with CVA and TBI have higher rates of hospitalisation among those using RAC across all types of hospital episodes, which may reflect different needs for those using RAC with these clinical conditions or that RACs may be more likely to transfer younger adults for the care of a range of clinical conditions. Further research should explore whether such conditions would be more appropriately treated in the primary health care setting.

This study found that across clinical cohorts, the average length of stay for hospitalisations was longer for those using RAC (when considering either in-hospital days or hours spent in the Emergency Department) compared to those living in the community. There are a number of potential explanations for why those using RAC experience longer lengths of stay on average, including that those using RAC may have more complex needs than those living in the community and additional time is needed for any number of reasons that may include organising staff, equipment and services or arranging transportation for those in RAC, which can delay placement. More generally, younger adults in RAC may face difficulties getting the care they need and that could lead to longer hospitalisations compared to younger adults in the community, and this aspect requires further research.

This study used population-level administrative data to identify rates and types of hospitalisation within clinical cohorts of CVA, TBI and MS and to make comparisons among younger Australians using RAC and those living in the community. Given the relatively low incidence of RAC use among younger adults, using the large administrative data set allowed us to perform analyses within clinical cohorts of CVA, TBI and MS. These data also allowed us to identify sizeable groups of younger Australians using RAC and those living in the community. To identify appropriate comparable groups of younger adults, the analytic data set was created using the full set of hospitalisation data within Victoria to identify cases for comparison and contrast. We chose to limit index hospitalisations in the cohorts living with CVA and TBI to those with stays over 4 days in order to identify comparable populations of those using RAC and those in the community who had extended illnesses that could lead to RAC use. This assumption could be tested in more extended studies of RAC and community cohorts.

Furthermore, there are some limitations to our approach of using administrative data. First, while the use of hospital admission data sets ensured that there was substantial data on the clinical cohorts using RAC, the quality and completeness of the data were not directly under the researchers' control. Furthermore, the use of administrative data limited how much the use of RAC could be explored. While data were available on discharge destination for each hospital admission, the reason for the transfer was not. We could not identify RAC users who were permanently living in residential care separate from those who were transferred to RAC as an interim option. Consequently, we focused more generally on individuals known to have used RAC during the study period. It should be noted that there were some individuals within the data set who seemed to transition frequently between RAC and home. In addition, data from the VAED and VEMD are released with restricted date fields to month and year, which could not be used to directly link emergency care episodes and hospital admissions. We have presented unadjusted rates of use for both emergency care and inpatient hospital care and further research should include potential confounders such as age and sex and also link the data to identify how frequently emergency care led to lengthier hospitalisations.

5 | CONCLUSION

These results support findings from previous studies that younger adults using RAC have more complex healthcare needs and more severe disease progression than younger adults in these cohorts who reside in the community (Oliver et al., 2020). In addition, we found that RAC users among younger adults with complex

chronic conditions are at a higher risk of potentially preventable hospitalisation.

At the same time, differences were found by clinical condition with TBI and CVA cohorts having higher rates of hospitalisation among those using RAC compared to those in the community, while within the cohort living with MS, those in the community have a higher rate of hospitalisation. Furthermore, the MS cohort experienced twice as many hospitalisations as the other two cohorts, specifically for short-term non-emergency stays, which may reflect the use of hospital care for routine and short-term management of disease progression. The support provided to younger adults should distinguish those with MS, who frequently use short-stay non-emergency hospitalisations in care, from those with a high level of disability from TBI and CVA. While the Australian government has committed to a strategic plan for reducing the number of younger adults in RAC, very little is known about the specific health support needs of those at risk of admission to RAC. This study describes hospitalisations among younger people using RAC and those in the community with similar health issues; in order for community-based housing and support options to be sustainable future comparisons should review whether shifting younger people away from RAC impacts subsequent hospital use.

AUTHOR CONTRIBUTIONS

Study conceptualisation: all authors; Data curation: MB, PC, RMo, RMu, VM and SES; Formal analysis: RMo and SES; Funding acquisition: PC, RMo and SES; Investigation: MB, PC, JBH, RMo, RMu, VM and SES; Methodology: PC, JBH, RMo and SES; Project administration: PC, RMo and DW; Resources: MB, PC, RMo, RMu, SES and DW; Manuscript drafting: JBH, RMo and SES; Review, revisions and approval of the manuscript: all authors.

ACKNOWLEDGEMENTS

Early results from this study were presented at the HSRAANZ International Meeting, December 2019 in Auckland, NZ. This project was funded by the Summer Foundation of Australia. Open access publishing facilitated by Monash University, as part of the Wiley - Monash University agreement via the Council of Australian University Librarians.

CONFLICT OF INTEREST

None of the authors had conflicts.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analysed in this study.

TRIAL REGISTRATION

Not applicable here.

REFERENCES

AIHW. (2015). National Healthcare Agreement: PI 18-Selected potentially preventable hospitalisations. Retrieved from https://meteor.aihw.gov.au/content/index.phtml/itemId/559032

AIHW. (2021). *GEN fact sheet June 2021: Younger people in residential aged care*. Australian Institute of Health and Welfare. Retrieved from https://www.gen-agedcaredata.gov.au/www_aihwgen/media/2020-21-YPIRAC/YPIRAC-fact-sheet-30-June-2021-PDF.pdf.

Australian Bureau of Statistics. (2011). *Socio-economic indexes for areas (SEIFA): Technical Paper* (2033.0.55.001). Retrieved from Canberra, ACT

Barry, S., Knox, L., & Douglas, J. (2018). "Time's up": The experience of entering residential Aged Care for Young People with acquired neurological disorders and their families. *Brain Impairment*, *20*, 37–48. https://doi.org/10.1017/BrImp.2018.13

Buchanan, R. J., Wang, S., Tai-Seale, M., & Ju, H. (2003). Analyses of nursing home residents with multiple sclerosis and depression using the minimum data set. *Multiple Sclerosis Journal*, *9*(2), 171–188. https://doi.org/10.1191/1352458503ms872oa

Büchele, G., Rapp, K., König, H. H., Jaensch, A., Rothenbacher, D., Becker, C., & Benzinger, P. (2016). The risk of hospital admission due to traumatic brain injury is increased in older persons with severe functional limitations. *Journal of the American Medical Directors Association*, *17*(7), 609–612. https://doi.org/10.1016/j.jamda.2016.02.032

Cameron, C., Pirozzo, S., & Tooth, L. (2001). Long-term care of people below age 65 with severe acquired brain injury: Appropriateness of aged care facilities. *Australian and New Zealand Journal of Public Health*, *25*, 261–264. https://doi.org/10.1111/j.1467-842x.2001.tb00574.x

Dwyer, R., Gabbe, B., Stoelwinder, J. U., & Lowthian, J. (2014). A systematic review of outcomes following emergency transfer to hospital for residents of aged care facilities. *Age and Ageing*, *43*, 759–766. https://doi.org/10.1093/ageing/afu117

Dwyer, R., Stoelwinder, J., Gabbe, B., & Lowthian, J. (2015). Unplanned transfer to emergency departments for frail elderly residents of Aged care facilities: A review of patient and organizational factors. *Journal of the American Medical Directors Association*, *16*(7), 551–562. https://doi.org/10.1016/j.jamda.2015.03.007

Elixhauser, R. A., Steiner, M. C., Harris, M. D., & Coffey, M. R. (1998). Comorbidity measures for use with administrative data. *Medical Care*, *36*, 8–27. https://doi.org/10.1097/00005650-199801000-00004

Fan, L., Hou, X. Y., Zhao, J., Sun, J., Dingle, K., Purtill, R., Tapp, S., & Lukin, B. (2016). Hospital in the Nursing Home program reduces emergency department presentations and hospital admissions from residential aged care facilities in Queensland, Australia: A quasi-experimental study. *BMC Health Services Research*, *16*, 46. https://doi.org/10.1186/s12913-016-1275-z

Fries, B. E., Wodchis, W. P., Blaum, C., Buttar, A., Drabek, J., & Morris, J. N. (2005). A national study showed that diagnoses varied by age group in nursing home residents under age 65. *Journal of Clinical Epidemiology*, *58*, 198–205. https://doi.org/10.1016/j.jclinepi.2004.07.001

Harvey, L. A., Mitchell, R., Brodaty, H., Draper, B., & Close, J. C. (2017). Comparison of fall-related traumatic brain injury in residential aged care and community-dwelling older people: A population-based study. *Australasian Journal on Ageing*, *36*(2), 144–150. https://doi.org/10.1111/ajag.12422

NDIS. (2020a). *NDIS QR Q4 201920 Full Report PDF*. Retrieved from https://www.ndis.gov.au/about-us/publications/quarterly-reports.

NDIS. (2020b). *Younger people in residential aged care: Strategy 2020–2025*. Retrieved from https://www.dss.gov.au/disability-and-carers-programs-services-for-people-with-disability-younger-people-with-disability-in-residential-aged-care-initiative/younger-people-in-residential-aged-care-strategy-2020-25.

Oliver, S., Gosden-Kaye, E., Jarman, H., Winkler, D., & Douglas, J. (2020). A scoping review to explore the experiences and outcomes of younger people with disabilities in residential aged care facilities. *Brain Injury*, *34*, 1446–1460. https://doi.org/10.1080/02699052.2020.1805124

Ouslander, J. G., Bonner, A., Herndon, L., & Shutes, J. (2014). The interventions to reduce acute care transfers (INTERACT) quality improvement program: An overview for medical directors and primary care clinicians in long term care. *Journal of the American Medical Directors Association*, *15*(3), 162–170. https://doi.org/10.1016/j.jamda.2013.12.005

Quan, D. H., Sundararajan, A. V., Halfon, E. P., Fong, A. A., Burnand, A. B., Luthi, A. J.-C., Saunders, L. D., Beck, C. A., Feasby, T. E., & Ghali, A. W. (2005). Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. *Medical Care*, *43*, 1130–1139. https://doi.org/10.1097/01.mlr.0000182534.19832.83

Royal Commission into Aged Care Quality and Safety. (2021). *Royal Commission into Aged care quality and safety final report: Care, Dignity and Respect*. Retrieved from https://agedcare.royalcommission.gov.au/sites/default/files/2021-03/final-report-volume-1_0.pdf

Smith, B., & Caddick, N. (2015). The impact of living in a care home on the health and wellbeing of spinal cord injured people. *International Journal of Environmental Research and Public Health*, *12*, 4185–4202. https://doi.org/10.3390/ijerph120404185

State of Victoria. (2015). *Victorian Admitted Episodes Dataset (VAED) manual: 25th edition 2015–16*. Retrieved from Melbourne: www.health.vic.gov.au/hdss/vaed/index.htm

Thorpe, L. U., Knox, K., Jalbert, R., Hyun-Ja Lim, J., Nickel, D., & Hader, W. J. (2015). Predictors of institutionalization for people with multiple sclerosis. *Disability and Health Journal*, *8*(2), 271–277. https://doi.org/10.1016/j.dhjo.2014.10.002

Winkler, D., Farnworth, L., & Sloan, S. (2006). People under 60 living in aged care facilities in Victoria: [the placement of young people in aged care is a social injustice that needs urgent attention.]. *Australian Health Review*, *30*, 100–108. https://doi.org/10.1071/AH060100

Winkler, D., Sloan, S., & Callaway, L. (2010). People under 50 with acquired brain injury living in residential Aged care. *Brain Impairment*, *11*, 299–312. https://doi.org/10.1375/brim.11.3.299

How to cite this article: Banaszak-Holl, J., Morello, R., Soh, S.-E., Cameron, P., Brown, M., Mitsch, V., Moubarak, R., & Winkler, D. (2022). Do young people with neurological conditions in residential aged care use hospitals differently than those in the community? Evidence from Victorian hospital data, 2014–2017. *Health & Social Care in the Community*, *30*, e5907–e5915. https://doi.org/10.1111/hsc.14022