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Exploring community mental health service use following hospital-treated intentional self-harm among older Australians: a survival analysis

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ABSTRACT

Objectives: This study aimed to examine the impact of community mental health (CMH) care following index hospital-treated intentional self-harm (ISH) on all-cause mortality. A secondary aim was to describe patterns of CMH care surrounding index hospital-treated ISH.

Design: A longitudinal whole-of-population record linkage study was conducted (2014–2019), with index ISH hospitalization (Emergency Department and/or hospital admissions) linked to all available hospital, deaths/cause of death, and CMH data.

Setting: Australia's most populous state, New South Wales (NSW) comprised approximately 7.7 million people during the study period. CMH services are provided statewide, to assess and treat non-admitted patients, including post-discharge review.

Participants: Individuals with an index hospital presentation in NSW of ISH during the study period, aged 45 years or older.

Intervention: CMH care within 14 days from index, versus not.

Measurements: Cox-proportionate hazards regression analysis evaluated all-cause mortality risk, adjusted for relevant covariates.

Results: Totally, 24,544 persons aged 45 years or older experienced a nonfatal hospital-treated ISH diagnosis between 2014 and 2019. CMH care was received by 56% within 14 days from index. Survival analysis demonstrated this was associated with 34% lower risk of death, adjusted for age, sex, marital status, index diagnosis, and 14-day hospital readmission (HR 0.66, 95% CI 0.58, 0.74, $p < 0.001$). Older males and chronic injury conveyed significantly greater risk of death overall.

Conclusions: CMH care within 14 days of index presentation for self-harm may reduce the risk of all-cause mortality. Greater effort is needed to engage older males presenting for self-harm in ongoing community mental health care.

Key words: intentional self-harm, healthcare utilization, data linkage, older persons, community mental healthcare, survival

Introduction

Age-specific suicide rates in Australia are highest among individuals over the age of 45 years. In 2022, the highest increase in suicide rates was reported in males aged 55–64 years, in 2021, the highest rate was for males aged 85 years and over (Australian Institute of Health and Welfare, 2022). Females aged 45–49 years represent a second peak in lifetime rates of sex- and age-specific hospitalizations for intentional self-harm (ISH), after their first peak in young adulthood (Australian Institute of Health and Welfare, 2020). Nonfatal ISH is relatively steady for all ages in males (Australian Institute of Health and Welfare, 2020). Higher rates of fatal intent in ISH have been reported

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in those aged over 60 years compared with younger persons, and a greater proportion of non-fatal ISH outcome has been described for females, compared with males (Hawton and Harriss, 2008).

Among people with psychiatric disorders, mortality has been shown to be up to 10-fold higher from physical disorders as it has from suicide (Kisely *et al.*, 2014). Australian research findings identified mandatory community-based mental health treatments among an inception cohort of people with psychiatric disorder to significantly reduce all-cause mortality up to 3 years following index presentation (Steve *et al.*, 2013).

The role of community mental health (CMH) care in reducing rates of suicidal behaviors has been previously explored (Boulet *et al.*, 2022, Lapierre *et al.*, 2011, Okolie *et al.*, 2017, Rihmer *et al.*, 1995, Vasiliadis *et al.*, 2015); however, access to CMH care is not consistent. The quality and consistency of healthcare are known to contribute to poor health and excess mortality among people with mental disorders (Druss *et al.*, 2010). When able to be provided in a timely manner following ISH, there is evidence that it is a crucial point for early intervention for suicidal ideation, particularly within male populations and older ages where suicidality may not be so explicit (Almeida *et al.*, 2012, De Leo *et al.*, 2013, Deisenhammer *et al.*, 2007, Schou Pedersen *et al.*, 2019).

Emergency departments are often not ideal places to provide mental health care, and their primary focus often being the physical treatment for the consequences of the self-harm. The first priority is to stabilize the patient's physiology, which may require hospital admission. Treating clinician referrals to CMH care from the Emergency Department or hospital inpatient ward prior to discharge are vital, with care coordination and follow-up more likely to ensure engagement. Older adults attending ED's more frequently report social disconnection than their younger counterparts (Kandasamy *et al.*, 2018); in rural areas both social isolation and poorer access to high-quality CMH care can further impair outcomes (Lecamwasam *et al.*, 2022).

The primary aim of the study was to examine the impact of CMH care following index hospital-treated ISH on all-cause mortality and measure the impact of age by comparing the middle-aged (45–64), young-old (65–85) and "old" old (85 +). A secondary aim was to describe patterns of CMH care surrounding index hospital-treated ISH.

Methods

We included presentations for ISH by people aged 45 years or older to any NSW ED or hospital inpatient department ("hospital treated") with an arrival date between January 1, 2014, and December 31, 2019. A longitudinal whole of population-level dataset was analyzed to examine patterns of CMH care prior to and following a hospital-treated, nonfatal index episode of ISH among people aged 45 years or older in NSW and all-cause mortality during the study period following index ISH. As the data were longitudinal and contained any presentation to hospital for any reason during the time period, as long as they had at least one episode of ISH, where there was more than one episode for an individual, the index was taken as the first occurring in chronological order. Day only admissions for psychiatric care were not included in the count of psychiatric hospital admissions following ISH. Using a unique person identifier allocated by the NSW Centre for Health Record Linkage, we sequentially linked records at the individual level across the Admitted Patient Data Collection (APDC), Emergency Department Data Collection (EDDC), Cause of Death Unit Record File (CODURF), Registry of Births, Deaths, and Marriages (RBDM), and CMH datasets.

Data collection and cleaning

Data were cleaned using *SAS Enterprise Guide* (v7.1). See Supplementary 1 for a full description of data cleaning. The APDC and EDDC datasets were used to identify all individuals aged 45 years or older with an index event of hospital-treated, nonfatal ISH in NSW, occurring during the study period (Supplementary 2). Hospital-treated ISH incidents were identified using two methods, given the fact that ED diagnosis codes alone have low sensitivity for detecting suicidal thoughts or behaviors. First, standard self-harm codes (X60-X84, Y87.0) were extracted using International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD10-AM) – an international system used to classify diseases, injuries, and related health problems (Australian Consortium for Classification Development, 2017). Suicidal ideation was identified by the ICD-10-AM code R45.81. Second, NSW Health adopts an enhanced system for routine reporting of self-harm or suicidal ideation presentations (Sara *et al.*, 2023). Systematized Nomenclature of Medicine Clinical Terms (SNOMED) terms were first transformed to ICD10-AM codes using mapping tables supplied by the Australian Digital Health Agency, and further codes denoting self-harm were added by NSW Health. These additional diagnostic codes covered specific substances often used in deliberate self-harm (paracetamol, sedatives, and antidepressants) as an

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indication of self-poisoning. Additionally, this method used regular expressions such as "self-harm," "suicidal," or "overdose" across the presenting problem text. Self-harm and suicidal ideation presentations identified in these ways were considered as a single category, as they both have significant association with suicide and also require CMH assessment and intervention (Large *et al.*, 2021).

Given ED patient records do not record the external cause codes from the ICD10-AM dictionary, whereas the admitted patient records do, the principal diagnosis given within the ED dataset was used to classify the main reason for admission for ED only presentations, and the APDC dataset used to classify the same for admitted persons.

Measurements

The index data were evaluated to describe the cohort, using demographic characteristics isolated at the index series including age category at index (45–64, 65–84, and 85 +), sex (male or female), Indigenous status which included Aboriginal and/or Torres Strait Islander (yes or no), marital status (never married, married/defacto, divorced, widowed, and unknown), and principal diagnosis at index ISH presentation, derived using ICD10-AM and SNOMED codes (poisoning, mental disorder/suicidal ideation, injury, substance use, chronic condition, and other/missing). Chronic conditions included cancer, neurodegenerative disorders such as Parkinson's disease, gastrointestinal disorders such as alcoholic liver disease, and cardiac conditions such as cardiomyopathy. ICD10-AM codes used to identify chronic conditions are included in Supplementary 3.

Key outcome measures were all-cause death following (but not including) index presentation, identified by linking the CODURF and RBDM data (Supplementary 4), CMH presentation within 14 days following index and hospital (ED or inpatient), readmission within 14 days following index. Survival was determined when persons had no RBDM/CODURF record in the study period, and all persons remaining alive on December 31, 2019, were right censored.

The underlying cause of death was extracted from ICD-10 codes listed as cause of death in CODURF datasets; for this study, we considered mortality from all causes, not just suicide mortality.

Statistical analysis

All statistical analyses were conducted using STATAv17 (STATACorp, 2017). We calculated descriptive statistics for all measures and compared crude differences between the groups of interest, namely those who received CMH care within 14 days of index ISH presentation with those who did not. Pearson's chi-squared test of independence was used to determine p-value statistics for binary or categorical variables, concordant with appropriate data sizes. The rank-sum (Mann–Whitney U) test was used to compare two independent groups of numerical data with non-normal distributions. The statistical significance level for all tests of association was set at $p = 0.05$. Longitudinal data was used to derive history of CMH care prior to index ISH hospitalization, as well as derive the grouping variable for the survival analysis: CMH within 14 days from index or not (1, 0). The data were set up for survival analysis utilizing the *stset* function to specify the time variable and censoring information in a survival analysis.

Cox proportional hazards (PH) regression analysis was used in survival analysis to investigate the relationship between the predictor variables and the time until death from any cause following the index ISH hospital attendance. We used the Breslow method to handle tied event times in this model. The Breslow method assigns a weight to each individual at the time of an event, based on the number of individuals at risk just before the time, then using these weights to calculate the partial likelihood, which is used in the Cox PH regression model. As a regression assumption this was evaluated using the Schoenfeld goodness-of-fit test to examine whether the residuals of the Cox PH model were independent of time. Variables entered into the first iteration of the Cox PH regression model were attendance at CMH services within 2 weeks of index discharge, sex, age category in years at index, marital status at index, principal diagnosis at index, readmission within 14 days from index, and previously known to CMH care. The Bayesian Information Criterion (Dziak *et al.*, 2020) (BIC) was used to compare the different Cox PH models in terms of their goodness-of-fit and complexity. The BIC is based on the maximization of the likelihood function and considers the number of parameters in the model and the sample size. The variable removed in the most parsimonious model according to the BIC was "previously known to CMH care."

Results

Index ISH events

There were 24,544 persons aged 45 years and over identified with an index event of ISH (not ending in death), occurring between 2014 and 2019 inclusive. There were slightly more males than females, and the age category 45–64 years represented the majority of cases; and 5.1% ($n = 1,255$) of persons under study were aged 85 years and older. Under

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half required hospital admission at index ($n = 10{,}404$, 42.4%), and of these, 3248 (31.2%) within a psychiatric unit. Of those requiring admission at index, the largest age group was the 45–64 years ($n = 7843$, 75.4%), with around 20% of the 65–84 years age group receiving admission ($n = 2103$, 20.2%), and less than 5% of the 85 + years age group ($n = 458$, 4.4%). Admission to a psychiatric unit was also experienced much less in the older age groups (45–64 years ($n = 1794$, 80.3%), 65–84 years ($n = 400$, 17.9%), and 85 + years ($n = 39$, 1.7%). The administrative data does not specify further the type of ward a patient has received treatment in. Table 1 describes the characteristics of individuals at their index presentation with ISH.

Community mental health care

CMH attendance prior to the index presentation is reported in Table 1. Older individuals were less likely to have had any engagement with CMH care prior to their index presentation for ISH (OR 0.96, $p < 0.001$). Just over half of the study index population received CMH care within 14 days following index hospital presentation ($n = 13752$, 56.0%). Individuals who had been previously known to CMH care, were 8.2 times more likely to attend CMH post-discharge within 2 weeks of their index hospital presentation ($p < 0.001$, 95% CI 7.76, 8.71). Table 2 compares characteristics of individuals who were treated at CMH services within 2 weeks from index hospital with those who were not. Post index follow-up care at CMH services was more likely seen among younger, female persons ($n = 7543$, 54.8%, $p < 0.001$), those with mental disorders or suicidal ideation at index ($n = 1505$, 10.9%, $p < 0.001$), and those who received admission to hospital at their index presentation ($n = 7877$, 57.2%, $p < 0.001$).

We also evaluated outcomes from index presentation for non-fatal ISH and found hospital re-presentation also more common among individuals who received CMH care within 14 days from index (21.7%, $p < 0.001$) compared with those who did not receive CMH care within 14 days (15.4%). Death following index, for the 1317 persons who died during the follow-up study period, was more frequent among those who did not receive CMH care within 14 days ($n = 784$, 7.3%) compared with those who did receive CMH care within 14 days from index ($n = 533$, 3.9%). Breakdown by age group shows this was more frequent among older ages than younger. Table 3 describes these outcomes following index presentation, compared between CMH care within 14 days or not.

Our Cox proportionate hazards survival analysis evaluated 24,544 subjects over 72,116.8 person years of time at risk. There were 1,317 deaths yielding a crude mortality rate of 18.25 deaths per 1000 person years (95% CI 17.00–19.50). The adjusted Cox PH survival regression analysis found that females had a lower risk of death (HR 0.56, 95% CI 0.51–0.63) than males, those aged 85 years and over had 6.17 times the risk of death compared to those aged 45–64 years (HR 6.17, 95% CI 5.26–7.23) and persons aged 65-84 years had almost 3 times the risk of death compared with persons aged 45–64 years (HR 2.96, 95% CI 2.62, 3.35). Individuals with a chronic condition as the principal diagnosis at index ISH had 3.31 times the risk of death, compared to individuals who had a principal diagnosis of self-poisoning at index ISH (95% CI 2.41, 4.54).

The particular focus of this study was the receipt of CMH care following index presentation for ISH. The adjusted hazard ratio of death of 0.66 (95% CI 0.58, 0.74) demonstrated that, holding all other variables constant, CMH care within 2 weeks following index offered 34% lower risk of death than those who did not receive CMH care within this time period.

Using the Schoenfeld goodness-of-fit test to assess the proportional hazards assumption that the hazard ratio should remain constant over time, gave a p-value of 0.079, indicating that the Cox PH model was appropriate for the data. Table 4 displays the univariable and multivariable hazard ratios from survival regression analysis; this being the most parsimonious model with the lowest BIC.

Discussion

We evaluated all-cause mortality following index ISH presentation among 24,544 individuals aged 45 years and over in the Australian state of NSW, between 2014 and 2019, and particularly focused on their engagement with CMH care services both prior to and within the first 14 days following this index presentation. Our study population had a crude mortality rate of 18.25 deaths per 1000 person years (95% CI 17.00–19.50). The oldest age group (85 years and over), males, and those with chronic conditions demonstrated higher risk of death following index ISH. Chronic conditions such as neurological disorders and cancer cause significant suffering and debility, not only increasing risk of suicidal behaviors (Fässberg *et al.*, 2016) but also leading to death as an outcome of the condition.

Readmission and mortality outcomes differed according to CMH attendance. Those who attended CMH within 14 days were more likely to be readmitted to ED and/or the hospital, presumably

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Table 1. Characteristics of individuals at their index presentation for intentional self-harm ($n = 24,544$)

CHARACTERISTIC	*N* (%)
Age, years (median, IQR)	55.4 (16.7)
Age groups, years	
45–64	18,005 (73.4)
65–84	5,285 (21.5)
85 +	1,255 (5.1)
Sex	
Male	12,903 (52.7)
Female	11,641 (47.4)
Aboriginal or Torres Strait Islander	
Yes	1,501 (6.1)
No	23,043 (93.9)
Marital status	
Married/de facto	8,202 (33.4)
Divorced/Separated	8,173 (33.3)
Never married	4,718 (19.2)
Widowed	2,804 (11.4)
Unknown	647 (2.6)
Principal diagnosis	
Poisoning	14,804 (60.3)
Mental disorder/Suicidal ideation	1,891 (7.7)
Injury*	1,346 (5.9)
Substance use	279 (1.1)
Chronic condition[b]	178 (0.7)
Other/missing	6,046 (24.6)
Self-poisoning by age group, years	
45–64	10,557 (58.6)
65–84	3463 (65.5)
85 +	799 (63.7)
Chronic condition by age group, years	
45–64	56 (0.3)
65–84	78 (1.4)
85 +	44 (3.5)
Admitted at index	
Yes	10,404 (42.4)
No	14,140 (57.6)
Admitted at index by age group, years	
45–64	7843 (75.4)
65–84	2103 (20.2)
85 +	458 (4.4)
Length of stay[a], hours (median, IQR)	89.9 (258.6)
Treated in inpatient psychiatric unit[a]	2233 (21.4)
Index psychiatric admission by age group, years	
45–64	1794 (80.3)
65–84	400 (17.9)
85 +	39 (1.7)
Previously known to CMH	
Yes	12,803 (52.2)
No	11,741 (47.8)
Previously known to CMH by age group, years	
45–64	10,427 (81.4)
65–84	2,059 (16.1)
85 +	317 (2.5)
Attended CMH prior to index	
Within 7 days prior	7,700 (31.3)
8–14 days prior	1,814 (7.4)
15–30 days prior	2,291 (9.3)
31–90 days prior	3,144 (12.8)
Number of time periods a person attended	
1–3 prior to index	10,656 (43.4)
4–6 prior to index	2,147 (8.7)

*Includes physical injuries, burns, and asphyxia.
[a]If admitted to hospital, not day only attendance.
[b]Includes neurological conditions (e.g. Parkinson's disease), cancer, gastrointestinal disorders (e.g. alcoholic liver disease).

due to detection of clinical deterioration by the CMH clinician. They also had lower all-cause mortality outcomes than those who did not attend. This might in part relate to the higher rates of 14-day readmissions that this group experienced, readmissions that could well have addressed issues that might otherwise have been lethal. Yet, overall, those that did require readmission within 14 days were at increased risk of dying.

Previous studies have reported increased risk of all-cause mortality in individuals who self-harm particularly in the first year (Kuo *et al.*, 2012, Ostamo and Lönnqvist, 2001, Steeg *et al.*, 2018). An Australian study reported that mortality risk in the 12 months after self-harm hospitalization was nearly ten times higher than in a matched non-injury comparison cohort (Mitchell and Cameron, 2018). Our findings that mortality risk was increased in males, older people, and in the presence of chronic conditions is consistent with previous studies (Kuo *et al.*, 2012, Mitchell and Cameron, 2018, Mitchell *et al.*, 2017b, Ostamo and Lönnqvist, 2001).

There are a number of possible explanations for the association between reduced all-cause mortality and CMH attendance within 14 days. The process of establishing a connection between the person who self-harms and CMH might in itself encourage further connections with primary and secondary health care and thus enable treatment of physical and mental disorders. Persons aged 50 years and over who are hospitalized for self-harm were found to have higher rates of chronic physical disorders such as neurological disorders, malignancies, diabetes, respiratory disorders, liver disease, and pain as well as mental disorders than persons hospitalized for other injuries (Mitchell *et al.*, 2017a). Therefore, this is a population requiring regular medical attention for optimal management.

It is also possible that those that attended CMH were a self-selected group in better overall health and/or with better adherence to medical treatments for their various comorbidities. They were also

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Table 2. Comparison of index presentation characteristics of individuals who were treated at Community Mental Health (CMH) Services within 14 days versus not

Characteristic	Did not attend CMH in 14 days ($N = 10,792$) *N* (%)	Attended CMH within 14 days ($N = 13,752$) *N* (%)	Chi-squ'd test statistic (p-value)
Age, years (median, IQR)	57.7 (21.0)	54.0 (13.6)	<0.001
Age groups, years			
45–64	7020 (65.0)	10,985 (79.9)	729.0
65–84	2938 (27.2)	2346 (17.1)	(<0.001)
85 +	834 (7.7)	421 (3.1)	
Sex			
Male	5430 (50.3)	6209 (45.1)	64.7 (<0.001)
Female	5362 (49.7)	7543 (54.8)	
Indigenous status[a]			
No	10,118 (93.7)	12,925 (93.9)	0.56 (0.42)
Yes	674 (6.3)	827 (6.0)	
Marital status			
Divorced/Separated	2681 (24.8)	5492 (39.9)	643.1
Married/de facto	4206 (38.9)	3996 (29.1)	(<0.001)
Never married	2239 (20.7)	2479 (18.0)	
Widowed	1335 (12.4)	1469 (10.9)	
Unknown	326 (3.0)	312 (2.2)	
Principal diagnosis			
Poisoning	3217 (29.8)	2829 (20.6)	721.7
Mental disorder/Suicidal ideation	473 (4.4)	1505 (10.9)	(<0.001)
Injury[*]	348 (3.2)	892 (6.5)	
Substance use	139 (1.3)	144 (1.0)	
Chronic condition[b]	129 (1.2)	49 (0.4)	
Other/missing	6486 (60.1)	8333 (60.6)	
Admitted at index			
No	8265 (76.6)	5875 (42.7)	2.8e (<0.001)
Yes	2527 (23.4)	7877 (57.2)	
Previously known to CMH			
No	8082 (74.9)	3659 (26.6)	5.6e (<0.001)
Yes	2710 (25.1)	10,093 (73.4)	
If known to CMH, age group			
45–64	2242 (82.7)	8185 (81.1)	6.15 (0.04)
65–84	416 (15.3)	1643 (16.3)	
85 +	52 (1.9)	265 (2.6)	
Attended CMH up to 14 days prior to index			
No	10,575 (97.9)	6001 (43.6)	8.1e (<0.001)
Yes	217 (2.0)	7751 (56.4)	

[*]Includes physical injuries, burns, and asphyxia.
[a]Aboriginal or Torres Strait Islander.
[b]Includes neurological conditions (e.g. Parkinson's disease), cancer, gastrointestinal disorders (e.g. alcoholic liver disease).

younger and more likely to be female. Thus, the lower mortality outcomes might largely relate to these factors rather than the intervention.

Older people in this study were less likely to have had contact with CMH prior to the index presentation than those under the age of 65, with the proportion known to CMH (36.3%) being similar to that reported in a systematic review of self-harm in older adults (41.3%) (Troya *et al.*, 2019). This may be of importance, as we found that the oldest group in this study (85 + years) had more than 6 times greater risk of death than the 45–64 years age group (HR 6.17 (5.26, 7.23), adjusted). At the index presentation, psychiatric hospitalization decreased by age with less than 20% of persons aged 65–84 years receiving psychiatric admission, and only 1.7% of persons 85 years and over receiving psychiatric admission, a finding that contrasts to the experience in the UK where those aged 65 years and over had the highest rates of psychiatric hospitalization

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Table 3. Comparisons of outcomes of individuals who were treated at Community Mental Health (CMH) Services within 14 days versus not

CHARACTERISTIC	DID NOT ATTEND CMH IN 14 DAYS ($N = 10,792$)	ATTENDED CMH WITHIN 14 DAYS ($N = 13,752$)	TEST STATISTIC *P*-VALUE
	Median (IQR)		**Wilcoxon ranksum**
Days in study from index	1062 (1211)	1086 (1163.5)	<0.001
Days to death after index	106 (184.5)	139 (169)	
	n (%)		**Chi-squ'ed**
Died after index			
No	10,008 (92.7)	13,219 (96.1)	136.7
Yes	784 (7.3)	533 (3.9)	(<0.001)
If died after index, age			
45–64	284 (36.2)	277 (51.9)	32.9
65–84	329 (41.9)	177 (33.2)	(<0.001)
85 +	171 (21.8)	79 (14.8)	
Readmitted within 14 days			
No	9129 (84.6)	10,760 (78.2)	158.5
Yes	1663 (15.4)	2992 (21.7)	(<0.001)
If readmitted 14 days, age			
45–64	1105 (66.5)	2477 (82.8)	175.7
65–84	451 (27.1)	458 (15.3)	(<0.001)
85 +	107 (6.4)	57 (1.9)	
If readmitted in 14 days			
ED only	787 (47.3)	1328 (44.7)	25.9
ED & hospital admit	483 (29.0)	1007 (33.7)	(<0.001)
Hospital admit only	393 (23.6)	657 (21.9)	

(Kapur *et al.*, 2015), and much lower than in a national study in the US where 77% of persons aged 65 years and over who presented to an emergency department with deliberate self-harm in 2015 were hospitalized (Schmutte *et al.*, 2019).

Among the total population, 56% had contact with CMH care in the 14 days following the index presentation. Attendance at CMH within 14 days of discharge was more likely to occur in females, persons under the age of 65, those who were divorced/separated, persons with pre-index CMH attendance, and in those who were hospitalized. Older people that had attended CMH before the index presentation had similar rates of post-discharge CMH attendance as younger people indicating the importance of having an established relationship with the CMH service and replicating findings in the US (Schmutte *et al.*, 2019). An earlier Australian study of all-age adults admitted to hospital for self-harm found lower rates of CMH care follow-up in the 30 days following the index presentation (41%) than the current study, but also found that follow-up rates were lower for older adults (Spittal *et al.*, 2017).This difference in follow-up rates is not necessarily explained by the different sampling frame (admitted persons vs emergency department presentations and admitted persons), as in the current study, being admitted to hospital increased the likelihood of CMH care follow-up. One possible explanation is that there has been an overall increase in CMH care follow-up after hospital-treated self-harm. Those who self-harmed had a 21 percent higher health service use in the 12 months pre and post the self-harm admission (Mitchell and Cameron, 2018).

Strengths and limitations

Our study had several strengths. The age distinctions provided in this study provide further insight into the variability in the population by age structure. While some of the findings presented here are consistent with previous studies in Australian cohorts (Clapperton *et al.*, 2021, Pillans *et al.*, 2017), the distinction between persons aged 65–84 and 85 + years is unique to this study.

Furthermore, by using longitudinal data linkage, we were able to describe a large population of anonymized trajectories of care by persons diagnosed with ISH both before and after their index ISH hospitalization, where they had received CMH care. When combined with smaller-size qualitative studies into a mixed-method approach, data linkage can provide the grounds for high-quality research. Future research should aim to incorporate qualitative literature in order to determine the nuance of some of the findings presented here.

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Table 4. Univariable and multivariable hazard ratios from survival regression analysis

CHARACTERISTIC	CRUDE HR (95% CI)	ADJUSTED HR (95% CI)	*P*-VALUE
CMH[a] within 2 weeks			
No	1 (ref)		
Yes	0.52 (0.46, 0.58)	0.66 (0.58, 0.74)	<0.001
Sex			
Male	1 (ref)		
Female	0.59 (0.53, 0.66)	0.56 (0.51, 0.63)	<0.001
Age category (years, index)			
45–64	1 (ref)		
65–84	3.19 (2.82, 3.59)	2.96 (2.62, 3.35)	<0.001
85 +	7.01 (6.04, 8.14)	6.17 (5.26, 7.23)	<0.001
Marital status (index)			
Divorced	1 (ref)		
Married/Defacto	0.95 (0.82, 1.09)	0.83 (0.71, 0.95)	0.011
Never married	1.17 (1.00, 1.36)	1.03 (0.88, 1.20)	0.685
Widowed	1.81 (1.55, 2.12)	1.15 (0.97, 1.36)	0.098
Unknown	0.60 (0.38, 0.95)	0.58 (0.36, 0.92)	0.020
Principal diagnosis (index)			
Self-poisoning	1 (ref)		
Injury*	1.34 (1.07, 1.67)	1.32 (1.06. 1.66)	0.014
Chronic condition[b]	5.05 (3.69, 6.91)	3.31 (2.41, 4.54)	<0.001
Mental disorder/suicidal ideation	0.66 (0.52, 0.84)	0.80 (0.62, 1.02)	0.076
Substance use disorder	0.39 (0.17, 0.86)	0.49 (0.22, 1.10)	0.087
Other/missing	1.04 (0.92, 1.19)	1.04 (0.91, 1.19)	0.499
Readmission within 14 days from index			
No	1 (ref)		
Yes	1.49 (1.32, 1.69)	1.67 (1.47, 1.88)	<0.001

*Includes physical injuries, burns, and asphyxia.
[a]Community Mental Health treatment within 2 weeks from index.
[b]Includes neurological conditions (e.g. Parkinson's disease), cancer, gastrointestinal disorders (e.g. alcoholic liver disease).

Our study also had some limitations. Principally, this study did not have access to primary healthcare consultation data, obtainable from the Medicare Benefits Schedule. It is possible that some individuals had an existing relationship with their General Practitioner, psychologist, or specialist psychiatric consultant and attended these services instead of CMH care.

The administrative datasets used in this study do not identify the suicidal or non-suicidal intent of the self-harm incident, due to the limitations of the ICD-10-AM in accurately identifying this distinction. Although non-suicidal self-injury is less prevalent in older than younger adults, it may represent approximately one-quarter of self-harm presentations in older adults (Schmutte *et al.*, 2020). Nevertheless, non-suicidal self-harm is a risk factor for suicide (Grant *et al.*, 2019). A further limitation of the data is the likelihood that some episodes of self-harm presenting to the ED will have been captured in the data: the reason for ED care is recorded as a single final diagnosis by ED clinicians, along with a free-text field identifying the presenting problem. This limitation has been somewhat mitigated in the ED dataset used for this study by annotating cases using the text fields recorded at triage to improve diagnostic sensitivity (Grant *et al.*, 2019).

Finally, it should be noted that these data are accepted as correlational, and despite the methodological rigor of these analyses, a causal relationship cannot be assigned. There are complex variable interrelationships, as well as other factors not able to be identified within administrative data that could produce both post-incident CMH involvement and mortality.

Implications for future research

This is one of the largest studies to analyze associations between CMH care following non-fatal ISH; and the largest in Australia.

Ongoing research should aim to further isolate confounders to CMH care, socioeconomic variables, as well as addressing the limitations outlined in this paper, such as examining the impact of care received following hospital-treated self-harm from other services, e.g. general practitioners, psychologists, psychiatrists, and dedicated suicide aftercare services.

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Conclusion

CMH care following an episode of hospital-treated self-harm in those aged 45 years and over may be protective against all-cause mortality. This finding may be a result of the protective effects of CMH care, and/or the possibility that those who engaged with CMH care had better overall health and were more likely to engage in other types of healthcare. Younger people and females were more likely to engage with CMH care, indicating that we are missing the opportunity to engage older males, one of the highest risk groups in Australia, in community care following self-harm.

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Description of authors' roles

FS (among others) obtained the research funding. BD conceived of the study; MW undertook the initial literature review. LNS cleaned the datasets and conducted the analysis with oversight from BD and FS. LNS and MW drafted the original manuscript. All authors contributed to its review, editing, and interpretation of findings. MW undertook Honors research (University of New South Wales Faculty of Medicine and Health) within this project.

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Supplementary material

The supplementary material for this article can be found at https://doi.org/10.1017/S1041610223000959.

References

Almeida, O. P. *et al.* (2012). A randomized trial to reduce the prevalence of depression and self-harm behavior in older primary care patients. *Annals of Family Medicine*, 10, 347–356.

Australian Consortium for Classification Development (2017). *The International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM/ACHI/ACS)*. 10th edition. Darlinghurst, NSW: Independent Hospital Pricing Authority.

Australian Institute of Health and Welfare (2020). *Intentional Self-harm Hospitalisations, by Age and Sex, Australia, 2008-09 to 2019-20*. Canberra: AIHW.

Australian Institute of Health and Welfare (2022). *Suicide and Self-harm Monitoring*. Canberra: AIHW.

Boulet, S., Gagnon, A. P., Nadeau, A., Mowbray, F. and Mercier, É. (2022). Characteristics of older adults attending the emergency department for suicidal thoughts or voluntary intoxication: a multicenter retrospective cohort study. *Cureus*, 14, e30428.

Clapperton, A., Dwyer, J., Millar, C., Tolhurst, P. and Berecki-Gisolf, J. (2021). Sociodemographic characteristics associated with hospital contact in the year prior to suicide: a data linkage cohort study in Victoria, Australia. *PLOS One*, 16, e0252682.

De Leo, D., Draper, B. M., Snowdon, J. and Kõlves, K. (2013). Contacts with health professionals before suicide: missed opportunities for prevention? *Comprehensive Psychiatry*, 54, 1117–1123.

Deisenhammer, E. A., Huber, M., Kemmler, G., Weiss, E. M. and Hinterhuber, H. (2007). Suicide victims' contacts with physicians during the year before death. *European Archives of Psychiatry and Clinical Neuroscience*, 257, 480–485.

Druss, B. G., Von Esenwein, S. A., Compton, M. T., Rask, K. J., Zhao, L. and Parker, R. M. (2010). A randomized trial of medical care management for community mental health settings: the Primary Care Access, Referral, and Evaluation (PCARE) study. *American Journal of Psychiatry*, 167, 151–159.

Dziak, J. J., Coffman, D. L., Lanza, S. T., Li, R. and Jermiin, L. S. (2020). Sensitivity and specificity of information criteria. *Briefings in Bioinformormatics*, 21, 553–565.

Fässberg, M. M. *et al.* (2016). A systematic review of physical illness, functional disability, and suicidal behaviour among older adults. *Aging & Mental Health*, 20, 166–194.

Grant, S. *et al.* (2019). Cohort profile: Mental Health Living Longer: a population-wide data linkage to understand and reduce premature mortality in mental health service users in New South Wales, Australia. *BMJ Open*, 9, e033588.

Hawton, K. and Harriss, L. (2008). How often does deliberate self-harm occur relative to each suicide? A study of variations by gender and age. *Suicide and Life Threatening Behavior*, 38, 650–660.

Kandasamy, D., Platts-Mills, T. F., Shah, M. N., Van Orden, K. A. and Betz, M. E. (2018). Social disconnection among older adults receiving care in the emergency department. *Western Journal of Emergency Medicine*, 19, 919–925.

Kapur, N. *et al.* (2015). Hospital management of suicidal behaviour and subsequent mortality: a prospective cohort study. *Lancet Psychiatry*, 2, 809–816.

Kisely, S., Xiao, J., Lawrence, D. and Jian, L. (2014). Is the effect of compulsory community treatment on preventable deaths from physical disorders mediated by

better access to specialized medical procedures? *The Canadian Journal of Psychiatry*, 59, 54–58.

Kuo, C. J., Gunnell, D., Chen, C. C., Yip, P. S. and Chen, Y. Y. (2012). Suicide and non-suicide mortality after self-harm in Taipei City, Taiwan. *British Journal of Psychiatry*, 200, 405–411.

Lapierre, S. *et al.* (2011). A systematic review of elderly suicide prevention programs. *Crisis*, 32, 88–98.

Large, M., Corderoy, A. and McHugh, C. (2021). Is suicidal behaviour a stronger predictor of later suicide than suicidal ideation? A systematic review and meta-analysis. *Australian and New Zealand Journal of Psychiatry*, 55, 254–267.

Lecamwasam, D., Gupta, N. and Battersby, M. (2022). An audit of mental health care plans in community mental health services for older persons in rural communities in a state in Australia. *Journal of Behavioral Health Services and Research*, 49, 162–189.

Mitchell, R., Draper, B., Harvey, L., Brodaty, H. and Close, J. (2017a). The association of physical illness and self-harm resulting in hospitalisation among older people in a population-based study. *Aging & Mental Health*, 21, 279–288.

Mitchell, R., Draper, B., Harvey, L., Brodaty, H. and Close, J. (2017b). The survival and characteristics of older people with and without dementia who are hospitalised following intentional self-harm. *International Journal of Geriatric Psychiatry*, 32, 892–900.

Mitchell, R. J. and Cameron, C. M. (2018). Self-harm hospitalised morbidity and mortality risk using a matched population-based cohort design. *Australian and New Zealand Journal of Psychiatry*, 52, 262–270.

Okolie, C., Dennis, M., Simon Thomas, E. and John, A. (2017). A systematic review of interventions to prevent suicidal behaviors and reduce suicidal ideation in older people. *International Psychogeriatrics*, 29, 1801–1824.

Ostamo, A. and Lönnqvist, J. (2001). Excess mortality of suicide attempters. *Social Psychiatry and Psychiatric Epidemiology*, 36, 29–35.

Pillans, P. I., Page, C. B., Ilango, S., Kashchuk, A. and Isbister, G. K. (2017). Self-poisoning by older Australians: a cohort study. *Medical Journal of Australia*, 206, 164–169.

Rihmer, Z., Rutz, W. and Pihlgren, H. (1995). Depression and suicide on Gotland. An intensive study of all suicides before and after a depression-training programme for general practitioners. *Journal of Affective Disorders*, 35, 147–152.

Sara, G. *et al.* (2023). Growth in emergency department self-harm or suicidal ideation presentations in young people: comparing trends before and since the COVID-19 first wave in New South Wales, Australia. *Australian and New Zealand Journal of Psychiatry*, 57, 58–68.

Schmutte, T., Olfson, M., Xie, M. and Marcus, S. C. (2019). Deliberate self-harm in older adults: a national analysis of US emergency department visits and follow-up care. *International Journal of Geriatric Psychiatry*, 34, 1058–1069.

Schmutte, T., Olfson, M., Xie, M. and Marcus, S. C. (2020). Self-harm, suicidal ideation, and attempted suicide in older adults: a national study of emergency department visits and follow-up care. *The American Journal of Geriatric Psychiatry*, 28, 646–658.

Schou Pedersen, H., Fenger-Grøn, M., Bech, B. H., Erlangsen, A. and Vestergaard, M. (2019). Frequency of health care utilization in the year prior to completed suicide: a Danish nationwide matched comparative study. *PLoS One*, 14, e0214605.

Spittal, M. J., Shand, F., Christensen, H., Brophy, L. and Pirkis, J. (2017). Community mental health care after self-harm: a retrospective cohort study. *Australian and New Zealand Journal of Psychiatry*, 51, 727–735.

Statacorp, (2017). *Stata Statistical Software. Release 15.1, College Station, TX,* Statacorp LLC.

Steeg, S. *et al.* (2018). Suicide and all-cause mortality following routine hospital management of self-harm: propensity score analysis using multicentre cohort data. *PLoS One*, 13, e0204670.

Steve, K., Neil, P., Jianguo, X., David, L., Sandra, L. and Elizabeth, C. (2013). Reducing all-cause mortality among patients with psychiatric disorders: a population-based study. *Canadian Medical Association Journal*, 185, E50–E56.

Troya, M. I. *et al.* (2019). Self-harm in older adults: systematic review. *British Journal of Psychiatry*, 214, 186–200.

Vasiliadis, H. M., Lesage, A., Latimer, E. and Seguin, M. (2015). Implementing suicide prevention programs: costs and potential life years saved in Canada. *Journal of Mental Health Policy and Economics*, 18, 147–155.

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