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ABSTRACT

Background: Death from resident-to-resident aggression (RRA) among nursing home residents is an emergent yet understudied public health problem.

Objective: To describe the frequency and nature of deaths from RRA in nursing homes in Australia.

Design: A national population-based retrospective cohort study.

Subjects and setting: Residents of accredited nursing homes in Australia whose deaths resulted from RRA and were reported to the Coroner between 1 July 2000 and 31 December 2013.

Measurements: Cases were identified using the National Coronial Information System, and data on individual; interpersonal; organisational; and societal factors was collected through review of the hard copy coroners' files.

Results: This research identified 28 deaths from RRA over a 14-year study period (0.004 per 100,000 bed days). Most exhibitors of aggression were male ($n=24$, 85.7%) and risk of death from RRA was twice as high for male residents compared to female residents ($RR=2.13$, $95\%CI=0.93-4.80$, $p=0.05$) in the nursing home population. Almost 90% of residents involved in RRA had a diagnosis of dementia, and three-quarters had a history of behavioural issues including wandering and aggression. Dyad analysis showed exhibitors were often younger and more recently admitted to the nursing home than targets. RRA incidents commonly occurred in communal areas, during the afternoon, and involved a "push and fall". Seven (25%) of RRA deaths had a coronial inquest and criminal charges were rarely laid.

Conclusion: This is the first national study in Australia, and the largest internationally, to examine RRA deaths using medico legal data. This generates hypotheses for future research on the impact of environmental and organisational factors on the frequency and preventability of RRA.

INTRODUCTION

Resident-to-resident aggression (RRA) in nursing homes is an emergent public health concern[1]. It is defined as *“negative, aggressive and intrusive verbal, physical, sexual, and material interactions between long-term care residents that in a community setting would likely be unwelcome and potentially cause physical or psychological distress or harm to the recipient”* (p.157)[1].

Aggression is a common behavioural and psychological symptom of dementia (BPSD), although its exact prevalence remains unknown with significant variation in estimates[2]. The number of people diagnosed with dementia will almost triple from 46 million in 2015 to over 100 million by 2050[3], posing a significant public health problem[4]. This trend is magnified in the nursing home population, with 50% of residents in Australia[5] and the United States (US)[6] diagnosed with dementia. It is estimated at least 20% of nursing home residents exhibit aggressive behaviour[7]. Resident aggression towards caregivers and staff is a workplace health and safety hazard[8]. It is even more dangerous when directed towards other residents (RRA), due to their heightened vulnerability to injury and death[9, 10].

The prevalence of RRA has been estimated as affecting 20.2% [95% CI=18.1-22.5] of nursing home residents in the US[11]. A recent systematic review on physical RRA leading to injury identified eighteen relevant studies[12], thirteen of which were conducted in the US and none in Australia. The review found RRA often occurs between exhibitors (residents who exhibit aggressive behaviour) with higher levels of cognitive awareness, physical functionality and a history of aggression[13, 14]; and female targets (residents to whom the aggressive behaviour is directed) with cognitive impairment and a history of wandering[13-16]. RRA also commonly takes place in the afternoon in communal areas[13, 17], and is often unprovoked[15, 17] or triggered by communication issues and perceived invasion of space[13, 18, 19].

Studies rarely considered organisational factors (such as facility size and care level); interventions; or outcomes of RRA. In fact, only one death from RRA was reported across eighteen studies[20]. In response to the paucity of knowledge, a recent editorial citing 40 deaths from RRA using international media reports called for more empirical research on the topic[21].

Currently in Australia, no centralised collection of data on RRA incidents exists with detailed information on individuals involved (i.e. staff or residents); outcomes and responses; or the circumstances surrounding the incident[22]. Australia does, however, have a national death reporting system that collects medico-legal data on all deaths required to be reported to the Coroner, including from RRA. This

provides a unique opportunity to address the gap in international literature by contributing empirical data on the most severe outcome of RRA.

This is the first national study to describe the frequency and nature of deaths from RRA in nursing homes in Australia using existing medico-legal information - a valuable data source for public health research[23]. This research aims to: (a) describe the epidemiology of deaths from RRA in Australian nursing homes (2000-2013); and (b) provide an analysis of relationships between RRA exhibitor-target dyads.

METHOD

Study design

This national retrospective cohort study of deaths from RRA among nursing home residents in Australia was conducted and reported in accordance with guidelines for Reporting of studies Conducted using Observational Routinely-collected Data (RECORD)[24].

Subjects and setting

Subjects were residents of accredited nursing homes in Australia who died from injuries sustained in RRA incidents and whose deaths were coroner notified (2000-2013). During the study period, Australia's population increased from 19 to 23 million, with older adults aged over 65 years making up 12.3% (2000) and 14.4% (2013) of the population[25, 26]. In 2000, there were ~140,000 older adults living in ~2,900 accredited nursing homes[27]. In 2013, there were ~180,000 older adults living in approximately ~2,700 accredited nursing homes[28].

Case identification

Cases were identified via a search of the National Coronial Information System (NCIS), an internet-based data storage and retrieval system of information generated for coroners' investigations (www.ncis.org.au). The researchers searched for all deaths where the incident location was classified as a nursing home; home for the elderly or retirement village; hospice, palliative, or respite care; or residential care facility, and the coroners' investigation was completed as of 31st December 2013. A unit record data extract of the search results was provided by NCIS staff.

Inclusion criteria

Cases were included if: a) the incident occurred in an accredited nursing home; b) the deceased was a permanent or temporary resident at the time of the incident; and c) the death was determined to be the result of an RRA incident. To determine the first two criteria, a database of nursing homes accredited by the Australian Aged Care Quality Agency (AACQA) was compiled from annual lists published online (and archived) by the Australian Government Department of Health (www.agedcare.health.gov.au). This was used to link the street address of the incident location for the death to the street address of an accredited nursing home to confirm the first two criteria. The final criterion was fulfilled if the “intent” field in NCIS was coded as assault, and the “perpetrator” was identified as another resident of the same facility; or it was determined the death occurred proximate to an RRA incident following manual review of documents attached to NCIS.

Data collection

The NCIS contains a record of each death including socio-demographic information about the deceased, cause of death, and details of the coroner’s investigation[29]. Data collected directly from the NCIS were supplemented by more detailed information on the circumstances of the death obtained from the paper-based coronial record. Information contained in the coronial record included: police report; witness statements (from family members, nursing home staff, or treating health care professionals); medical or nursing notes (where available); autopsy report; toxicology report; and coroners’ finding. Variables for collection were derived from findings of a systematic literature review[12] and informed by the Socio-Ecological Model (SEM) for violence prevention[30]. The SEM is a theory-based framework which advocates for collection and analysis of information at the individual, interpersonal, incident; organisational, and societal level to identify opportunities for health promotion and injury prevention at each level[30, 31]. A single researcher (BM) manually reviewed the coronial record at each State and Territory Coroner’s Office to collect data on: individual and interpersonal variables for targets and exhibitors (including demographic, physical, mental, and behavioural factors); incident variables (including date, time, and location); organisational variables of the nursing home; and societal variables (details of the medico-legal investigation). Data items were entered into an Excel spread sheet pre-populated by information from the NCIS then exported into the IBM Statistical Package for the Social Sciences (SPSS) version 22 for analysis[32].

Data analysis

Incidence rates per 100,000 bed days (residential care places over the study period) and rate ratios (RR) were calculated using resident population data[33]. Univariate and bivariate descriptive statistical analyses were performed on variables related to targets and exhibitors (individually and as a dyad); the circumstances of the death; and coroners' investigation. All normally distributed data were measured using means and standard deviation (SD), while non-normally distributed data was measured with medians and interquartile range (IQR). Mean differences in age and duration of residence were calculated using paired samples t-tests. McNemar's test was used determine if there was a significant difference in distribution of sex among targets and exhibitors. Results were considered significant at $p < 0.05$.

Ethics

This study was approved by the Victorian Institute of Forensic Medicine Research Advisory Committee (RAC014-14), the Department of Justice Human Research Ethics Committee (CF/14/17569), and registered with the Monash University Human Research Ethics Committee (CF15/157-2015000077).

RESULTS

Overview

During the 14-year study period, 28 deaths from RRA were identified at a rate of 0.004 per 100,000 bed days (Table 1). A median of two deaths (IQR=1-2) occurred per year involving 56 residents (28 exhibitors and 28 targets) (Table 2).

Individual and interpersonal factors (exhibitor-target dyad)

Sex

Risk of death from RRA was twice as high for male residents compared to female residents (RR=2.13, 95%CI=0.93-4.80, $p=0.05$) in the nursing home population. Of the 56 residents involved in RRA incidents, the majority were male ($n=37, 66\%$). Similarly, most of the 28 exhibitors were also male ($n=24, 85.7\%$), while over half of the 28 targets were female ($n=15, 53.6\%$). There was a significant difference in the distribution of sex amongst targets and exhibitors (McNemar's $\chi^2=12.0$, $p=0.001$). The exhibitor-target dyad (Figure 1) shows there were a similar number of male ($n=13$) and female ($n=12$) targets, yet 100% of incidents involving a male target also involved a male exhibitor.

Age

There was no significant difference in risk of death from RRA based on residents' age (Table 1). The age of residents involved in fatal RRA incidents ranged from 54 to 98 years, with a mean age of 81.5 years (SD=9.2). Targets (mean age=84.3 years, SD=7.9) were older than exhibitors (mean age=78.2 years, SD=9.5), with a mean difference of 6.1 years ($t(23)=3.31, 95\%CI=2.30-9.95, p=0.003$).

Mental health

Almost 90% of residents involved in RRA incidents had a diagnosis of dementia with the same proportion for both exhibitors ($n=25, 89.3\%$) and targets ($n=25, 89.3\%$). Approximately one-quarter of exhibitors had a diagnosis of schizophrenia ($n=8, 28.6\%$) and a similar number of targets had a diagnosis of depression ($n=7, 25.0\%$).

History of behavioural issues

A history of behavioural issues was common among both targets ($n=22, 78.6\%$) and exhibitors ($n=21, 75.0\%$). More exhibitors had a history of aggression ($n=19, 67.9\%$), and wandering behaviours ($n=17, 60.7\%$), than targets ($n=15, 53.6\%$ and $n=14, 50.0\%$, respectively). Other behavioural issues such as verbal outbursts and disinhibited sexual behaviour were also common among both targets ($n=14, 50.0\%$) and exhibitors ($n=12, 42.9\%$). In 64.3% of RRA incidents, both exhibitors and targets had a history of behavioural issues (Figure 1). Almost one third of exhibitor-target dyads ($n=9, 32.1\%$) had been involved in at least one prior incident together in the last 12 months.

Duration of residence

Duration of residence among those involved in fatal RRA incidents was positively skewed with a median duration of 9.5 months (IQR=2-24). The difference in median duration of residence between targets (14.3 months, IQR=2.2-32.9) and exhibitors (9.3 months, IQR=3.0-19.2) was not significant ($t(20)=0.99, 95\%CI=-5.17-14.52, p=0.33$). While equal proportions of targets ($n=15, 53.6\%$) and exhibitors ($n=15, 53.6\%$) had resided in the nursing home for less than 12 months, analysis of the exhibitor-target dyad revealed most exhibitors had resided less than 12 months, and targets for greater than 12 months ($n=9, 32.1\%$).

Incident factors

Half of all RRA incidents leading to death involved a "push and fall" type assault ($n=14, 50.0\%$) (Table 3). Common primary injuries sustained by targets included head injuries ($n=11, 39.3\%$) and hip fractures ($n=6, 21.4\%$). The majority of targets were transferred to hospital within 24 hours of the incident

(n=23,82.1%), where many died within one week without being returned to the nursing home (n=14,50.0%). Half of all RRA incidents involved an unintentional target[34] (n=14,50.0%), while a small proportion involved a target who exhibited antagonistic behaviour (n=6,21.4%). Incidents were often witnessed by a staff member (n=18,64.3%), and captured on security footage in one case. RRA commonly occurred in communal areas such as corridors (n=10,35.7%) or shared living and dining areas (n=7,25.0%) and during the afternoon nursing shift from 2pm to 10pm (n=14,50.0%).

Organisational factors

Proportionally, RRA incidents most commonly took place in large facilities with 60 or more beds (n=18,64.3%), offering both high and low care services (n=16,57.1%), and located in metropolitan areas (n=21,75.0%). However, there were no significant differences in rates across nursing home types (Supplementary Appendix S1), hence the results are inconclusive.

Societal factors (medico-legal death investigation)

Medico-legal death investigation of RRA deaths (Supplementary Appendix S2) included a full autopsy (including internal examination) in 75% of cases (n=21), and toxicological analysis in over half (n=16,57.1%). An inquest (formal public hearing) into the death was held in one-quarter of cases (n=7,25.0%), and coroners recommendations were made in three cases (10.7%). Criminal charges were laid in only two cases (7.1%), and in both instances the accused died before court proceedings began. Reasons criminal charges were not laid in the majority of cases (n=23,82.1%) were often not specified (n=14,60.9%), or included that the exhibitor was deemed unfit for police interview (n=4,17.4%) or not in the public interest to prosecute (n=3,13.0%).

DISCUSSION

Summary of findings

This national study identified 28 deaths from RRA notified to the coroner over a 14-year period. This is the largest cohort of RRA deaths examined using medico-legal data published in the research literature. RRA is estimated to affect at least 20%[11, 35] of nursing home residents, but little is known about its outcomes. This research provides foundational information on the most severe outcome of RRA: death. Lessons learned from this data can be applied to preventing both fatal and non-fatal incidents.

A higher proportion of male residents were involved in RRA incidents in this study (66.1%) compared to an earlier US study which found only 30% of residents involved in RRA were male[17]. This is likely due to the difference in outcomes measured (deaths and police reports), as the proportion of male residents in the studies was similar (38% Australia: 41% US). In fact, risk of death from RRA was found to be twice as high for male residents compared to female residents in the nursing home population.

As anticipated, there was a high prevalence of dementia among residents involved in a fatal RRA incident (~90%), and much greater than those involved in non-fatal incidents (50-75%)[17, 36]. Somewhat surprisingly, over one quarter of exhibitors had a diagnosis of schizophrenia. This is concerning given the rising prevalence of mental health issues including dementia and schizophrenia in the nursing home population[37]. Without intervention, an increasing number of nursing home residents will be at risk of death from RRA. This finding suggests a need to review the appropriateness of assessment, management and accommodation arrangements for individuals with dementia and schizophrenia.

This is the first study to examine the exhibitor-target dyad. In accordance with SEM theory, these results suggest RRA arises from a combination of individual and interpersonal factors of both targets and exhibitors. For example, while analysis of individuals identified exhibitors are more commonly male and targets most commonly female, dyad analysis revealed RRA is most likely to occur between two male residents. This finding is supported by previous research which found male residents were twice as likely as female residents to be injured by another resident[15]. Furthermore, while the conventional understanding is RRA occurs between an exhibitor with a history of aggression[13, 14] and a target with a history of wandering[15], dyad analysis indicates both exhibitors and targets are likely to have a combination of behavioural issues. This suggests residents at risk of being involved in RRA could become either the exhibitor or target, depending on the circumstances triggering an incident. The finding that exhibitors are often younger than targets is new, but is consistent with the knowledge that younger persons who enter nursing homes may be more physically mobile and have pre-existing psychiatric conditions[38]. Collectively, these findings highlight the importance of analysing persons involved in RRA as a dyad.

An examination of incident-related factors revealed high-risk locations and time periods for RRA incidents. RRA most commonly occurred in communal areas (60.7% in current study compared to as high as 70% in a previous study[17]). This is unsurprising given this is where residents are most likely to interact with one another. RRA incidents also frequently occurs in residents' bedrooms (approximately

40% in current and previous studies[11, 15]), often when residents mistake another resident's room for their own. Both fatal and non-fatal RRA incidents are most likely to occur during the afternoon or evening[11, 17], which is consistent with when BPSD usually manifests. Finally, "push and fall" type assaults were found to be most common, in keeping with experiences of non-fatal RRA (94% of nurse aides reported witnessing this type of assault[39]). Other forms of aggression less likely to result in a fatality, such as hitting[11], grabbing, and pinching[39], were uncommon or not present in this study. This information provides a basis for development of new strategies to better manage aggressive behaviours among nursing home residents. However, this study can only generate hypotheses about prevention approaches, further research is needed to develop and test intervention strategies.

Investigation of deaths from RRA involved an inquest (public court hearing) in seven (25%) cases, fivefold greater than the 5% of all deaths reported to the coroner in Australia[40]. Conversely, in the criminal justice system, charges were rarely laid against exhibitors (7.1%). Comparative information on criminal charges resulting from elder abuse cases in Australia is currently unavailable[41]. To provide some context, family violence related assaults result in charges laid against perpetrators in approximately 40% of cases[42]. RRA is an increasing area of concern for geriatricians and nursing home staff, and poses a unique problem for the legal sector and society in how to appropriately respond.

Strengths and limitations

This world-first study examined deaths from RRA using existing medico-legal death investigation information. Whilst there are known limitations of the NCIS[23], collection of unit record data from paper based coronial records enabled a richness of information not otherwise available. Despite this, detailed information on the nature of care provided and its impact on residents involved in RRA was not available through this secondary dataset, but is important to collect and examine in future studies. A further limitation is the small number of cases which limits data analysis. RRA incidents in Australia are likely underreported. This is contributed to by a number of factors, including that incidents may occur without any credible witnesses present, and the current legislative framework only requires providers to report incidents to an external authority in certain circumstances[43]. Nevertheless, findings from this research are likely to be generalizable to a broader international audience given Australia is a developed country with similar coronial[44] and aged care systems[45] to the United Kingdom and the US.

Conclusion

This research provides a foundation for future inquiry into RRA in Australia and contributes to the growing international body of knowledge aimed at better understanding this behaviour. The research generates hypotheses that the frequency of RRA differs between nursing homes with different: resident cohort mixes; physical environments; organisational systems; and degrees of patient-centred care. Further research is needed to improve the quality and depth of information on RRA to develop appropriate management and prevention strategies.

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Author contributions: BM contributed to study conception and design, data collection, analysis and interpretation, drafting of article, and final approval. JEI contributed to study conception and design, interpretation, drafting of article, critical revision and final approval. LB contributed to study design, data collection, interpretation, drafting of article, critical revision and final approval. JP contributed to study design, interpretation, drafting of article, critical revision and final approval.

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FIGURES

Figure 1: Interpersonal factors for resident-to-resident aggression (exhibitor-target dyads)

*Information was not available in some cases for exhibitor age (n=7); exhibitor duration of residence (n=6); and target duration of residence (n=1).

TABLES

Table 1: Resident-to-resident aggression deaths nursing homes in Australia, by sex and age

	RRA deaths		Nursing homes		Rate Ratio (RR)	95% CI		p=
	n	%	Occupied bed days (2000-2013)	Rate of death from RRA		Lower	Upper	
Sex								
Female	15	53.6	556,779,178	0.003	1.00	-	-	-
Male	13	46.4	226,320,601	0.006	2.13	0.934	4.803	0.05
Age (years)								
<65	1	3.6	30,612,564	0.003	0.89	0.020	6.386	1.00
65-74	2	7.1	67,696,739	0.003	0.80	0.084	3.866	0.83
75-84	9	32.1	243,783,973	0.004	1.00	-	-	-
85-94	14	50	371,946,079	0.004	1.02	0.411	2.670	0.98
95+	2	7.1	69,060,424	0.003	0.79	0.083	3.790	0.81
Total	28	100	783,099,779	0.004				

Table 2: Individual characteristics of targets and exhibitors of resident-to-resident aggression

Individual variables	Target		Exhibitor	
	n	%	n	%
Sex				
Female	15	53.6	4	14.3
Male	13	46.4	24	85.7
Age group				
<65 years	1	3.6	1	3.6
65-74 years	2	7.1	5	17.9
75-84 years	9	32.1	12	42.9
85-94 years	14	50.0	6	21.4
95 and over	2	7.1	-	-
Unlikely to be known	-	-	4	14.3

Presence of mental health issues (a)					
Organic disorders (including dementia)	25	89.3	25	89.3	
Mood disorder (including depression)	7	25.0	6	21.4	
Other	6	21.4	15	53.6	
None	2	7.1	1	3.6	
History of behavioural issues (b)					
Aggression	15	53.6	19	67.9	
Wandering	14	50.0	17	60.7	
Other	14	50.0	12	42.9	
None	3	10.7	2	7.1	
Prior incidents involving target/exhibitor					
Between target and exhibitor	9	32.1	9	32.1	
Between target/exhibitor and other residents	10	35.7	13	46.4	
Between target/exhibitor and staff	6	21.4	11	39.3	
None	8	28.6	7	25.0	
Unlikely to be known	4	14.3	4	14.3	
Presence of physical health issues (c)					
Diseases of the circulatory system	19	67.9	11	39.3	
Diseases of the musculoskeletal system	16	57.1	4	14.3	
Diseases of the genitourinary system	13	46.4	7	25.0	
Diseases of the respiratory system	10	35.7	-	-	
Diseases of the digestive system	9	32.1	2	7.1	
Other	16	57.1	9	32.1	
Presence of physical impairments					
Visual	7	25.0	5	17.9	
Hearing	5	17.9	3	10.7	
Speech	4	14.3	1	3.6	
Mobility	12	42.9	4	14.3	

Note: (a) Other mental health diagnoses include: Schizophrenia and delusional disorders; Substance use-related disorders; Neurotic and stress-related disorders; Personality disorders. (b) Other behavioural issues include: Sexual disinhibition; racial outbursts; resistance to care; intrusive or territorial behaviours. Residents' history of behavioural issues was unable to be determined for exhibitors in five cases (17.9%), and for targets in three cases (10.7%). (c) Other physical health diagnoses include: Endocrine, nutritional and metabolic diseases; Neoplasms; Diseases of the nervous system; diseases of the skin and subcutaneous tissue; and Certain infectious and parasitic diseases. Physical health diagnoses were unable to be determined for exhibitors in eleven cases (39.2%) and for the target in one case (3.6%).

Table 3: Resident-to-resident aggression incident factors

Incident level variables	n	%
Assault type		
Push and fall	14	50.0
Punch/strike and fall	6	21.4
Punch/strike with no fall	2	7.1
Wrestle/scuffle and fall	2	7.1
Strike/push with object	2	7.1

Other	2	7.1
Primary injury sustained		
Head injury	11	39.3
Hip fracture	6	21.4
Rib fracture	4	14.3
Neck / spinal fracture	3	10.7
Facial injuries and defensive wounds	3	10.7
Arm fracture	1	3.6
Witnessed		
No	8	28.6
Yes	19	67.9
Unlikely to be known	1	3.6
Target type		
Unintentional	14	50.0
Provoking	6	21.4
Bystander	4	14.3
Unlikely to be known	4	14.3
Location within facility		
Corridor / hallway	10	35.7
Communal living area	7	25.0
Target's bedroom	5	17.9
Exhibitor's bedroom	5	17.9
Shared bedroom	1	3.6
Season		
Spring (Sep-Nov)	11	39.3
Summer (Dec-Feb)	6	21.4
Autumn (Mar-May)	7	25.0
Winter (Jun-Aug)	4	14.3
Nursing shift (time of incident)		
Morning (7am-1:59pm)	10	35.7
Afternoon (2pm-9:59pm)	14	50.0
Night (10pm-6:59am)	4	14.3

SUPPLEMENTARY MATERIAL

Supplementary Appendix S1: Organisational factors relevant to resident-to-resident aggression

Supplementary Appendix S2: Societal factors relevant to resident-to-resident aggression (medico-legal death investigation process)

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