Article type: Brief Report

Received date: 09/23/2015

Revised date: 01/04/2016

Accepted date: 01/05/2016

Abstract

Objective: At a time of increasing dementia prevalence, this research explores the cost of treatment and length of stay associated with the syndrome in a large regional hospital.

Methods: Database analysis of 4,332 recorded admissions to a large, regional Australian hospital among adults aged 55 years and older during winter 2013 and 2014.

Results: Costs of hospital treatment and length of stay for people with a diagnosis of dementia who presented to a regional hospital were significantly greater than people with no diagnosis over two years. Costs were unrelated to age or likelihood of death in hospital. Prevalence of dementia admissions was low, but treated conditions indicate that the syndrome may be an underlying, and potentially unrecognised, factor in many admissions.

Conclusions: Dementia imposes a large cost and resource burden on a regional hospital. Improved identification of the syndrome on admission and implementation of best-evidence management of dementia in regional hospitals may improve care efficiency.

Keywords: Australia, cost of treatment, dementia, regional hospital.

Introduction

Costs of care and treatment for people with dementia are rising with growing prevalence, exceeding AUD4.9 billion (USD3.7 billion) annually in Australia in 2012 (1). When admitted to hospital, people with dementia often experience deleterious outcomes at higher rates than individuals who do not have dementia, including increased mortality and unnecessary or burdensome interventions (2). The growth of dementia-related hospital admissions are a particular concern in regional and rural areas due to disproportionate population ageing resulting from out-migration among younger adults, higher levels of health risk factors

This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the [Version of Record](#). Please cite this article as [doi: 10.1111/ajag.12318](https://doi.org/10.1111/ajag.12318)

This article is protected by copyright. All rights reserved

(including smoking and obesity), and comparatively poorer access to specialist health services (3, 4). These challenges are compounded in regional hospitals by high staff turnover, lack of geriatric and diagnostic services, limited professional training opportunities, and an absence of dementia-friendly wards (5). This research examines the costs of treatment, length of stay, and prevalence of dementia among older adults who were admitted to a large regional Australian hospital over two years.

Methods

Design and sample

This research was conceived as a comparative and exploratory regional investigation. De-identified patient data for individuals aged 55 years and older were collected from a large regional hospital in Tasmania, Australia, during three months in winter 2013 and winter 2014 (periods of high older-adult admissions). Data were gathered over two years to increase the reliability and confirmability of the findings. Tasmania is an appropriate location for this study as it has the oldest population profile of all Australian states and territories and a comparatively high proportion of people with dementia (6). All patient data were de-identified within the participating hospital prior to analysis, and the study received approval from a university human research ethics committee (reference number H0014084).

Measurement

In Australia, every person admitted to hospital is assigned a Diagnostic Related Group (DRG) code based on diagnosis and treatment information at the time of discharge. The Australian Government collects national information about the cost of treatment for each DRG and assigns an average cost value. Treatment cost and length of stay information were ascertained by linking individual DRG records with national average costs through the Australian Revised DRG (AR-DRG) database (7) and assessing patient records to identify dementia-related presentations. Dementia is recorded as either a primary presentation (the reason a person is admitted to hospital) or as a previously diagnosed condition within Australian health records.

Data analysis

Positively skewed treatment cost and length of stay data indicated non-parametric data analyses were appropriate in this study. Mann-Whitney U tests were employed to compare cost of treatment and length of stay between patients who had a diagnosis of dementia and

those who did not. Spearman correlations were used to explore relationships among variables potentially associated with cost of treatment. SPSS (version 20) was used to facilitate statistical analyses (8).

Results

In total, 4,332 patient records were examined for people aged 55 years and older admitted to a large regional hospital during winter 2013 and 2014. Mean age at admission among this cohort was 73 years ($SD=4$). The majority of older-adult hospital admissions originated from private dwellings ($n=3,872$), with comparatively fewer from aged care facilities ($n=460$). Less than 1 percent ($n=26$) of older patients were designated as having a primary presentation of 'dementia' or 'delirium with dementia'. Examination of patient health records (including all previous diagnoses) identified 254 individuals who had an existing diagnosis of dementia at the time of admission ($n=120$ in 2013; $n=134$ in 2014). The diagnosis of dementia was recorded either in patient's DRG code (current presenting condition) or in their electronic medical record (pre-existing diagnosis).

In winter 2013, there was a statistically significant difference in median cost of hospital treatment between people who had a diagnosis of dementia ($Mdn=AUD\$9,165$, $n=120$) and people who had no diagnosis ($Mdn=AUD\$5,519$, $n=1807$), $U=67959$, $z=-6.86$, $p<.001$. These findings were confirmed in winter 2014 where there was also a statistically significant difference in cost of treatment between people who had a diagnosis of dementia ($Mdn=AUD\$9,625$, $n=134$) and people who had no diagnosis ($Mdn=AUD\$5,879$, $n=2269$), $U=95505$, $z=-7.25$, $p<.001$. For both years, cost of treatment was ≥ 39 percent higher among cohorts of older adults who had a diagnosis of dementia.

Significant differences were also observed in length of stay data. In winter 2013, there was a statistically significant difference in median length of stay between people with a diagnosis of dementia ($Mdn=5$, $n=120$) and people with no diagnosis ($Mdn=3$, $n=1807$), $U=87280$, $z=-3.64$, $p<.001$. In 2014, there was also a statistically significant increase in length of stay between people with a dementia diagnosis ($Mdn=5$, $n=134$) and people with no diagnosis ($Mdn=2$, $n=2269$), $U=106014$, $z=-6.11$, $p<.001$. Each year, length of stay was ≥ 40 percent longer among cohorts of older adults who had a diagnosis of dementia.

Insert Table 1 here

Among individuals who presented to the regional hospital with a diagnosis of dementia in 2013, longer stay was correlated with higher treatment costs, $r=.43$, $p<.001$. There was, however, no correlation between cost of treatment and age ($r=-.05$, $p=.60$) or death during admission ($r=.14$, $p=.14$). Similarly, among individuals who presented to the hospital and had a diagnosis of dementia in 2014, longer stay was correlated with cost of treatment, $r=0.32$, $p<.001$. Again, there was no correlation between average cost of treatment and age ($r=-.03$, $p=.75$) or death during admission ($r=.05$, $p=.58$).

Within the cohort of older adults who had an existing dementia diagnosis, 15 percent ($n=18$) of 2013 and 18 percent ($n=24$) of 2014 admissions had 'dementia' or 'delirium with dementia' recorded as their primary presentation. When individuals with dementia were admitted to the regional hospital, conditions that they were treated for (recorded in DRG information) included kidney disease and urinary tract infections (9%), respiratory illnesses (16%), cognitive and cerebral problems (20%), injuries and fractures resulting from accidents (27%), diseases of the circulatory and cardiovascular system (10%), and other conditions (18%) including cancer, diabetes, and infections.

Discussion

This study is among the first to report significantly increased treatment costs and length of stay for people with dementia admitted to a large regional hospital when compared to populations with no diagnosis. In both winter 2013 and 2014, the cost of treatment for a person aged 55 years or older with a dementia diagnosis admitted to a large regional hospital was at least 39 percent higher than individuals with no diagnosis. Similarly, length of stay was at least 40 percent higher among older adults who had a diagnosis of dementia. Greater cost of treatment and length of stay among those with a dementia diagnosis were highly correlated and potentially related to the increased complexity of care requirements (e.g. challenges imposed by multiple comorbidities and communication difficulties), greater number of required investigative procedures, or the need for additional human resources to support the person with dementia (9, 10). Treatment costs for people with dementia were not significantly associated with either age or death during admission indicating that proximity to death does not account for increased treatment expense among this cohort. Proximity to death is often cited as a reliable indicator of likely costs of treatment for individuals admitted to hospital (11), although our data suggest that dementia may be an independently significant influence.

Recorded prevalence of dementia among those admitted to a large regional hospital was less than 1% of total admissions. Estimates of dementia prevalence in Tasmania (5% of the 55 and older population) suggest that the recorded number of hospital admissions observed in this study was low (12). This could be explained by enduring under-diagnosis of dementia that has been reported in Australia and internationally, where up to 50% of people with dementia are not diagnosed in a timely manner (13, 14). Reasons for under-diagnosis of dementia that have been reported in the literature include differing attitudes to and knowledge about dementia diagnosis as well as frequent misinterpretation of symptoms as part of normal ageing (14). In addition to the potential for under-diagnosis, there are also gaps in the ascertainment and categorisation of dementia upon hospital presentation and in medical coding (DRG codes). Research from Tasmania has previously identified problems of under-coding of dementia (and other cognitive deficits) and a low correlation between admission diagnosis and recorded dementia codes upon separation from hospital (15). Although dementia is infrequently the primary presentation among older adults admitted to a regional hospital (with underdiagnoses and under-ascertainment in medical coding), it may be an underlying contributor in many conditions for which older adults with dementia are hospitalised. The international literature indicates that dementia is related to the onset or exacerbation of a range of health conditions for which older adults are hospitalised, including respiratory diseases, urinary tract infections, falls and fractures, delirium, and accidental poisoning or overdosing on medication (16-18). These conditions were commonly recorded primary presentations among people with a diagnosis of dementia and represented up to 72% of admissions in this group. The under-recognition of dementia as a pre-existing diagnosis during a hospital admission may be associated with a lack of expert knowledge about symptomatology, a focus on treating a presenting condition to the exclusion of underlying concerns, a lack of screening of older people with cognitive symptoms, a lack of proper investigation into a patient's health history, or no existing diagnostic history (19).

Although these findings are preliminary and require verification with a multi-site and representative sample, it is conceivable that there may be poor alignment between initial categorisation of presentations among the cohort of people who have dementia and the management that they receive within a regional hospital. These findings suggest the need for better screening of patients with a cognitive impairment, early identification of dementia in hospital, and targeted education concerning best-evidence diagnosis, care, and treatment among clinical staff. From 2016, a co-funded National Health and Medical Research Council

(NHMRC) and Australian Research Council (ARC) study (led by the first author) will explore the effects of an online dementia education intervention on costs of treatment, length of hospital stay, and other metrics in regional and rural Australian hospitals. International randomised controlled trials have reported that educational interventions in hospitals are a cost-effective strategy for improving treatment outcomes for chronic health concerns (20), although more work is required to evaluate the effects of dementia education programs.

Conclusion

When older adults with dementia present to a large regional hospital they incur significantly higher costs of treatment and longer stays than older adults who have no dementia diagnosis. This relationship appears to be unrelated to proximity to death. Although the reported prevalence of dementia in a regional hospital is low, many of the conditions for which people with dementia are hospitalised are potentially related to the progression or exacerbation of the underlying pathology of the condition, potentially masking the true impact of dementia in regional hospitals.

Key points

1. Regional hospital admissions of people with diagnosed dementia are associated with significantly higher treatment costs and longer stays when compared to people with no diagnosis.
2. Regional hospital costs of treatment for people with dementia are not associated with either age or likelihood of death.
3. Dementia-related presentations in a large regional hospital are low, but potentially masked by acute exacerbation or injury associated with progression of the syndrome.

References

1. Australian Institute of Health and Welfare. Dementia in Australia. Canberra, Australia Australian Government 2012. Report No.: AGE70.
2. Alzheimer's Australia. Dementia care in the acute hospital setting: issues and strategies. Canberra, Australia Alzheimer's Australia 2014. Report No.: 40.
3. Davis S, Bartlett H. Healthy ageing in rural Australia: issues and challenges. *Australasian Journal on Ageing*. 2008;27(2):56-60.
4. Nunes B, Silva RD, Cruz VT, Roriz JM, Pais J, Silva MC. Prevalence and pattern of cognitive impairment in rural and urban populations from Northern Portugal. *BMC Neurology*. 2010;10(1):42.

5. Alzheimer's Australia. Support needs of people living with dementia in rural and remote Australia. Canberra, Australia Alzheimer's Australia 2007.
6. Australian Bureau of Statistics. Population by age and sex: Tasmania. Canberra, Australia: Australian Bureau of Statistics; 2011 [cited 2015 16 March]; Available from: <http://www.abs.gov.au/ausstats/abs>
7. Australian Institute of Health and Welfare. Australia refined diagnosis-related groups (AR-DRG) data cubes. Canberra, Australia: Australian Institute of Health and Welfare; 2015 [cited 2015 15 April]; Available from: <http://www.aihw.gov.au/hospitals-data>
8. IBM Corp. IBM SPSS Statistics for Windows, Version 20.0. Armonk, New York: IBM Corp.; 2011.
9. Sampson EL, Gould V, Lee D, Blanchard MR. Differences in care received by patients with and without dementia who died during acute hospital admission: a retrospective case note study. *Age and Ageing*. 2006;35(2):187-9.
10. Zweifel P, Felder S, Meiers M. Ageing of population and health care expenditure: a red herring? *Health Economics*. 1999;8(6): 485-96.
11. Werblow A, Felder S, Zweifel P. Population ageing and health care expenditure: a school of 'red herrings'? *Health Economics*. 2007;16(10):1109.
12. Deloitte Access Economics. Dementia across Australia: 2011-2050. Canberra, Australia: Alzheimer's Australia 2011.
13. Greenway-Crombie A, Snow P, Disler P, Davis S, Pond D. Influence of rurality on diagnosing dementia in Australian general practice. *Australian Journal of Primary Health*. 2012;18(3):178-84.
14. Connolly A, Gaehl E, Martin H, Morris J, Purandare N. Underdiagnosis of dementia in primary care: variations in the observed prevalence and comparisons to the expected prevalence. *Aging and Mental Health*. 2011;15(8):978-84.
15. Cummings E, Maher R, Showell CM, Croft T, Tolman J, Vickers J, et al. Hospital coding of Dementia: is it accurate? *Health Information Management Journal*. 2011;40(3): 5.
16. Kurrle S, Brodaty H, Hogarth R. Physical comorbidities of dementia: Cambridge University Press; 2012.
17. Russ TC, Shenkin SD, Reynish E, Ryan T, Anderson D, MacLulich AM. Dementia in acute hospital inpatients: the role of the geriatrician. *Age and Ageing*. 2012;41(3):282-4.
18. Sampson EL, Blanchard MR, Jones L, Tookman A, King M. Dementia in the acute hospital: prospective cohort study of prevalence and mortality. *The British Journal of Psychiatry*. 2009;195(1):61-6.

19. Maslow K, Mezey M. Recognition of dementia in hospitalized older adults. The American Journal of Nursing. 2008;108(1):40-9.
20. Forsetlund L, Bjorndal A, Rashidian A, Jamtvedt G, O'Brien MA, Wolf F, et al. Continuing education meetings and workshops: effects on professional practice and health care outcomes. Cochrane Database Syst Rev. 2009;2(2): 1-97.

Table 1: Cost of hospital treatment and length of stay for people aged 55 and older in winter 2013 and winter 2014 ($N = 4,332$).

	Median cost of treatment (AUD [†]) (interquartile range, <i>IQR</i>)	Mean cost of treatment (AUD) (standard deviation, <i>SD</i>)	Median hospital stay (interquartile range, <i>IQR</i>)	Mean length of stay (standard deviation, <i>SD</i>)
2013 Person with a dementia diagnosis ($n=120$)	\$9,165 (<i>IQR</i> = \$5,753) (USD [‡] \$7,069) [§]	\$10,827 (<i>SD</i> = \$7,061) (USD \$8,350)	5 days (<i>IQR</i> = 7)	7.05 days (<i>SD</i> = 7.44)
2013 Person without a dementia diagnosis ($n=1,807$)	\$5,519 (<i>IQR</i> = \$7,242) (USD \$4,257)	\$8,299 (<i>SD</i> = \$11,768) (USD \$9,076)	3 days (<i>IQR</i> = 5)	5.46 days (<i>SD</i> = 7.10)
2014 Person with a dementia diagnosis ($n=134$)	\$9,625 (<i>IQR</i> = \$5,759) (USD \$7,423)	\$10,322 (<i>SD</i> = \$6,265) (USD \$7,961)	5 days (<i>IQR</i> = 8)	7.04 days (<i>SD</i> = 6.29)
2014 Person without a dementia diagnosis ($n=2,269$)	\$5,879 (<i>IQR</i> = \$7080) (USD \$4,534)	\$8,119 (<i>SD</i> = \$11,371) (USD \$6,262)	2 days (<i>IQR</i> = 5)	4.63 days (<i>SD</i> = 6.86)

[†] Australian dollars

[‡] United States of America dollars

[§] Currency exchange rate of AUD1.00 to USD0.77 at 22/4/15

Minerva Access is the Institutional Repository of The University of Melbourne

Author/s:

Annear, MJ;Tierney, LT;Vickers, JC;Palmer, AJ

Title:

Counting the cost of dementia-related hospital admissions: A regional investigation

Date:

2016-09-01

Citation:

Annear, M. J., Tierney, L. T., Vickers, J. C. & Palmer, A. J. (2016). Counting the cost of dementia-related hospital admissions: A regional investigation. AUSTRALASIAN JOURNAL ON AGEING, 35 (3), pp.E32-E35. <https://doi.org/10.1111/ajag.12318>.

Persistent Link:

<http://hdl.handle.net/11343/291054>