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Protocol paper

First incident hospitalisation for Australian women aged 70 and beyond: A 10 year examination using competing risks

Melissa L. Harris[a,*], Xenia Dolja-Gore[a], Hal Kendig[b,c], Julie E. Byles[a,c]

[a] Research Centre for Generational Health and Ageing, Faculty of Health and Medicine, University of Newcastle, Australia
[b] Centre for Research on Ageing, Health and Wellbeing, College of Medicine, Biology and Environment, Australian National University, Australia
[c] ARC Centre of Excellence in Population Ageing Research (CEPAR), Australia

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ABSTRACT

There are increasing concerns regarding high hospital use among older adults and the capacity to manage the economic impact of the ageing population trend on healthcare systems. First hospitalisation in old age may act as a catalyst for ongoing intensification of health problems and acute care use. This study examined factors associated with first incident hospitalisation in women aged over 70, accounting for the health inequalities associated with geographic location. Survey data from 3780 women from the 1921 to 1926 cohort of the Australian Longitudinal Study on Women's Health were matched with the Admitted Patients Data Collection and National Death Index. Days to first event (hospitalisation or death) were modelled using competing risks methods. A total of 3065 (80.3%) women had at least one hospital admission. More than half of the top 15 reasons for first hospitalisation were related to cardiovascular disease, with atrial fibrillation the most common. Proportional subdistribution hazards models showed that first hospital admission was driven by enabling and need factors including asthma/bronchitis diagnosis (HR = 1.16; $p = 0.047$), private health insurance (HR = 1.16; $p = 0.004$) more than two prescribed medications in previous month (HR = 1.31; $p = 0.001$), more than four general practitioner visits in previous year (HR = 1.50; $p = 0.034$), lower physical functioning (HR = 0.99; $p < 0.001$) and living in an inner regional area (HR = 1.17; $p = 0.003$). First overnight hospitalisation was primarily related with potentially preventable and treatable chronic diseases. Primary and secondary strategies aimed at chronic disease generally, and better chronic disease management particularly for cardiovascular and respiratory diseases, may play a vital role in disease prevention or delay in readmissions among this population.

1. Introduction

There are increasing concerns regarding high hospital use among older adults and the capacity to manage the economic impact of the current ageing population trend on healthcare systems, even in Australia (Department of Treasury, 2015). Over the last decade, the proportion of Australians aged 65 and over has increased by about 30%, with those aged 85 and over representing the fastest growing cohort. Approximately 2% of the total Australian population are aged 85 and over, 65% of which are women (Australian Institute of Health and Welfare, 2013). This figure is projected to quadruple by 2050. This global trend is expected to have widespread implications for developing and developed nations, with the gap in life expectancy set to narrow (United Nations Department of Economic and Social Affairs Populated Division, 2013). In Australia, ageing and health pressures are projected to result in increased healthcare expenditure, particularly in terms of hospital use (Australian Institute of Health and Welfare, 2015; Department of Treasury, 2015). Understanding factors contributing to hospitalisations in the older population is therefore a key public health priority.

Hospitalisation (particularly in frail older adults) has been associated with a sequence of events that can result in deleterious outcomes, including reduced functioning, transition into aged care, and even death (Dent, Chapman, Howell, Piantadosi, & Visvanathan, 2014; Gaugler, Duval, Anderson, & Kane, 2007). Increased hospitalisation has been attributed to a number of factors depending upon the study design and population examined. Drivers of hospitalisation, (particularly readmission), have been attributed to clinical factors such as specific chronic diseases (including multimorbidity) (Condelius, Edberg, Jakobsson, &

* Corresponding author at: Research Centre for Generational Health and Ageing, Faculty of Health and Medicine, University of Newcastle, University Drive, Callaghan, NSW 2308, Australia. Fax: +61 2 4042 0044.
E-mail address: melissa.harris@newcastle.edu.au (M.L. Harris).

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Hallberg, 2008). Non-disease health factors (e.g. self-rated health, functional decline, obesity, smoking, falls) (Korda et al., 2013; Laniece et al., 2008; Wang, Shamliyan, Talley, Ramakrishnan, & Kane, 2013; Wang, Sheu, Shyu, Chang, & Li, 2014) as well as sociodemographic and psychosocial factors (e.g. social support, geographic location) (Aminzadeh & Dalziel, 2002; Jakobsson, Kristensson, Hallberg, & Midlov, 2011; Sandoval et al., 2010) have also been associated with hospital admissions (and healthcare utilisation, more broadly), although less consistently.

Currently, there is a lack of evidence regarding factors that predict first incident hospital admission (which can be the catalyst for ongoing intensification of health problems and acute care service use) in older adults. Understanding such factors may play a critical role in future healthcare planning and the targeting of preventive interventions to reduce poor health outcomes for this population. In Australia, however, geographic location complicates the healthcare picture with significant health, and healthcare inequalities identified between rural and remote communities and those in metropolitan areas (Australian Institute of Health and Welfare, 2014). Health disparities across geographic location have primarily been attributed to the prevalence of predisposing biomedical and behavioural risk factors, relative socioeconomic disadvantage, and limited access to health services (Australian Institute of Health and Welfare, 2014; Harvey, 2007). This suggests that geographic location may confound the relationship with healthcare utilisation. Further, studies examining hospitalisation (and healthcare utilisation more broadly) have failed to account for the competing risk associated with death in analyses. Competing risks occur when participants can experience one or more events which 'compete' with the outcome of interest. The competing risk hinders the observation of interest and modifies the chance that this event occurs (Noordzij et al., 2013). In this instance, death competes with being admitted to hospital and modifies the chance of hospitalisation. As such, accounting for only one event may introduce bias. Therefore, conceptualised within the Andersen–Newman behavioural model of health service utilisation (Andersen, 1995), the aim of this study is to examine factors associated with first incident hospitalisation, in women aged over 70, accounting for the health inequalities associated with geographic location.

2. Methods

2.1. Overview of study design and participants

This study used data from the 1921–1926 cohort of the Australian Longitudinal Study on Women's Health (ALSWH). Baseline surveys were completed in 1996 when the women were aged 70–75 years ($N = 12{,}432$). Of these women, 11,726 (94%) consented to having their survey data linked to various administrative datasets. The cohort has been surveyed every three years since 1996. Participants were eligible for inclusion in this analysis if they were New South Wales (NSW) residents. Of the women meeting this criterion ($N = 4364$), 3780 were residents for the entire period between 1 July, 2000 and 30 December, 2010 (when the administrative hospital data were available), consented to data linkage, and had not been hospitalised during 1998–2000.

Participant status was defined by their first event (hospitalisation or death) within the observation period. Deaths records were obtained from the National Death Index (Powers, Ball, Adamson, & Dobson, 2000) (which contains records of all deaths occurring in Australia since 1980) and matched on identifying information including name, address, gender, state, date of birth and age at last contact. For this study, data on first admission to hospital was collected from the NSW Admitted Patients Data Collection (APDC). This database is a census of all admitted patients services provided by NSW public and private hospitals for each resident. The database includes but is not limited to admission and separation dates, as well as reason for admission (www.cherel.org.au). As hospital care in Australia is provided by a tax-funded universal healthcare system which is managed separately by each state or territory, continuous hospital data was provided for each participant during the observation period. Good agreement has been found between hospital records and the ALSWH self-report data (Navin Cristina, Stewart Williams, Parkinson, Sibbritt, & Byles, 2015). Time to participant's first event was measured in days from 1 July 2000 to the date of the event, with data censored at 30 December 2010.

2.2. Confounder

Geographic location was assessed according to the Accessibility/Remoteness Index of Australia Plus (ARIA+) (Department of Health and Aged Care (GISCA), 2001) which measures distance to services including access to tertiary teaching hospitals, and classified as 'metropolitan', 'inner regional', and 'outer regional/remote/very remote'.

2.3. Predictors

Baseline measures were collected from the 1999 survey. Variables were included in the models according to the Andersen–Newman framework (Andersen, 1995) which proposes that health service is driven by predisposing (distal factors such as demographics and health beliefs), enabling (individual or community-specific factors such as income, health insurance and social network) and need (illness level factors such as perceived health status and diagnoses) characteristics. Predisposing factors included age, marital status (widowed, not widowed), highest educational qualification (no formal schooling/year 10, post-schooling), Country of birth (Australia, other), language spoken at home (English, other) and smoking status (current smoker, ex-smoker, non-smoker). Enabling factors included receiving a government pension (yes, no), contributing to private health insurance (yes, no) and perceived social support (Koenig et al., 1993). Need factors included number of general practitioner (GP) services (0, 1, $\geq$2), prescribed medications (0, 1, $\geq$2) and BMI categorised according to World Health Organization guidelines (WHO Consultation on Obesity, 1999) ('underweight' $<$18.5, 'healthy' 18.5–24.99, 'overweight/obese' >25). As previous research has indicated that traditional BMI cut points may not be suitable for adults aged over 65 years (with overweight and mild obesity found to be protective against mortality) (Kulminski et al., 2008) sensitivity analyses were conducted using the following BMI cut points: (i) high risk ($<$22), healthy weight (22–24.9), minimal risk (25.0–34.9) and obese ($\geq$35) (Kulminski et al., 2008) (ii) high risk ($<$18.5), healthy weight (18.5–24.9), minimal risk (25.0–29.9) and obese ($\geq$30) (Flicker et al., 2010). Other need factors included the presence of pre-existing chronic conditions (yes, no) such as diabetes, cancer, heart disease, stroke, hypertension, asthma/bronchitis or arthritis, and falls in the last 12 months. Health perceptions such as perceived general health (excellent/good, not good/poor) as well as the physical functioning and mental health subscales of the SF-36 were also included.

2.4. Ethical approval

The ALSWH project has ongoing ethical clearance from both the University of Newcastle and University of Queensland's Human Research Ethics Committees. Ethical approval for the linkage of ALSWH survey data to the NSW APDC was received from the NSW