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# Dementia: A risk factor for burns in the elderly

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ABSTRACT

*Background:* Older people are disproportionately at risk of burn and have a high risk of dementia; however the impact of dementia on risk of burn is unknown.

*Method:* Linked hospitalisation and death records for individuals aged 65 years and older admitted to a NSW hospital for a burn over the ten year period 2003–2012 were analysed. Demographic and burn characteristics and health outcomes were compared for people with and without dementia. Incidence rates were calculated per 100,000 population and negative binomial regression was used to examine temporal trends.

*Results:* Of the 1535 older people hospitalised for a burn, 11.0% had a record of dementia. The age-standardised incidence rate for people with dementia was 22.7 per 100,000, and for people without dementia was 14.2 per 100,000 population, an incident rate ratio (IRR) of 1.6 (95%CI 1.3–2.0, $p < 0.0001$). There was no significant change in rates over time. People with dementia were more likely to be admitted with burns to the trunk and have greater than 20% total body surface area (TBSA) burn. Mean length of stay (LOS) was more than double (24 vs 12 days) and 30-day mortality three times higher (15.4% vs 5.1%) for people with dementia. Adjusting for differences in age, sex, TBSA, inhalation injury, comorbidities and complications eliminated the increased mortality but not the difference in LOS. People with dementia were more likely to have been burnt by hot tap water (RR 2.3; 95%CI 1.8–2.8, $p < 0.0001$) and ignition of clothing/nightwear (RR 2.6; 95% CI 1.2–5.4, $p = 0.0149$) and to have sustained the burn in residential aged care (20.0%).

*Conclusion:* Burns in people with dementia are significant injuries, which have not decreased over the past ten years despite prevention efforts to reduce burns in older people. Targeted prevention education in the home and residential aged care facilities is warranted.



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## 1. Introduction

Currently 17.5% of the population in high income countries are aged 65 years and older, and with the ageing of the population it is estimated that by 2040 one in every four persons will be aged over 65 years [1]. In Australia, there are 3.6 million people aged over 65 years, which is projected to increase to 6.8 million by 2040 [2]. This increase presents a considerable challenge to burns care, as older people are disproportionately represented in burn-related hospitalisations [3]. Burns in this age group constitute more serious injuries than in the general population for a given burn; incur longer hospital lengths of stay (LOS), higher rates of inhalation injury and complications, and result in higher mortality [3–7].

As people age their risk of age-associated medical conditions, including dementia, increases. Around 9% of the population aged 65 years and older are estimated to have dementia in Australia [8]. Dementia is characterised by a gradual, progressive and irreversible decline in cognition, including memory, language, problem solving and decision making abilities [9], which can lead to an impaired ability to identify a high risk situation as well as reduced capacity to appropriately respond to danger. It is not surprising that dementia is associated with substantial trauma-related morbidity and mortality. A recent population-based study found that injury is the most common reason for admission to hospital for people with dementia in Australia [10], and dementia has been shown to be independently associated with increased mortality for some injuries, such as hip fracture [11].

To date, few studies have explored the relationship between burn and dementia and their findings have been contradictory. In a small case-control study of 36 patients with dementia admitted to an urban burn centre, Alden and colleagues found that a higher proportion of people with dementia required ventilator support and monitoring in an intensive care unit (ICU), with an in-hospital mortality rate twice that of those without dementia, whilst there was no difference in LOS [12]. In contrast, a large study by Thombs and colleagues investigating the impact of comorbidities on in-hospital mortality and LOS in 31,338 adult burns patients aged 18 years and over, found that dementia was associated with increased LOS but not mortality [13].

To address these inconsistencies in the literature, inform the planning of care and identify potentially avoidable risk factors for older people with dementia who have sustained a burn, we analysed linked hospitalisation and death data for burn-related hospitalisations for people aged 65 years and older admitted to hospital in New South Wales (Australia) for the ten year period 2003–2012. The aims were to: estimate the incidence of burn in people with dementia; to determine whether, and to what extent, dementia impacts on mortality risk and length of hospitalisation in patients hospitalised with acute burn; and to determine whether the mechanism of injury differs between people with and without dementia.

## 2. Methods

### 2.1. Study population and data sources

New South Wales (NSW) is Australia's most populous state, with an estimated 1.1 million people aged 65 years and older [14]. It is serviced by around 400 public and private hospitals including three designated tertiary referral Burns Units (two adult, one paediatric). To identify burn-related hospitalisations and long-term mortality outcomes at the population level, two administrative data sources were linked; the admitted patient data collection (APDC) and the register of births deaths and marriages (RBDM). The APDC provides a census of hospital admissions to all NSW public and private hospitals. Data is collected on all 'episodes of care' in hospital which end with the discharge, transfer or death of the patient or when the service category for the patient changes (i.e. a change from acute care to rehabilitation for a patient during a stay in a single facility). Thus for a single burn an individual may have multiple episodes of care recorded. Data is coded using the International Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM) [15]. The RBDM contains records of all deaths of NSW residents, and provides date of death.

Linkage was undertaken by the Centre for Health Record Linkage (CHeReL) using probabilistic matching of patient's name, date of birth, and address [16].

### 2.2. Case selection and creation of study variables

Cases selected included all individuals aged 65 years and older admitted to a NSW hospital with a primary diagnosis of burn in the ICD-10-AM range 'T20-T31' over the ten year period 1 January 2003 to 31 December 2012.

#### 2.2.1. Patient characteristics

ICD-10-AM codes used to define the study variables are specified in Table 1. A flag of 'dementia' was assigned to a record of an individual if a diagnosis of dementia was recorded in any of the first 40 additional diagnosis fields associated with that record, or in any hospitalisation record in the year prior to that admission (i.e.: using a 12 month look back period).

The Charlson Comorbidity Index (CCI) was used to identify comorbidities. The ICD-10 coding algorithm developed by Quan [17] which has been validated for use in older populations [18], and a 12 month lookback period was used to identify comorbidities contributing to the index. Dementia (CCI group 5) was excluded from the total CCI score to avoid collinearity between CCI and dementia status. The resulting CCI score was categorised as 0, 1–2 and 3+. The Socio-Economic Index for Areas (SEIFA), which provides an index of relative socioeconomic disadvantage, was used to determine socioeconomic status. The SEIFA index values were grouped into quintiles with each quintile being assigned based on a person's statistical local government area of residence.

#### 2.2.2. Burn characteristics

A flag of 'inhalation injury' was assigned to denote burn of the respiratory tract, mouth and pharynx, or toxic effect of carbon