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Accidental injuries among older adults: An incidence study

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ABSTRACT

Background: To date, the majority of studies assessing accidental injuries among the elderly have focused on fall injuries, while studies of other mechanisms of injuries have been lacking. Therefore, the main objective of this study was to investigate all injury-related visits among older adults to an emergency department and risk factors for injuries.

Methods: Data were collected on all registered visits of adults, ≥67 years old, living in the capital of Iceland, to the emergency department of Landspitali, the National University Hospital, in 2011 and 2012.

Results: The yearly incidence rate for injuries was 106 per 1000 adults, ≥67 years old. Of all injuries (n = 4,469), falls were the most common mechanism of injury (78 per 1000), followed by being struck or hit (12 per 1000) and being crushed, cut or pierced (8 per 1000). Other mechanisms of injury, such as acute over-exertion, foreign body in natural orifice, injuries caused by thermal and chemical effect and other and un-specified mechanism were less common (8 per 1000). Fractures were the most common consequences of injuries (36 per 1000). The most frequent place of injury was in or around homes (77 per 1000), with men being more likely than women to be injured outside of the home (60 per 1000 vs. 36 per 1000).

Conclusion: Results indicate that falls are the main cause of accidental injuries, followed by being struck and hit injuries but other causes contributed to the rest. Falls constitute a major public health problem and fall-related injuries can have a substantial impact on the lives of older adults. As life expectancy continues to increase, fall risk is expected to increase. Since falls constitute a major impact on the lives of older adults and can lead to not only declines in physical activity and functional status, but to considerable health care costs, the health care system needs to intervene.

1. Background

Worldwide, injuries caused by accidents are a common public health problem for older adults [1] and are the leading cause of both fatal and non-fatal injuries in this age group [2]. Approximately 6.7 million adults 60 years and older are treated for injuries in hospitals in the European Union every year and about one third of them will need to be admitted for an extended hospital stay [2]. Injuries can have a substantial impact on the lives of older adults (i.e. adults 60 years and older) [3], such as declines in physical activity and functional status [4]. Furthermore, injuries take an enormous toll on the economy, both through health care costs arising from disability, hospitalization and premature death [5].

Previous research has found older age to be a risk factor for accidental injuries among older adults [6]. In addition, females have been found to be at greater risk for accidental injuries than men during late adulthood (≥65) [5,7]. Furthermore, previous research has found fractures to be the most common consequence of injuries among this age group [8], specifically fractures of the hip, lower end of radius, rib and humerus [9]. The most serious of these fractures are hip fractures [10], which most often result from falls [11]. Nearly half of all injuries among older adults seem to occur in the home environment [9], while other places of occurrence include residential care facilities, health care settings and transport areas [8].

Falls have been found to be the most common reason for accidental injuries [8] accounting for up to 70% of visits to the EDs among older

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adults [2,12]. Mechanisms of injuries other than falls, such as being struck by or against something, overexertion, cuts and pierce wounds, seem to be much less common than falls among older adults [13]. The struck by or struck against injuries are defined as injuries that result from contact made between a person and another human, animal or inanimate object such as furniture [14]. These types of injuries were the second leading cause of non-fatal injuries treated in EDs in the U.S. in 2015 among people 65 years and older [13]. To date, the majority of studies assessing injuries among the elderly have focused on fall-related injuries, while studies on other mechanisms of accidental injuries, such as struck by or struck against are lacking [15]. Two studies have previously assessed consequences of accidental injuries among older adults, both assessing accidental injuries at the Umea University Hospital in Sweden. Results indicate that fractures were the most common consequence of injuries, followed by wounds and contusions [8,15]. However, neither study assessed the mechanism of injuries.

To date, the majority of research assessing the incidence and prevalence of accidental injuries relies on data from a small portion of the populations under study. We address this limitation by relying on data from Landspitali, the National University Hospital of Iceland, which accounts for the majority of visits by older adults to emergency departments in the country [16,17]. The National University Hospital is the single academic tertiary hospital in the country, which collects extensive electronic medical records applying the NOMESCO classification system for external causes of injuries [18].

The overarching aim of this study was to present an overview of the injury spectrum for older adults. Specifically, to assess the mechanisms of injuries, rate and risk factors for injuries among older adults admitted to the emergency department of the national hospital in Iceland in 2011–2012 using registry-based data.

2. Methods

2.1. Study context and data source

The context for the study was the capital region in Iceland, where approximately 65% of inhabitants in the country reside or 215,000 [19]. Data on accidental injuries was obtained from medical registries at Landspitali, the only hospital in the region, the Nordic Medico-Statistical Committee (NOMESCO) database [18] and the International Classification of Diseases (ICD-10) [20] coding systems. The primary data source of the study was all visits of adults, aged 67 and older, to the general emergency department of Landspitali, the National University Hospital of Iceland, in the years 2011 and 2012. Older adults were defined as people aged 67 and older, based on the general retirement age in Iceland. Trauma ICD-10 diagnosis on discharge from the national hospital were used.

2.2. Exposure and outcome

The independent variables of interest were obtained from the NOMESCO register: gender, age, place of residence, place of occurrence, mechanism of injury and type of injury. Age was divided into the following six groups: 67–69, 70–74, 75–79, 80–84, 85–89, ≥90 years.

The following NOMESCO categories for place of occurrence were used [18]: school, institutional area and public premises; transport area; retail, commercial and service area. We split the NOMESCO category for residential area into two categories: inside of a residential area (i.e. in the kitchen, living room, bedroom, bathroom, washroom or stairs) and outside of a residential area (i.e. garden, playground, driveway, yard, parking area or garage). We combined the NOMESCO categories amusement, entertainment and park area and open nature. Furthermore, we combined the categories for sea, lake and river, production and workshop area and sports area categories with place, other and unspecified.

In our study we further used the following NOMESCO categories for the mechanism of injury variable [18]: struck, hit by fall; struck, hit by contact with other object, person or animal; crushing, cutting, piercing (e.g. penetration of skin by foreign body such as splinter); foreign body in natural orifice; acute overexertion of body or part of body. We combined the NOMESCO category chemical effect with thermal effect. Finally, we combined the NOMESCO categories suffocation and electric/radiation and effect of other energy-waves with mechanism of injury, other and unspecified.

2.3. Statistical analysis

Analyses were conducted using the statistical software R Studio for Mac (version 3.1.2.). Generalized linear model with Poisson error structure, using the natural logarithm of the population numbers as offset, was used to conduct regression analysis to assess the accident rate with regards to age and gender as well as the differences in accident rate between the years 2011 and 2012. Age-adjusted incidence of injuries was calculated for each year during the study period, in 2011 and 2012, along with the overall incidence. Population data was collected from Statistics Iceland, using the annual midyear population, and used to calculate the age-specific incidence of visits to the emergency department per 1000 population. Additionally, the age-specific incidence was broken down per 1000 males and females to determine statistical difference between genders. The National Data Protection Authority (2014060949AT) and The Landspitali Bioethics Committee (9/2013) approved the study.

3. Results

3.1. Demographics

In the study period, older adults made 4,469 visits to the emergency department of the national hospital due to accidental injuries; 2,180 visits in the year 2011 and 2,289 visits in the year 2012. The age of injured older adults ranged from 67 to 107 years ($\bar{x}$ = 79; SD ± 7.5). The average age of men and women was 78 (SD ± 7.2) and 79 (SD ± 7.7), respectively. Of the 4,469 visits, 3,459 individuals visited the hospital once and 505 individuals twice. The majority of those injured were women, or 62%.

3.2. Distribution of injuries by age and gender

Overall, the yearly incidence rate for visits among adults 67 years and older was 106 per 1000 population. Poisson regression analysis revealed no difference in injury rate between the years 2011 and 2012 (RR = 1.02, 95% CI 0.96–1.08). Furthermore, injury rates increased with age (test for linear trend $p < 0.001$) and were highest for adults 90 years and older. Injury rates increased with age for both genders. Among men, the injury rate was lowest at 63 per 1000 in the youngest age group and highest at 185 per 1000 in the oldest age group. Among women, the injury rate was lowest at 71 per 1000 in the youngest age group and highest at 196 per 1000 in the oldest age group (Table 1).

Injury rates per 1000 women were higher than among men in all age groups (RR = 1.19, 95% CI 1.12–1.26; $p < 0.001$). Furthermore, women aged 75–89 were significantly more likely to sustain injuries compared to men ($p < 0.05$). No difference in injury rate with regard to gender was found in other age groups (Table 1).

3.3. Place of occurrence

Injuries in or around the homes were most common, with 49 per 1000 population occurring inside homes and 28 per 1000 population occurring outside the homes. Women were significantly more likely to suffer injuries inside the homes ($p < 0.05$), while men were significantly more likely to suffer injuries outside of the homes ($p < 0.05$). Furthermore, women were significantly more likely to