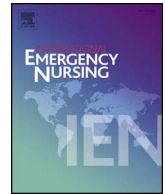




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Variations in elderly peoples' visits to the emergency departments in Iceland: A five-year population study

Elisabet Gudmundsdottir^{a,*}, Helga Rosa Masdottir^{b,c}, Hlif Gudmundsdottir^{c,e},
Lovisa Agnes Jonsdottir^{b,c}, Ingibjörg Sigurthorsdottir^{b,c}, Sigrun Sunna Skuladottir^{b,c},
Sigrun Helga Lund^d, Thordis Thorsteinsdottir^{b,e}

^a Division of Finance and Information, Landspítali-The National University Hospital of Iceland, Iceland

^b Research Institute in Emergency Care, Landspítali-The National University Hospital of Iceland, Iceland

^c Division of Emergency, Geriatrics and Rehabilitation Services, Landspítali-The National University Hospital of Iceland, Iceland

^d Department of Public Health Sciences, University of Iceland, Iceland

^e Faculty of Nursing, School of Health Sciences, University of Iceland, Iceland

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ABSTRACT

Introduction: Elderly people visiting emergency departments (ED) are a non-homogenous group. Gender and other socio-demographic variations in emergency care might be present. However, gender-specific ED-data is scarce.

Methods: We retrieved retrospective data on all ED-visits, by 67 years and older from 2008 to 2012, and calculated incidence of visits applying population registries. The relationship of age-categories, marital status, health and residence with outcomes were analyzed descriptively by Chi-square tests. Regression models were built to analyze gender-specific variations.

Results: Of the total ED-visits, 20% were from the elderly population (n = 66,141), at a mean 3.1 visits per individual. Men (n = 30,269) had higher incidence of visits in all age-categories. They were mostly married (69%) and women widowed (43%), although the incidence of partnered visitors underrepresented population-data while widowed and single living overrepresented. Women had more often co-morbidities, their most common causes of visits were musculoskeletal (20%) and men circulatory causes (14%). Men were more likely to be admitted (OR: 1.23; 95% CI 1.16–1.30) and had more unplanned ED-revisits (HR: 1.20; 95% CI 1.06–1.35) within 30 days.

Discussion: Elderly men visiting the ED were more often married than women. Gender differences were found in causes of visits and outcomes. In clinical practice, gender may be considered when identifying risk and planning adequate care related elderly ED-visits.

1. Introduction

The frequency of ED visits by elderly people appears to increase with age [1–3], but data on gender differences and marital status of elderly visitors are more vague. A Canadian study from 1997 revealed that elderly men visited the ED more often than women as well as those living alone compared with married [4]. Previous studies have mainly compared elderly people with younger ED attendants or they have focused on specific patient-groups amongst the elderly [1,5,6]. There is limited scientific knowledge describing demographic and especially gender differences in what causes ED visits amongst elderly and results vary on different outcomes after the visits [7,8]. There are known gender differences in outcomes and mortality after several acute

conditions such as: stroke, myocardial infarct, sepsis and burns that are varying between age categories [9–13]. Studies have found the rate of admission to hospital after ED visits to vary between 30% and 90% for the elderly [1,2,5,14]. Hence, EDs' are important portals to specialized health-care for elderly people taken in account different health-care organisations internationally. Although, studies have shown gender differences on number of visits and admission rates, other results are rarely presented by gender. Therefore, it was of interest to explore if women seek ED care of different causes or have a different socio-demographic background than men visiting the ED. This gap in the research area, that might be important for ED professionals, has been identified earlier [15,16] and is worth exploring.

It may be possible to prevent some unplanned ED revisits with

* Corresponding author at: Eiríksgata 5, 101 Reykjavík, Iceland.
E-mail address: elisabeg@landspitali.is (E. Gudmundsdottir).

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appropriate referrals or specialized follow up after an ED visit. To identify those in most need for special care and adequate referrals, it is of importance to find predictors for visits and outcomes after ED visits among the elderly. In this study, we utilized the extensive electronic health-record databases available at the hospital combined with population registries. We aimed to study gender variations in causes and outcomes of visits, by those 67 years and older, to the ED at LUH. The research questions were:

- (1) Were there variations in incidence of visits by elderly men and women by marital status or age as well as variations in causes of visits, co-morbidity, outcomes and unplanned ED revisits during the five-year period, 2008–2012?
- (2) How did gender, age, marital status, residence or cause of visit associate with the outcomes after the ED visit?

2. Methods

2.1. Study design and setting

A retrospective observational study was conducted on all ED visits by pension-aged patients (67 years and older) to the general ED at Landspítali National University Hospital in Reykjavík, Iceland, from January 1st 2008 to December 31st 2012. This ED covers approximately 62% of all ED visits by the elderly population in Iceland, including all emergency visits by the elderly living in the capital area of Reykjavík. Following an ED visit, elderly patients may be admitted to various hospital wards or discharged home with or without referrals to outpatient services. Since each ED visit is a separate care-event, the number of cases was based on the number of visits, not the number of individuals. Referrals from the ED are most commonly to outpatient services at the hospital, for example specialized geriatric services, heart or lung clinics or other [17,18].

2.2. Study population

During the study period, Iceland's population was approximately 318,000. Of these 10.5% were 67 years and older. LUH is the only academic hospital in Iceland and serves the entire nation as a tertiary hospital. It is the primary hospital as well, for the residents of the Reykjavík metropolitan area. During the study period, the metropolitan area's population was approximately 205,000, 10% of which were aged 67 and older. The hospital had around 680 in-patient beds and approximately 373,000 emergency visits in the period 2008–2012. The mean admission rate of all ED visits was 15% [19]. In Iceland, no referral is needed for visits to the ED.

2.3. Data collection

Data from the Electronic Health Records (EHR) were retrieved through the Clinical-Data Warehouse at LUH with permission from the Bioethics Committee at the hospital (9/2013) and the National Data Protection Authority (2013020228HGK). The data were processed and cleansed in Excel to categorize and define the variables for data analysis. Every Icelander has a lifetime unique identification number. In this study, this number was coded to preserve anonymity. In the EHR, every hospital visit and admission also have unique identifiers, date and time, which allow the tracking of every patient's "hospital journey" between departments and visits. The data retrieved were: gender (male/female), age, marital status, postal code of residence (rural/urban living), admission/discharge date and time, medical diagnoses (ICD-10), Main Diagnostic Categories codes (MDC) [20], discharge destination from the ED (home, other hospital, admission, death) and the date and type of outpatient services following a the ED visit. The MDC data were retrieved from the clinical data warehouse which includes all the diagnoses documented by ER physicians. Triage was

being implemented at the ER during the study period but the quality of the data was not meeting the standards for this study (too much data was missing etc.). Referral visits were defined as a planned visit to outpatient services at the hospital within 21-day from an ED visit, which is at the hospital considered adequate time limit for such a visit. Unplanned ED revisits were defined in this study as a second unscheduled visit to the ED within 21, 30 and 90 days respectively, the latter two defined based on literature [21–23]. Data on marital status and postal codes in the EHR directly link to the Icelandic Population Register. In this study, multi-morbidity was defined when more than one ICD-10 diagnoses were recorded in the EHR during the emergency visit, MDC group was used as the cause of visit.

2.4. Statistical analysis

Firstly, the number of visits by gender (male/female), age and age-categories, year of attendance, marital status and MDC was analyzed descriptively. Statistical difference in mean age at visit between genders, was assessed with a t-test. With information from Statistics Iceland, available on number of individuals in each age-category and marital status in the Icelandic total population, the average yearly incidence over the five-year period of female, male and total visits was calculated per 1000 inhabitants and the difference in incidence between the two genders assessed with a Chi-square test with a Bonferroni correction. In addition, the statistical significances of variations in causes of visits, gender differences in multi-morbidity and in outcomes after the ED visit, including unplanned ED revisits were calculated by the Chi-square test. To find out which patient-related factors were associated with outcomes, the predictors for outcomes were calculated by multivariable logistic regression with mixed effects adjusting for multiple visits by the same individuals as well as all the entered variables. These were presented as odds ratios (OR) with 95% confidence intervals, adjusting for all the other variables entered into the model. In the model the three largest MDC groups were compared to all the other MDC categories. Finally, possible predictors for unplanned ED revisits within three specific time limits were calculated with multivariable Cox regression as hazard ratios (HR) with 95% confidence intervals. In the Cox-regression model, individuals were censored at the end of the set time limit if they did not have an unplanned ED revisit before that time.

3. Results

3.1. Patient demographics

In the five-year study period 21,256 Icelanders 67 years and older attended the ED 66,141 times and accounted for about 20% of all visits to the ED. The number of elderly visits increased during the research period in coherence with the increased number of elderly in the Icelandic population, i.e. the yearly incidence did not significantly change (Table 1). Women accounted for the majority of the visits, 54% (n = 35,868), although the incidence of female visits calculated per 1000 inhabitants was lower than for men (Table 1). The socio-demographical variables differed statistically significantly between men and women. The elderly visiting the ED were mainly living in the metropolitan area, i.e. 97%, 1.4% were living abroad or had no registered address in Iceland. The proportion of men from rural areas visiting was higher than for women (Table 1). Further, the mean age for all the visits was 78 years; the mean age of women (78.6) was statistically significantly 1.3 year higher than of men. Men had higher incidence of visits in all age-categories. The incidence of visits increased with higher age, but lowered again for women in the age-category 90 years and older. The most common age group was 70–79 years (45%), and 49% of the total study-population was married or living with a partner (Table 1). As seen in Fig. 1, the proportion of married elderly visiting the ED was lower than in the population of elderly: married male visitors were 32% vs. 36%, $p < .001$; married women 37% vs. 45%,

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