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Epidemiology of extremity fractures in the Netherlands

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ABSTRACT

Introduction: Insight in epidemiologic data of extremity fractures is relevant to identify people at risk. By analyzing age- and gender specific fracture incidence and treatment patterns we may adjust future policy, take preventive measures and optimize health care management. Current epidemiologic data on extremity fractures and their treatment are scarce, outdated or aiming at a small spectrum of fractures. The aim of this study was to assess trends in incidence and treatment of extremity fractures between 2004 and 2012 in relation to gender and age.

Methods: We used a combination of national registries of patients aged ≥ 16 years with extremity fractures. Fractures were coded by the International Classification of Diseases (ICD) 10, and allocated to an anatomic region. ICD-10 codes were used for combining the data of the registries. Absolute numbers, incidences, number of patients treated in university hospitals and surgically treated patients were reported. A binary logistic regression was used to calculate trends during the study period.

Results: From 2004 to 2012 the Dutch population aged ≥16 years grew from 13,047,018 to 13,639,412 inhabitants, particularly in the higher age groups of 46 years and older. The absolute number of extremity fractures increased significantly from 129,188 to 176,129 (OR 1.308 [1.299–1.318]), except for forearm and lower leg fractures. Incidences increased significantly (3–4%) for wrist, hand/finger, hip/upper leg, ankle and foot/toe fractures. In contrast to the older age categories from 66 years and older, in younger age categories from 16 to 35 years, fractures of the extremities were more frequent in men than in women. Treatments gradually moved towards non-university hospitals for all except forearm fractures. Both relative and absolute numbers increased for surgical treatments of clavicle/shoulder, forearm, wrist and hand/finger fractures. Contrarily, lower extremity fractures showed an increase in non-surgical treatment, except for lower leg fractures.

Conclusion: During the study period, we observed an increasing incidence of extremity fractures and a shift towards surgical treatment. Patient numbers in university hospitals declined. If these trends continue, policy makers would be well advised to consider the changing demands in extremity fracture treatment and pro-actively increase capacity and resources.

Introduction

"Study the past, if you would define the future" is a famous quote by Chinese philosopher Confucius (551-479 BCE). Extremity fractures comprise a major part of public health care cost in the Western world [1,2]. Insight in epidemiologic data of extremity fractures is important to identify people at risk for these fractures. By analyzing age- and gender specific fracture incidence and treatment patterns we may be able to adjust future policy, take preventive measures and optimize management in health care.

During the last decades, the ongoing development of surgical implants and a deeper understanding of fracture biology and predictors of functional outcome have changed the indications for surgical fracture treatment [3]. In addition, in Western Europe, an ageing population is creating a great challenge with a higher incidence of (severely) osteoporotic fractures. For the younger age category, fracture epidemiology has a substantial influence on

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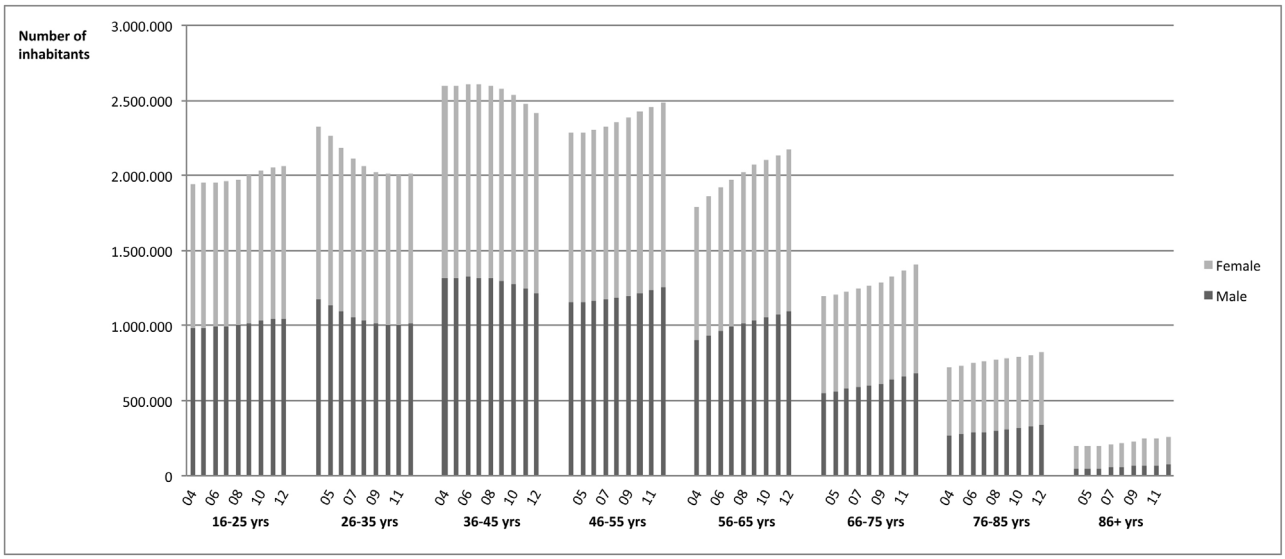

Fig. 1. Mid-year population per age category in the Netherlands.
The corresponding table is published in the online appendix. For every year the growth per age category were calculated with a weighed binary regression analysis, with 2004 as reference category. For the total population a multinomial logistic regression analysis was used, with 2004 as reference category.
The 95% confidence intervals of 2012 compared to 2004, all with a P-value of <0.001, were respectively 1.018 [1.016–1.020] for age category 16–25 years; 0.798 [0.796–0.799] for age categroy 26–35 years; 0.867 [0.866–0.869] for age category 36–45 years; 1.050 [1.052–1.050] for age category 46–55 years; 1.191 [1.188–1.194] for age category 56–65 years; 1.136 [1.136–1.142] for age category 66–75 years; 1.093 [1.090–1.097] for age category 76–85 years and 1.308 [1.300–1.315] for the age category of 86 years and older. For the total population the 95% confidence interval was 1.004 [1.004–1.004].
Source: Dutch Central Bureau of Statistics.

societal costs in terms of loss of productivity [4]. Moreover, national registries are more reliable and therefore useful for national and global comparison.

Unfortunately, currently published epidemiologic studies about extremity fractures and their management are scarce [5–9], outdated [10] or aiming at a small spectrum of fractures, for example osteoporotic fractures [11,12]. Therefore, in order to signal the need for possible policy adjustments in fracture care, the aim of this study was to assess trends in incidence and treatment of extremity fractures between 2004 and 2012 in relation to gender and age.

Patients and methods

Patients

This epidemiological study focused on extremity fractures in skeletally mature patients in the Netherlands occurring between 2004 and 2012. We assumed skeletal maturity in patients aged 16 years and older. Injury diagnoses were registered according to the International Classification of Diseases of the World Health Organization, Tenth Revision (ICD-10) and classified into fracture location by their anatomic region (online appendix). Data on

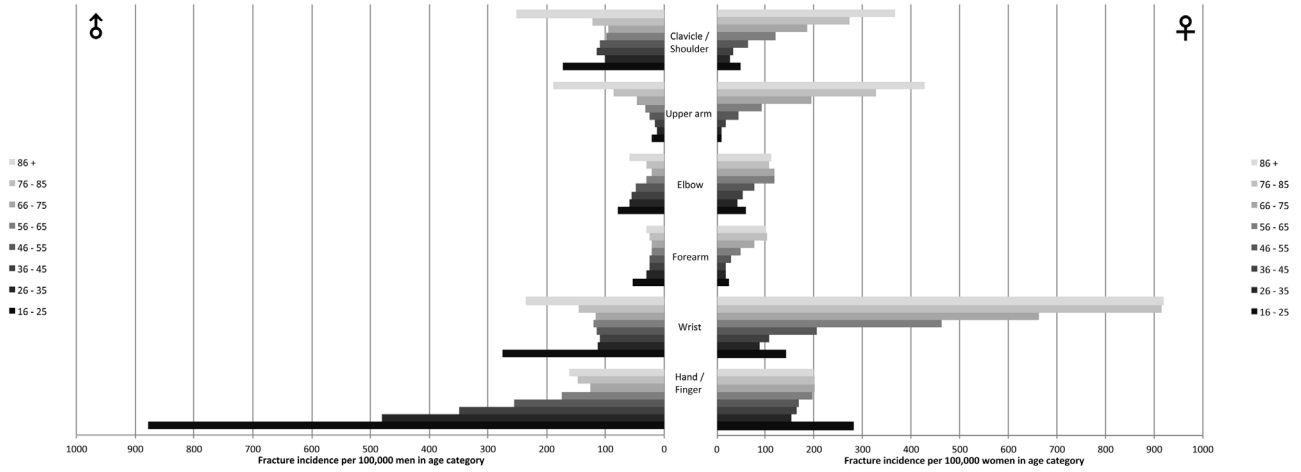

Fig. 2. Average incidence of upper extremity fractures per age category.
Average incidence of upper extremity fractures per sex and age category from the period 2004–2012.
Source: Dutch Injury Surveillance System (DISS).