Femoral fracture rates in people with and without disability

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Abstract

Objective: to estimate femoral fracture rates in community-dwelling older people without care need (CCN(−)), in community-dwelling older people with care need (CCN(+)) and in residents of nursing homes (RNH) and to determine their contribution to the overall burden of femoral fractures.

Methods: routine data of more than 1.2 million German people aged 65 years and more were used to calculate sex- and age-specific femoral fracture rates in the three groups CCN(−), CCN(+) and RNH. Those people receiving benefits of the long-term care insurance were defined as having care need. The percentile contribution of the three subpopulations to the overall burden of femoral fractures was determined.

Results: during 5,319,438 person-years, 44,000 femoral fractures were recorded. In each of the three subpopulations female and male fracture rates increased with increasing age. Femoral fracture rates of the total subpopulations were 6.13, 34.53 and 43.05 femoral fractures/1,000 person-years in CCN(−), CCN(+) and RNH in women and 2.66, 20.34 and 31.09 in men, respectively. The contribution of people with care need to the overall burden of femoral fractures in older people was about 50%.

Conclusion: the incidence of femoral fractures was considerably higher in people with care need than in people without care need. This should be considered when planning medical care or targeting preventive measures.

Keywords: femoral fractures, residence characteristics, independent living, home care, nursing home, elderly

Introduction

The epidemiology of femoral fractures has been analysed extensively. Incidence rates and secular trends have been published from different countries and different regions of the world [1–4]. Furthermore, risk factors for femoral fractures such as older age, female sex, maternal history of a femoral fracture or specific health conditions have been identified [5, 6]. For example, diseases such as stroke, heart failure or renal failure were shown to be associated with femoral fractures [7–9]. Femoral fractures are an injury occurring predominantly in old and very old people. These people often suffer from many diseases. Therefore, a person’s functional status is often more meaningful than a single disease in defining risk of femoral fracture.

When functional status decreases below a specific threshold one or more of the basic activities of daily living (ADL) (such as walking, washing or dressing) cannot be performed independently and these people require care which can be received either at home or at an institution. To be dependent from care is highly relevant not only for the individual but also for the family, the health care system and the society. It causes care giver burden, requires facility and nursing resources and causes considerable direct and indirect costs. In most countries, the majority of people with care need are cared for at home. In Germany, for example, about two-thirds of the people with care need still
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live at home. It is therefore surprising that nearly no data exist about incidence rates of femoral fractures comparing people without and with care need either living at home or in an institution.

Care need in people of old age is usually a consequence of disability. In our study, care need/disability was defined as being categorised into one of the three levels of care within the German statutory health insurance system. We analysed femoral fracture rates in people with and without care need. People with care need were additionally stratified according to their living setting in those cared for at home and those cared for in a nursing home.

The aim of our study was (i) to calculate age- and sex-specific femoral fracture rates in community-dwelling people without care need, in community-dwelling people with care need and in residents of nursing homes (RNH), (ii) to compare femoral fracture rates between these three subpopulations and (iii) to determine the contribution of the three subpopulations to the overall burden of femoral fractures.

Materials and methods

Study population

The data set consisted of all people aged 65 years and over and insured with the Allgemeine Ortskrankenkasse Bayern (AOK Bavaria) between 01.01.2004 and 30.06.2009. Bavaria is a federal state with 12.5 million inhabitants in the south of Germany. Health insurance, including cover for care at home or in a nursing home, is statutory in Germany. The AOK is Germany’s largest statutory health insurance company. This non-profit health insurance company covers nearly 50% of the Bavarian population aged 65 years and over.

Long-term care insurance and level of care

In 1995, long-term care insurance was introduced in the German social insurance system and is compulsory for all citizens [10]. In order to claim for long-term care benefit, people must need a minimum of assistance with basic ADL, such as washing, eating or dressing and of instrumental activities of daily living (IADL) such as cleaning or shopping, per day. Depending on the extent of care required recipients are categorised into three levels after an assessment by a nurse or a physician of the medical service of the German statutory health insurance system. The level of care 1 requires an average care need of at least 90 min containing more than 45 min of basic ADLs. Levels 2 and 3 require an average care need of at least 180 and 300 min containing more than 120 and 240 min of basic ADLs, respectively. In this study care need was defined as a categorisation in one of the three levels of care.

Long-term care benefits for community-dwelling persons with care need are either financial support for informal care performed by relatives or volunteers or reimbursement of professional care. For RNH professional home care is (partly) reimbursed. For institutional care nursing homes expect their residents to be categorised in one of the three levels of care. Persons receiving long-term care benefits are allowed to choose a nursing service or to live in a nursing home of their own choice.

Subpopulations

Femoral fracture rates were compared between three subpopulations: community-dwelling persons without care need (CCN(−)), community-dwelling persons with care need (CCN(+)) and residents from nursing homes (RNH). CCN (+) and RNH were identified by their categorisation in one of the three levels of care.

Data source

We utilised the routine data collection systems of the health insurance company to gain data on gender, age, date of the begin of care need, date of admission to a nursing home, and, if appropriate, femoral fractures and date of death for each individual. All data are held by the same health insurance company.

Femoral fractures

Hospital admission or discharge diagnoses were used to identify fractures of the femur (S72 in the tenth revision of the International Classification of Diseases (ICD-10)). Some persons had more than one femoral fracture during the observation period. Only the information about a first femoral fracture was used in order to avoid double coding of the same fracture event. However, if a person was assigned to more than one subpopulation during the observation period (e.g. through a change from CCN(−) to CCN (+)) information about an incident femoral fracture was treated independently from a previous femoral fracture in another subpopulation. In this case, the time between the two fractures had to be more than 30 days.

Statistics

All persons insured by the AOK Bavaria and aged 65 years and over at 1 January 2004 were included in the data set. Persons who became 65 years during the observation period entered additionally the study cohort at the date of their 65th birthday. To present representative distributions of the baseline characteristics of the study population some of the data of Table 1 were calculated at one point of time (1 January 2004) and did not consider persons later entering the study population.

Person-years at risk were accumulated between 1 January 2004 or date of entrance in the cohort and the end of the study (30 June 2009), date of death or date of hospital admission due to a femoral fracture. If a person changed the subpopulation within the observation period
person-years at risk started again at the date of the assignment to the new subpopulation. To demonstrate the association between age and femoral fracture rates, seven age-categories (each containing 5 years) were created. Person-time at risk for age-specific fracture rates were assigned to the age interval in which they were accumulated.

The crude incidence rate of femoral fractures was calculated by dividing the number of fractures by the total number of person-years. The rates are presented as fractures per 1,000 person-years. To compare femoral fracture rates between subpopulations sex- and age-specific fracture rate differences and incidence rate ratios with 95% confidence intervals were calculated. The percentage contribution of different subpopulations to the overall burden of femoral fractures and to the number of person-years under observation was presented in form of pie charts.

The evaluation of the study was approved by the local ethics committee.

**Results**

The total data set comprised 751,101 women (60.5%) and 491,098 men (39.5%) aged 65 years and older. The median follow-up was 3.8 years. Table 1 presents the number and median age of participants already included at study commencement (1 January 2004). The large majority of the population were community-dwelling persons without care need (84.3% in women and 90.9% in men). The percentages of the corresponding person-years under observation were considerably lower in the populations with care need. In women and men combined, the contributions of the three subpopulations to the overall burden of femoral fractures were roughly 50, 30 and 20% (data not shown).

We recorded femoral fracture rates differed considerably in residents from nursing homes (5.9 and 2.2%, respectively). The difference between women and men was still more pronounced higher in women (9.7%) than in men (7.0%). The differences in women and men were still more pronounced in residents from nursing homes (5.9 and 2.2%, respectively).

During the observation period, 44,000 femoral fractures were recorded. Femoral fracture rates differed considerably between the three analysed subpopulations. Compared with CCN(−) markedly higher fracture rates were observed in CCN(+) and in RNH (Table 1). This huge difference between persons with and without care need was partly due to different age distributions in the three subpopulations since femoral fracture rates increased in women and men in all three subpopulations with increasing age. But even when stratifying for age, femoral fracture rates were considerably higher in people with care need than in people without care need (Figure 1, Supplementary data are available in Age and Aging online, Table Appendix 1). The age-specific incidence rate ratio between RNH and CCN(−) or CCN(+) and CCN(−) decreased with increasing age. The absolute risk difference, however, was on a similar level over nearly all age groups in women and increased even with increasing age in men (Supplementary data are available in Age and Aging online, Table Appendix 2).

Figure 2 demonstrates the percentage contribution of the three subpopulations to the overall burden of femoral fractures in women and men aged 65 years and more. In women and men, the three subpopulations (CCN(−), CCN (+) and RNH) contributed to the overall burden of femoral fractures 49.1, 29.0, 21.9 and 55.3, 29.8, 15.0%, respectively. The percentages of the corresponding person-years under observation were considerably lower in the populations with care need. In women and men combined, the contributions of the three subpopulations to the overall burden of femoral fractures were roughly 50, 30 and 20% (data not shown).

**Discussion**

Our study compared for the first time femoral fracture rates from persons with and without care need and differentiated further between persons cared for at home or in an institution. The large database allowed us to calculate robust age- and sex-specific fracture rates. We observed much higher femoral fracture rates in persons with care need than in persons without care need, independently if persons lived at home or in a nursing home. Therefore,
persons with care need have to be regarded as a very high-risk group for femoral fractures. They contributed about 50% to the overall burden of femoral fractures in older people even though their corresponding person-years accounted only for 12% of the total. Usually reported femoral fracture rates from total populations are therefore strongly influenced by the two subpopulations of persons with care need. This information has not been available so far. It can be useful in health policy when planning medical care or targeting preventive measures.

Some studies have estimated femoral fracture rates in nursing homes [11–13]. The so far largest study was performed in another German federal state by our own study group [14]. Fracture rates in this previous study were somewhat higher than in our present study. Its data were derived from a cohort of newly admitted residents. The fracture rate has been shown to be highest immediately after admission to a nursing home and decreases thereafter [14, 15]. In the present study, data of residents living already in a nursing home at study commencement were also included. This explained the somewhat lower fracture rates.

We know of only two studies which analysed femoral fracture rates in community-dwelling people with care need [16, 17]. The first study included community-dwelling people certified by the state as eligible for nursing home care [16], the second study analysed people receiving home care. Both studies did not systematically present age-specific

Figure 1. Rate of femoral fractures stratified by age and setting (community-dwelling people with and without care need; residents from nursing homes) in women (A) and men (B) aged 65 years and more.
fracture rates but the size of their overall femoral fracture rates was comparable with our results. Both authors emphasised the similarity of their observed fracture rates with those from nursing home residents published elsewhere. This was now confirmed by our findings.

A few studies compared femoral fracture rates between people from residential care and community-dwelling people [18–21]. They did not differentiate between community-dwelling people with and without care need. Therefore, a comparison of our results with the data of these studies is difficult.

Femoral fracture risk has been reported to be considerably higher in women than in men [22]. Our findings support an about twofold higher age-specific risk in community-dwelling women without care need. In people with care need, the difference between women and men is less pronounced (Supplementary data are available in Age and Ageing online, Table Appendix 1). That means that in the subpopulation of people with care need not only women, but also men have to be regarded as highly vulnerable to femoral fracture.

Our results may have implications for targeting preventive measures. Recently we demonstrated that femoral fractures can be reduced in the subpopulation of residents from nursing homes by a multi-factorial fall prevention programme [23]. Furthermore, pooled data from three additional studies performed in nursing homes revealed a significant reduction in the risk of femoral fractures [24]. Most community-living persons with care need are regularly visited by professionals from nursing services. It could be a promising approach to extend the nurses’ tasks by fall prevention activities. Examples could be measures of optimisation like the initiation of the Otago exercise programme [25] or compensation like environmental adaptations [26] or the use of hip protectors [27]. Another approach is to reduce or postpone care need by population-based measures [28].

Major strengths of the study are its large number of study participants and femoral fractures, the exact documentation of the time under risk and the information about care need/disability. The outcome misclassification should be low because nearly all people with femoral fractures are admitted to hospital.

Several limitations have to be considered. We defined ‘care need’ as being categorised in one of the three levels of care. This definition may be arbitrary but the criteria are clear, the assessments are done by experts and the method has been shown to have good levels of inter-rater reliability [29]. People with a minor degree of care need which does not (yet) meet the requirements of the long-term care insurance were (mis-)classified in the subpopulation of community-dwelling people without care need. In addition about 14% of residents from nursing homes have not (yet) been assigned to a level of care [30] and could therefore not be identified by routine data. Therefore, the true contribution of RNH and of CCN(+) to the overall burden of femoral fractures is even somewhat higher than reported.

Our data were derived from only one health insurance company and may not be representative. But about 90% of the German population is member of one of the statutory health care insurances and the AOK is the by far largest statutory health care insurance and open to all people.

The composition of the persons in nursing homes may be different in different countries and may be influenced by different social and political determinants. This could influence the external validity of our results. However, the degree of functional limitations at which care is needed should be very similar over all Western countries.

In summary, we analysed femoral fracture rates in people with and without care need. Fracture rates were particularly high in people with care need living at home or in an institution and exceeded those in people without care need by far. About half of all femoral fractures occur in people with care need even though their corresponding person-years under observation accounted only for 12%.

Key points

- Femoral fracture rates are by far higher in people with care need than in people without care need.
- About half of all femoral fractures occur in people with care need.
- Programmes to reduce femoral fractures have to be aware of the completely different fracture risks in people with and without care need.

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Conflicts of interest
None declared.

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Supplementary data
Supplementary data mentioned in the text is available to subscribers in Age and Ageing online.

References

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