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Risk Group for Hip Fracture in Elderly Women Identified by Primary Care Questionnaire - Clinical Implications

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ABSTRACT

Background. Every fourth Swedish woman suffers hip fracture during life-time. Several methods for fall and fracture prevention are known. In this study we identify women at high hip fracture risk in a primary care population, describing their needs for possible fracture prevention as well.

Methods. Cross-sectional questionnaire study for self-assessment by randomly chosen elderly women (n=100) over 70 years of age in a Primary health Care district at 1998. Questionnaire was designed from previous validated study. Follow-up study after three years performed at 2001.

Results. Response rate was 92% (n=92, mean age 78) and 90% (n=83) answered the main 40 questions. 30% had at least two of four major risk factors for hip fracture; age over 80 years, body weight below 60 kg, recent fall and previous fragility fracture. The recall ability for at least two of these four risk factors was 93% in follow-up study after three years (relative risk = 8.0 with 95% confidence interval 3.5 to 18). 34% of the women had experienced any fracture since the age of 50. Only 22% of the women with previous fragility fracture had any pharmacological treatment for osteoporosis. 26% had falls in the preceding 12 months, mainly at home. Needs for fracture prevention were found in 34% (27 women).

Conclusions. Age, weight, recent falls or previous fragility fracture were common and important clinical risk factors for hip fracture with good recall ability after three years. By using this questionnaire in a Primary health Care district we identified women at high fracture risk. Needs for fracture prevention were observed for one third.

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INTRODUCTION

Incidence of hip fracture has more than doubled between 1950 and 1980 and lifetime risk for such a fracture is nowadays calculated to be 23% for Swedish women (1) with mean 81 years for first hip fracture. Many subjects will suffer pain and decreased mobility after their hip fracture and within one year 20% of women will die (2). Several risk factors are now identified. Advanced age, previous fragility fracture, corticosteroids and low bone mineral density (BMD value below –2.5 SD of young females) are major risk factors for hip fracture (3-7). Other risk factors are loss of weight since age of 25, low current body weight or body mass index (BMI), fall in the preceding year, smoking or a mother who has suffered hip fracture (3, 8, 9). Clinical risk factor assessment has in some studies shown better prediction for hip fracture than measurement of BMD only, with densitometry by single- or dual X-ray absorptiometry (SXA/DXA) (3, 10). The highest predictive value is achieved with a combination of both clinical risk factors and low BMD (3, 6, 11). Fracture risk evaluation is often neglected at consultation in primary care, even for patients recently sustaining a fracture, although efficient fracture prevention is possible (4, 5, 12-14). A simple and systematic strategy for clinical risk estimation among elderly women in primary care could reduce future fractures.

The aim of the present study was to identify elderly women at high risk for future hip fracture by use of several clinical risk factors combined, using a self-assessed questionnaire with simple questions in a Primary health Care district. Recall ability for the major risk factors were reassessed after three years. Also, for this elderly population we wanted to describe their needs for possible fracture prevention.

MATERIAL AND METHODS

Study population and data collection

The Primary Health Care Centre of Vislanda Community in Southern Sweden is responsible for a population of 6000 individuals in a rural area. There are three homes for elderly with 95 residents. One hundred of 236 women in this area aged 70 years or more were chosen at random. A questionnaire comprising 46 questions pertaining to risk and shelter factors for fall and fracture was sent to these 100 women in 1998. Relatives or home nursing staff were allowed to assist the responder answering the ques-

Abbreviations:
RR = relative risk
CI = confidence interval
BMD = bone mineral density
BMI = body mass index
SXA or DXA = single- or dual X-ray absorptiometry

tionnaire. Non-responders were reminded twice by post and once by telephone. After returning the questionnaire all participants received a leaflet on diet and lifestyle as well as advice for fall prevention. Some participants with special needs were offered a home visit by a district nurse as well as some written advice. The questionnaire was constructed with simple multiple-choice questions apart from their medication. "Have you broken any body bone since age of 50? Which bone?" or "Have you fallen down the last 12 months? How many times?" were two of the main questions. Questions were chosen partly from the Cummings study (3) where significant risk factors such as age, maternal history of hip fracture, weight loss (or low current weight), height, history of fracture since age of 50, fall last year, rise from the sitting position and health perception have been validated prospectively with regression analysis against hip fracture. Additional topics such as height at 25 years of age, walking capacity, menopause, smoking, cortisone medication and diseases related to fall or osteoporosis were collected from the Scandinavian Scandos study (5, 15) which also has been tested for answer reliability. Questions on time spent outside the home, current medication, home situation and contacts with health care were constructed for just this questionnaire. Dietary calcium intake from dairy products was estimated from each glass of milk or bowl of yoghurt to 200 mg calcium and for each slice of cheese 75 mg. Approximate total intake of calcium from all types of food was calculated: [(calcium intake from dairy products x 130%) + (calcium medication)]. Follow-up study was performed with a shorter self-assessed questionnaire after 3 years at 2001.

In this study simplified risk estimation for hip fracture is based on the Cummings study (3), advanced age, weight loss since age of 25, fall in the preceding year or prior fracture since age of 50 were all significant risk factors for hip fracture (see above). These four risk factors were now dichotomised, weight loss was replaced with low current weight (which in Cummings study also was associated with decreased risk of hip fracture although not quite as strong) and prior fracture was replaced by prior fragility fracture (at radius, humerus, hip or vertebrae).

The Ethics Committee at the University of Lund approved the study (LU 406-00).

Data analysis

Statistical analysis was performed using software SPSS 10 and Epiinfo 6. The relative risk (RR) with 95% confidence interval (95% CI) was estimated, significant when the CI not included one. Appropriate Fisher exact test was applied for the P-value, significant when $P<0.05$. The variables were usually analysed as dichotomised.

RESULTS

Ninetytwo out of 100 women (92 %) with a mean age of 78 (70–95) years returned the questionnaire. Half of these women were living alone. Seven women lived in homes for the elderly (8%) and 23 women received help every weak either from community care (15%) or other person (11%). All except one had parents born in the Scandinavian countries.

Valid answers were collected from an average of 90% of the main 40 multiple-choice questions on each form. Age, current weight, dairy intake, mobility and social data were especially well answered. Previous height and weight at 25 years of age had the lowest answer rate, 64% and 76%, respectively.

Their mean weight was 68 kg (42–96) and their mean height was 161 cm (144–174) with a mean decrease since 25 years of age of nine kg and two cm respectively. Seven per cent were smokers while 12% were ex-smokers. Mean age for menopause was 49 years.

A follow-up study after three years replies was received from 73 (79%) of the 92 women. Answer reliability for risk factors expected to be stable varied between 75–100% since enquiry of 1998, see Table 1. High age, low weight and prior fragility

Risk factors	Questionnaire reply at 2001 n (%)	Reported risk factor 1998 n	Confirmed risk factor 2001 n (%)
Previous maternal hip fracture	61 (84)	8	6 (75)
Actual / previous smoker	69 (95)	4 / 8	4 / 8 (100)
Weight 25 years old	52 (71)	52	43[1] (83)
Height 25 years old	45 (62)	44	40[1] (91)

[1]Weight or height considered in agreement if they differed by no more than 5 kg or 2 cm, respectivelly.

Table 1. Answer reliability for risk factors for fracture at three-year follow-up (n=73)

fracture were confirmed by 83–100% while fall (the preceding year) were reported only by 45% at follow-up, see Table 2. Altogether, 93% of these women had still at least two of these four risk factors after three years.

Fractures

There were 40 fractures in the 28 women who had one or more fracture over the age of 50, see Table 3. 75% of these women had sustained at least one fragility fracture (forearm, humerus, hip or vertebra); forearm fracture was the most prevalent. All four women with vertebral fractures had more than one fracture ($P = 0.01$) and they also had significantly lower body weight ($P = 0.02$).

Current smokers or women with impaired vision (self-estimated) more often had sustained a fracture ($P = 0.04$ respectively). Eight women (10%) reported that their mothers had sustained a hip fracture.

Risk factors	Questionnaire reply at 2001 n (%)	Reported risk factor 1998 n	Confirmed risk factor 2001 n (%)	Answer correlation 1998 to 2001 RR (95% CI)
Single risk factors				
Age over 80 years	73 (100)	22	22 (100)	3.9 (2.4 - 6.3)
Actual weight below 60 kg	70 (96)	12	10 (83)	5.4 (2.8 - 10)
Fall last year	64 (88)	11	5 (45)	2.4 (1.0 - 5.7)
Fragility fracture [1]	64 (88)	18	17 (94)	10.9 (4.2 - 28)
Combined 4 risk factors (see above)				
At least 2 of these 4 risk factors	57 (78)	14	13 (93)	8.0 (3.5 - 18)

[1] Fragility fracture is defined as prior fracture at hip, forearm, humerus and/or vertebrae after 50 years of age.

Table 2. Answer reliability for 4 major clinical risk factors for hip fracture at three-year follow-up (n=73).

Fracture location	Number of fractures n	Persons with fracture n (%)
Hip	6	5 (6)
Forearm	16	13 (16)
Humerus	4	4 (5)
Vertebrae	4	4 (5)
Ankle	6	5 (6)
Other	4	4 (5)
Total fractures	40	28 (34)
Total fragility fractures[2]	30	21 (25)

1. Nine of the 92 women didn t know if they had had any fracture.
2. Fragility fracture defined as fracture at hip, forearm, humerus or vertebrae after age of 50.

Table 3. Prevalence of previous fracture since age of 50 at 1998 for 83 women (mean age 78 years).[1]

Mobility

Seventy-five per cent walked or exercised regularly and 58% went outside their homes for more than two hours per week even in winter. One third used walking aids such as sticks and frames or could not rise from the sitting position without help from their arms. Falls during the preceding year were reported by 26%. Multiple falls were reported by eight per cent. Falls were more common (45%) in women aged 80 years or more (RR=2.9, 95% CI =1.4 to 5.8). Among these older women falls occurred indoors in 86%. Only 20% of women 70 to 80 years old fell indoors (P<0.001). Fall were more common among women that reported pharmacological treatment for hypertension (RR=2.3, 95% CI=1.1 to 5.0). This treatment was not related to more subjective vertigo (RR=1.2, 95% CI=0.5 to 2.7), nor did we find any clear relation between vertigo and fall tendency (RR=1.3, 95% CI=0.6 to 2.8). The use of diuretics among women with treated hypertension showed a slight increase for falls although non significant (RR=1.5, 95% CI=0.8 to 3.2). Age over 80 was also associated with infrequent walking (RR=9.2, 95% CI=2.9 to 29), inability to rise from the sitting position without help from their arms (RR=3.6, 95% CI=2.0 to 6.3) and impaired vision (RR=3.1, 95% CI=1.4 to 6.5).

Medication

The mean number of reported drugs was 3.4 per day. The mean calcium intake from dairy products was 610 ± 220 mg. Total calcium intake, including all types of food and medication, was estimated to be 890 mg per day. Only 11% used calcium tablets and the use of vitamin D3, bisphosphonate or hormone replacement therapy (HRT) were seven, six or two per cent respectively. Of women with previous fragility fracture 22% used some treatment for osteoporosis, mostly calcium. Corticosteroids had been prescribed for 12% for duration over three months and five women were currently on treatment. Drugs such as diuretics or sedative analgesics, known to increase the tendency to fall, were used by 33 or 10% respectively. Six per cent used thiazide diuretics.

Multiple risk factors for further evaluation and possible intervention

Eighty of the 92 women answered all four questions about age over 80 years, actual weight below 60 kg, fall in the preceding year or prior fragility fracture at questionnaire 1998 (see methods and Table 2). Eight women (10%) had at least three of these four risk factors indicating an elevated risk of future fall and fracture (3). Previous fragility fracture was reported among 20 women (25%); most of them (70%) had either low calcium intake and/or Vitamin D deficiency risk (calcium intake below 1 gram per day or less than 15 min outdoors per day without any vitamin D supplementation). Current corticosteroid treatment among five women (6%) indicates further needs of pharmacological treatment. Height reduction more than four cm since age of 25 without any known vertebral fracture among three women (4%) could motivate vertebral X-ray investigation. Four women (5%) that had fallen the last year and also experienced major fracture (at vertebrae, hip or multiple fractures at arm) after age of 50, these women could benefit the use of hip protectors.

Altogether 27 women (34%) belonged to these different risk groups for which further clinical evaluation and specific fracture prevention should be considered.

DISCUSSION

This study shows that a questionnaire, with focused questions, to elderly women validating the occurrence of risk factors for osteoporosis and fragility fractures, is useful in a primary care setting. In spite of the questionnaire being relatively extensive with 46 questions and the participants being of advanced age and in some cases living in homes for elderly, the reply frequency was as high as 92%. On average 90% of the main multiple-choice questions were answered. This indicates that this method could be applicable in an elderly population. For routine use, however, it is advisable to limit the number of questions, should it be adopted as a simple method to detect one of many diseases in primary health care. As part of the medical consultation at the health centre main clinical risk factors (as age, weight, fall and previous fragility fracture) could be assessed to gauge risk of hip fracture in this aged group. The recall ability for main risk factors after three years was still high (93 % for at least two of these four risk factors) which increase the value of the questionnaire.

We found 40 previous fractures since the age of 50 in 28 individuals (34%). This is comparable to 35.5% among white women with a mean age of 72 years found in a study (3) in the USA. It is not surprising that 75% of women with previous fracture had suffered at least one fragility fracture and that forearm fracture was the most prevalent type. The four women who reported vertebral fractures also had fractures of other bones and lower weight (15) showing that these simple signs are useful when suspecting vertebral fractures in elderly women.

Rather few (22 %) of the women with previous fragility fracture had any pharmacological treatment for osteoporosis, mostly calcium, and not many had combined calcium and vitamin D3 or bisphosphonate treatment. This is in contrast to findings that fracture reduction has been shown after calcium and vitamin D3 supplementation in women in institutional care (16) and in men and women over 65 years of age in the community (12, 14, 17). Bisphosphonates reduce the risk of vertebral and hip fracture in women with low BMD especially in patients with prevalent vertebral fracture (6, 10, 13, 18, 19). Falls were more frequent when treatment for hypertension, it emphasizes the choice of thiazide diuretics while it has been reported to protect against hip fracture (20). As expected, for diuretic treatment of hypertension we found a somewhat raised falling risk although non significant, probably due to the small sample size.

It is encouraging that 75% walked or exercised regularly. As expected, falls in the preceding year were most pronounced in the eldest group (45%) - aged 80 years or more. A majority fell indoors in their own home environment; this indicates the needs of hazard reduction at home (21). There is a value in searching for risk factors as there are several methods of intervention that have been shown to be effective.

Fall reduction, improved gait and muscle strength after less than three months training programme at home, after physiotherapy training at nursing home or with Tai Chi, has been shown to be effective in the elderly (22-24). Diminished environmental hazards at home for risk group and withdrawal of psychotropic medication also reduced the number of falls (25, 26). Wearing hip protectors prevents hip fracture, showed for elderly at institutional care (27).

In conclusion, we revealed many women with several risk factors for hip fracture. The self-assessed questionnaire was a useful tool in Primary health Care to identify risk groups for fracture. This questionnaire method gave a very high reply frequency and the recall ability after three years for main risk factors was good. A shorter questionnaire could be even more useful at screening or at a regular medical consultation. Subjects in risk groups could, after clinical evaluation, be suitable for more specific intervention such as mobility training, environmental intervention or pharmacological treatment in order to prevent future falls and fractures. This would promote mobility and independent living in old age.

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