Can health visitors prevent fractures in elderly people?

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Abstract

Objectives—**To assess whether intervention by a health visitor could reduce the number of fractures, over a four year period, in those aged 70 and over.**

Design—**Randomised, controlled trial; randomisation by household.**

Setting—**General practice in a market town.**

Subjects—**Of 863 patients aged 70 and over on the practice records, 674 were traced and successfully interviewed; 350 were assigned to the intervention group, 324 as controls.**

Intervention—**The people in the intervention group were allocated to the care of a health visitor. The approach was four pronged: assessment and correction of nutritional deficiencies, including reducing smoking and alcohol intake; assessment and referral of medical conditions such as heart block or inappropriate medication; assessment and correction of environmental hazards in the home such as poor lighting; assessment and improvement of fitness—for example, exercise classes for the moderately fit. The intervention continued for four years.**

Main outcome measure—**Fracture rate over four years.**

Results—**The incidence of fractures was 5% (16/350) in the intervention group and 4% (14/324) in the control group (difference not significant).**

Conclusions—**A health visitor visiting a group of people aged 70 and over and using simple preventive measures had no effect on the incidence of fractures.**

Introduction

Fractures are common in elderly people. They cause some mortality and considerable morbidity and are one of the major reasons for the high demand for orthopaedic services in Britain.[1]

One in 20 women over 80 years old have had a fractured femur, with over 30 000 cases a year and a steadily rising number over the past 10 years.[2-4] The outcome for elderly patients with fractures, especially those with fractured femurs, is poor: only half of all patients have returned to their usual place of residence at six months.[1] It has been suggested that up to three quarters of all fractures of the femur need not have occurred if simple preventive measures in primary care had been available,[5] but this has never been tested by a randomised controlled trial.

Health visitors have been used to detect and correct the problems of elderly people in the community in a number of studies, four of which have been randomised controlled trials. The first found that regular visiting increased the use of services but had little impact on functional and medical disorders.[6] The second, a 12 month cross over randomised controlled trial, showed that a health visitor was effective at bringing about a broad range of short term objectives, but the validity of the objectives was not clear.[7] The third was a two year trial of two general practices. In one practice the health visitor had no effect on morbidity or mortality; in the other many services were provided and mortality was reduced for the intervention group, together with some marginal improvements in the quality of life.[8] The fourth study was carried out in Copenhagen. The intervention consisted of visits every three months for three years. The intervention group showed a lower mortality and lower rate of admission to residential homes than the control group.[9]

The lack of consistent effect on the morbidity of the elderly people in these trials may have been due to poor targeting on a reversible problem by the nurses. Environmental factors likely to have an effect on falls and ultimately fractures in elderly people are potentially reversible, and health visitors are both accepted by elderly people and trained to check on such factors. Thus a targeted intervention, using health visitors, with the aim of substantially reducing the incidence of fractures in elderly people was consistent with current knowledge. If successful it would lead to worthwhile benefit.

Method

STUDY GROUP

A group practice of five general practitioners took part in the study. Fractures in elderly people were shown in the initial interview to have an episode rate of 3·3% a year in people over 70. This is equivalent to just over 12% over the four years of the study if first fractures only are counted. For such a population based intervention to be warranted the number of fractures should be reduced to about half. Sample size calculation based on these figures indicated that about 350 patients per group would be needed ($\alpha=0{\cdot}05$, $\beta=0{\cdot}80$). A full listing of patients over 70 in the practice was obtained from the family health services authority and 863 individuals were identified.

A research assistant (DF) visited all of these people with an interview schedule. Physical disability was based on a nine item score first described by Townsend.[10] This included a series of questions about activities normally required for daily living and whether the respondents could perform such activities without difficulty. An additive score was assigned to the answers. The questions about fractures and falls were followed up by asking for details of where and when falls had occurred and what had caused them. If satisfactory answers were obtained a fracture or fall was counted. Relatives and, in the case of fractures, the case notes were referred to if clear answers were not obtained.

RANDOMISATION

Once interviewed, the people in the study group were randomly allocated to intervention or control groups by household. The reason for this was that part of the intervention depended on improvements in the environment so that any changes would affect the whole household. The randomisation was carried out by NJV using random number tables with subjects' study numbers and without direct contact with the subjects.

INTERVENTION

A health visitor was employed to work in the practice with the task of reducing the incidence of fractures within the intervention group over four years. This was to be achieved by visiting the households at least once a year for those not presenting any problems, assessing

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patients' risk of falls or fractures, and intervening in those who had obvious risk characteristics or who had a history of such problems.

Those elderly people who had problems were visited as often as was thought necessary by the health visitor. She also referred people with problems to other professionals. The methods used were based on guidelines set out in previous work we had carried out with health visitors and described in some detail elsewhere.[11] The health visitor first obtained a history of illness and then concentrated on four factors.

Nutrition—Help was given with dietary advice to those with poor dietary intake or signs of undernourishment. This sometimes included taking venous blood samples for testing for haemoglobin or dietary constituents if necessary. Advice was also given about smoking and on the sensible use of alcohol.

Medical conditions—The subject was checked for a history or signs of heart block, vasovagal attacks, or other drop attacks. Medication was checked for inappropriate doses or mixtures that might cause falls or dizziness.

Environment—Environmental hazards such as trailing wires, loose carpets, or outside lavatories were looked for and corrected with the help of local voluntary agencies. Poor lighting levels both inside and out at night were identified, and dangerous, slippery slopes were modified. Pressure was put on local authorities specifically to grit areas where these people were living when there was ice or snow.

Assessment and improvement of general muscle tone and fitness—A part time physiotherapist was employed to help with fitness classes for moderately disabled people in one of the local sheltered housing complexes. These were well attended; an average of 30 people came each week.

SECOND INTERVIEW

At the end of the study the research assistant again visited all of the people in the control and intervention groups to obtain data on the original variables. The effectiveness of the health visitor was also checked by giving the respondents a photograph of the health visitor and asking whether that person had visited them previously and for details of what happened as a result of the visit. This information will be given elsewhere.

Virtually all of the elderly people in the intervention group remembered the health visitor, but only three of the control group remembered her. She had done a considerable amount of work with the intervention group, notably referring people to other services and providing direct advice and intervention on a wide range of topics from taking blood pressure to rehousing.

STATISTICS

The data summary statistics were obtained with the SPSS X package.[12] The confidence intervals were calculated as the difference between two proportions.[13]

Results

Of the 863 people aged over 70 on the practice records, 102 were dead, 60 had left the practice, and three were actually aged under 70. Of the 698 eligible for inclusion in the study, 674 were successfully interviewed on the first occasion, 14 refused, nine were excluded by the general practitioners because it was thought likely that they would refuse, and one had moved to another practice.

Of the 674 people included in the study group, 450 were fully interviewed again four years later. Of the remainder, 194 had died during the study, 17 had moved out of the practice, and 11 refused to be interviewed again.

SUCCESS OF RANDOMISATION

Basic characteristics of the 350 subjects allocated to the intervention group and the 324 subjects allocated to the control group were compared. The proportions of men and women and age distributions were similar ($\chi^2=0{\cdot}69$ for men, $\chi^2=3{\cdot}4$ for women (df=3); $p>0{\cdot}05$).

The initial interview showed annual prevalences of fractures of 3% in the intervention and control groups over the previous year (11 people in each group). The degree of disability in the intervention group was different from that in the control group: 159 (45%) of the intervention group and 117 (36%) of controls had no initial disability (95% confidence intervals for difference (9%) 0% to 18%).

FRACTURES

Table I shows changes in the outcome variable of the study, the number of surviving patients who had sustained fractures. The groups had similar proportions of fractures (5% and 4%). More falls were reported (all of those with fractures had fallen) on the second questionnaire by those in the intervention group than the control group (95/240 (40%) *v* 65/210 (31%); 9% difference; −5% to 21%). There were 88 (25%) deaths over the four years in the intervention group compared with 106 (33%) in the control group (8% difference, −5% to 21%).

TABLE I—*Number (percentage) of fractures and falls in people aged over 70*

	Intervention group (n=350)	Control group (n=324)
No falls or fractures	145 (41)	145 (45)
Fallen only	79 (23)	51 (16)
Fall and fracture	16 (5)	14 (4)
No data:		
Moved	14 (4)	5 (2)
Refused	8 (2)	3 (1)
Died	88 (25)	106 (33)

Because there may have been as much as an 18% difference between the groups in the number of subjects with no initial disability, we checked whether the difference in initial disability may have had an effect on the number of falls. The number of falls during the study were stratified by the initial degree of disability. Overall, survivors with the greatest degree of disability had most falls. There were more falls in the intervention group than in the control group for each level of disability, especially in patients with less severe disability (table II). Within each disability grouping

TABLE II—*Number (percentage) of fractures and falls stratified by degree of disability*

	Intervention group		Control group	
No initial disability		159 (100)		117 (100)
No falls	79 (50)		68 (58)	
Fall only	37 (23)		14 (12)	
Fall and fracture	8 (5)		4 (3)	
No data:				
Moved	6 (4)		2 (2)	
Refused	3 (2)		2 (2)	
Died	26 (16)		27 (23)	
Mild initial disability		104 (100)		112 (100)
No falls	51 (49)		61 (54)	
Fall only	16 (15)		16 (14)	
Fall and fracture	7 (7)		4 (4)	
No data:				
Moved	4 (4)		1 (1)	
Refused	4 (4)		1 (1)	
Died	22 (21)		29 (26)	
Moderate and severe initial disability		87 (100)		95 (100)
No falls	15 (17)		16 (17)	
Fall only	26 (20)		21 (22)	
Fall and fracture	1 (1)		6 (6)	
No data:				
Refused	1 (1)			
Moved	4 (5)		2 (2)	
Died	40 (46)		50 (53)	

fewer people in the intervention group died than in the corresponding control group. As our prior outcome measure was fractures, however, only on that measure was statistical testing justified.

Discussion

The initial annual prevalence of falls in this study was 28%. In a major community survey in Newcastle the rate in those aged 70 and over was 31%.[14] Individual age groups in the Newcastle study showed slightly higher rates than those in our study but the pattern was similar, suggesting that the initial interview data on falls in this community were similar to others, given the interviewing techniques employed.

The intervention failed to show any reduction in the number of fractures. When the data were stratified by initial disability to clarify the effect of the initial differences in disability, mortality was still lower in the intervention group.

The pattern of falls and fractures by disability and group is not straightforward, but a number of theories may be propounded. The memory of elderly people over the period is likely to have led to underreporting of falls. The randomised design of the trial assumed that this would be similar in the intervention and control groups, but there may have been reporting bias towards reporting falls in the intervention group because of the nature of the health visitor's work.

If there was no reporting bias for falls the results may have been due to the influence that disability and anxiety have on lifestyle. In the group with no initial disability the health visitor may have instilled confidence in the elderly people and persuaded them to take more exercise, and this may have put more of them into situations where falls were more likely: 45 in the intervention group (28%) and 18 in the control group (15%) fell. Creating more opportunities for elderly non-disabled people may paradoxically lead to more falls and more morbidity due to fractures (5% *v* 3%). However, they may benefit from a better quality of life; the extra confidence may allow greater mobility and subsequently reduce mortality.

The intervention and control groups with moderate and severe disability had a similar incidence of falls (31% and 28%), but the intervention group had fewer fractures. The difference in the ratio of the fractures to falls (1 in 27 for the intervention group, 6 in 27 for the controls) might be due to the safer home environment created by the health visitor. For elderly disabled people the attempt to create a safer environment did not lead to a reduction in falls but may have led to a reduction in fractures and a decrease in mortality.

Whatever the effect of the intervention on falls, fractures, and deaths, table II emphasises the close relation between initial disability and subsequent death rate associated with falls. The relation to the fracture rate is not as obvious—partly, no doubt, because of the small numbers concerned; possibly people sustaining a fracture have a high subsequent mortality. This would have the effect of selectively removing such individuals from the fractures group.

The mortality results are given for the weight of evidence to be judged. The results raise the possibility that the intervention had an unsought for beneficial effect. On the basis of this finding studies on the effect of such an intervention on mortality are justified.

In conclusion, further research on the effect of intervention on the falls:fractures ratio for people with different degrees of disability needs to be undertaken. Some information about other outcome measures, such as quality of life, would be interesting. In relation to the prevention of fractures, however, the study provides no evidence that a targeted intervention on behalf of people aged 70 and over will reduce the incidence of fractures.

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A PATIENT WHO CHANGED MY PRACTICE

Not always so simple

It was one of those extra busy weeks. My partner was on holiday so I was running the practice on my own without a locum. When the request came through on the Tuesday to visit a previously fit 27 year old man I spoke to his mother on the telephone, established that it certainly sounded like flu and was not serious, and persuaded her that a visit was unnecessary. Two days later she walked in mid-morning and announced to me in front of the packed waiting room that her son was dead. With a sick feeling in my stomach and visions of being sued, I went back to her house, where her son was unquestionably dead. Gradually the full story emerged. Her son had had flu and not severely. He had, however, also had pulmonary tuberculosis, treated apparently effectively nine years before with anti-tuberculosis chemotherapy. The necropsy showed that he had tuberculosis of his adrenals; the flu had presumably been the final insult, provoking a fatal Addisonian crisis.

The major lesson to me, though, was not my failure to visit, which was defendable, but the mother's comments. On the day after the requested visit her son had apparently seemed better. On the morning of his death he woke his mother at 5 00 am to say that he could not walk. He then called her again at 8 00 am saying that he could not see. On each occasion his mother reassured him that I had said that he had flu and that there was nothing to worry about. At 10 00 am he was dead. What appalled me was his mother's total acceptance of what I said, regardless of the change in his symptoms.

That all happened 12 years ago. With all patients, especially those with potentially serious illnesses, I now urge them to get in touch if there is any change for the worse or they fail to get better, as expected. I hope the 27 year old young man would regard this as a fitting memorial.—ROS KENNEDY *is a general practitioner in Bristol*