ELSEVIER

Safety Science 21 (1996) 239–246

safety science

Preventing femoral fractures among elderly: The community safety approach

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Abstract

The current picture of fatal injuries in Sweden is dominated by falls, which account for about 40%. Furthermore, falls are by far the most dominating cause of hospital in-patient care (57%). The aetiologic mechanisms behind falls and fractures are complicated, with a multifactorial causal pattern.

The Lidköping Accident Prevention Programme — one of the few comprehensive community intervention programs in the world — provides an opportunity to discuss links between a multifactorial intervention program and related injuries in the elderly. The incidence of femoral fractures in Lidköping shows a significantly declining trend for females (−6.6% per year) and a −5.4% decline for males during the study period of 1987–1992. The control area of Skaraborg County showed a minor decrease and Sweden as a whole showed an increasing trend during the same period.

In spite of the methodological problems of attributing effects in quasi-experiments, there is some support for the claim that the declining trend in the trial area was largely the result of the intervention program. This conclusion is further strengthened by the recently published report from the USA showing that a multiple-risk-factor intervention strategy resulted in a significant reduction in the risk of falling among elderly persons in the community.

Keywords: Injuries; Elderly; Community intervention; Evaluation

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SSDI 0925-7535(95)00067-4

1. Introduction

1.1. Incidence of injuries in Sweden

Unintentional injuries have been increasing as a cause of death since the beginning of this century (Statistics Sweden, 1989), but have constantly decreased since 1971 (Statistics Sweden, 1993). The current picture is dominated by falls, which account for about 40% of fatal injuries, motor vehicles and other traffic (about 30%) and drownings (10%), while fire only causes 3% of accidental deaths (Statistics Sweden, 1991).

Hospital discharge registers are the main source of information on injuries besides the mortality register. By far the most dominating cause of hospital in-patient care due to unintentional injuries is falls (57% in 1988) followed by transport (13%) (National Board of Health and Welfare, 1994). Actually, about a third of the days of hospital care for males and more than half for females in Sweden were caused by femoral fractures.

The rate of unintentional injuries leading to hospital care for both females and males has long been increasing, dominated by falls. However it is now levelling off, or even decreasing (National Board of Health and Welfare, 1994).

The mechanisms behind falls and fractures are complicated (Svanström, 1990). There is a multifactorial causal pattern including social factors like social network, and living alone, and environmental factors like deficiencies in the immediate environment, in the housing area and in the traffic environment. 75% of injuries to the elderly occur at home and most of the rest in the immediate environment, like staircases, or in traffic environment. Physical factors like physical inactivity, osteoporosis and nutritional factors also play an important role, as do lifestyle habits like alcohol consumption and smoking. Medical factors like tiredness, different diseases and medications also play a role. However, the causal link between dietary factors, osteoporosis, falls and risk for fractures is not established.

These and many other factors are some of the reasons for the lack of conclusive data on results of interventions. The road to such conclusive data is long but should be entered.

The purpose of this report is thus to describe one of the few documented programs dealing with prevention of falls and related injuries among the elderly, an activity within the Lidköping Accident Prevention Programme (LAPP). The purpose is also to discuss difficulties in linking program activities to outcome, i.e., changes in injury incidence.

2. Material and methods

2.1. Study area

Skaraborg County is situated between Gothenburg and Stockholm in southern Sweden. It is mainly an agricultural and manufacturing county; 40% of the area is arable land compared to 8% for Sweden as a whole. In 1978 the population was 267 342 (16.9% 65+), but by 1992 it had increased to 278 860 (18.3% 65+). One of its

municipalities, the study area, is Lidköping with 34812 inhabitants (16.9% 65 +) 1978 and 36289 (19.2% 65 +) 1992.

2.2. Intervention and process evaluation

In the early seventies, a Community Health Unit was established to plan and coordinate health and safety promotion for the population of Skaraborg county. Falköping municipality was chosen as suitable for intervention on accidents and injuries (The FAPP), with Lidköping as a control area. This community trial has been reported (Schelp, 1989). When the first trial was over in the beginning of the 1980 an intersectorial group for Accident and Injury Prevention was established in the former control area, Lidköping, from 1984 on.

To guide intervention and provide a baseline for evaluation, registration of injuries started in 1978. The surveillance system, which comprises emergency visits to hospitals and health centers, has been described elsewhere (Schelp and Svanström, 1987). The numbers of injuries in the test and control areas from the FAPP/LAPP Injury Surveillance System have been reported previously (Schelp, 1987, 1988, 1989). The data from the surveillance system formed the basis of the intervention program. Priority groups were children/adolescents and the elderly. Priority areas were housing, traffic, sports arenas and institutions, like schools, day-care centers and nursing homes.

Process evaluation was based mainly on notes and reports made by the health planners involved, combined with newspaper cuttings and interviews with key people. Outcome evaluation was based on information from hospital discharge data from Skaraborg County and from the Swedish National Board of Health and Welfare (Statistics Sweden, 1993).

2.3. Outcome evaluation

There were no out-patient data available for the intervention period, but there are Hospital Discharge Register data from the whole of Sweden, Skaraborg County and the municipalities within that county. Such data are lacking for Sweden for 1984 but are available from 1985 on. However, a new classification system was introduced from 1987 on, which led to changes. We have therefore chosen to start with a series of data from 1987 onwards (ICD9), concentrating on falls in the age-group 65 and leading to femoral fracture.

2.4. Statistical methods

Incidence calculations are based on actual numbers of hospital discharges by patients with femoral fractures aged 65 plus divided by the population in the respective geographical area per year. We have calculated 95% confidence intervals (c.i.) for the differences between the three areas (Lidköping municipality, Skaraborg county and the whole of Sweden) (Ott, 1984). Linear regression was used to analyze the trends for the incidence rates of three geographical areas. The slope of the regression line β represents the annual change in incidence.

3. Results

3.1. Process evaluation

The members of the Reference Group from 1984 represented the local health care organization and the municipal council, the police, as well as voluntary organizations. The safety promotion program agreed upon by this group included four elements: information, education, supervision of the population and environment and modification of the physical environment (Schelp, 1988). The work started with the focus mainly on injuries affecting children and the elderly, and the Reference Group was split into two. The Old People's Safety Group consisted of the Head District Nurse and representatives from the Emergency Hospital, the Social Services of the municipality and the Primary Health Care Services as well as representatives from the Pensioners' Council.

The program started in 1985 with joint training for personnel from the municipality and the county council services for home care and home sickness care. During 1986 the program became more intensive. The reference group met five times and the group developed material for information. A special case containing safety equipment and information material was developed. An exhibition with safety equipment was displayed at health centers, day care centers, district nurses' offices and public buildings including the Town Hall. It focused on risks in the environment because of different climatic situations, as well as risks in the home. A video that was produced during 1986/1987 focused on the same risks. During the same year, eight times were devoted to training of personnel. That year 346 persons were trained. The intervention included all possible items like changes to the floor surfaces (like rugs), doorway thresholds, lighting, handrails, etc.

The Pensioners' Council now had two representatives in the Reference Group and the housing planners in the community and the environmental health office were also involved. During 1987 the group trained another 134 people at 12 training sessions. That meant that during 1986 and 1987 almost 500 people were trained. New information and training material was developed and a survey of hip-fractures was performed from February 1987 to February 1988. Contacts were also taken with the planners of new housing areas in the municipality. The municipal architect showed great interest in planning the future home environment for the elderly jointly with the group.

A new routine was introduced during 1987, so-called Municipal Safety Rounds (Bjärås et al., 1990), which included participation of people from the Old People's Safety Group and the Child Safety Group.

During 1988 a management committee was established for the whole program and the planning of the Lidköping Conference on Methods to Prevent Injuries. During the same year, the Reference Group held ten meetings, six of them jointly with the Child Safety Group. During 1988 the representative from the Pensioners' Council informed about 300 pensioners on safety matters.

In 1989/1990 the training of different personnel and pensioners' groups was intensified. In 1991, based on experiences from the training, a program to achieve changes already in the planning of housing areas was introduced. A full-scale laboratory where designers could test new solutions for increased safety was established in

Table 1
Incidence rates (per 1000 inhabitants 65 years of age and over), mean (x) and confidence intervals (c.i.) of falls leading to femoral fractures and the population base (65 years of age and over) in Lidköping municipality, Skaraborg County, and the whole of Sweden, 1987–1992, by gender and geographical area

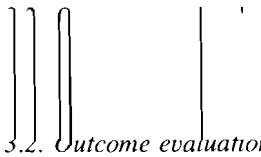
	Lidköping		Skaraborg		Sweden	
	Females	Males	Females	Males	Females	Males
1987						
Incidence	21.9	6.0	20.8	8.9	20.8	9.5
Population	3832	2985	27461	22591	644614	472215
1988						
Incidence	20.4	9.1	19.1	9.0	20.3	9.2
Population	3876	2985	27461	22595	650267	475359
1989						
Incidence	18.9	7.3	20.5	7.7	19.8	8.8
Population	3921	2997	27997	22738	656271	479053
1990						
Incidence	11.6	9.1	20.0	9.2	20.4	9.2
Population	3952	2972	28244	22680	660320	481136
1991						
Incidence	14.2	4.3	17.0	7.0	21.7	10.0
Population	3956	2999	28334	22714	663166	482276
1992						
Incidence	16.7	5.3	18.4	8.0	21.0	9.6
Population	3960	3010	28360	22676	661743	481706
x	17.3	6.9	19.3	8.3	20.7	9.4
c.i.	(13.2, 21.4)	(4.8, 8.9)	(17.8, 20.8)	(7.4, 9.2)	(20.0, 21.4)	(9.0, 9.8)

collaboration with the municipal architect, the housing department for the elderly and the health care services.

From 1991 to 1993 the program has more or less followed the same structure as in earlier years.

Table 2
Calculations of linear regression, based on Table 1, in order to analyze trends of injury incidence in the three geographical areas and two genders. The slope of the regression line is defined by B_1. 95% confidence interval and % change per year are calculated (Ott, 1984)

	Lidköping		Skaraborg		Sweden	
	Females	Males	Females	Males	Females	Males
β_1	−1.5	−0.5	0.5	0.3	0.2	0.1
c.i.	(−2.9, −0.1)	(−1.4, 0.5	(−1.1, 0.0)	(−0.6, 0.1)	(−0.1, 0.5)	(−0.1, 0.3)
Signific.	yes	no	no	no	no	no
% change/year	−6.6	−5.4	−2.5	−2.8	0.9	1.1



3.2. Outcome evaluation

The incidence rates of falls leading to femoral fractures in Lidköping, Skaraborg County and the whole of Sweden for the period 1987 to 1992 are shown in Table 1.

The injury (femoral fracture) incidence is generally lower for males than for females. Analysis of the differences between the three areas shows no significant difference in incidence of femoral fractures between Lidköping and Skaraborg County. However, Sweden as a whole shows a significant higher incidences for males compared to Lidköping.

Looking at the time trends of incidence of femoral fractures, Lidköping shows a declining trend for both genders, 6.6% (significant) for females and 5.4% (n.s.) for males (Table 2). Skaraborg County also shows a decreasing trend (n.s), while Sweden as a whole shows an increasing trend (n.s.) during the same period.

4. Discussion

4.1. Study design

In theory, intervention programs should be based on systematically researched models, and should be carefully monitored and evaluated (Kahn and Mann, 1969). Evaluation is supposed to be a rational process (Weiss, 1972a, b) in which the effects of policies and programs on their targets (individuals, groups, institutions, communities) are revealed, undistorted by prejudice or preconception. It is assumed that with "the facts" in their possession, decision-makers will make wiser choices than they otherwise would over future courses of action. In practice, the prior beliefs and paradigms of those involved colour everything from how the intervention is conceived to the language and scope of the evaluation and interpretation of the findings.

This means that the designs available for evaluating community intervention programs are in general rather weak. One is the one-area pre-test/post-test comparison. This can sometimes be strengthened by using an "interrupted time-series design", in which a series of observations are made before, during and after the intervention. Another approach is the natural experiment in which geographical areas are chosen for study on the basis of pre-existing, known contrasts in "exposure".

4.2. Outcome evaluation

In the LAPP, we have time series for hospital admissions that run from 1987 to 1992. The intervention to prevent injuries in the elderly started in 1985, was steadily built up and reached its "peak character" (organization, scope and intensity) over the period of 1988 and onwards.

Lidköping is not in all respects equivalent to the whole of Skaraborg County in terms of predisposing factors, and definitely not to the whole of Sweden. But these control areas provides sufficiently large numbers of cases and a sufficiently large population to make comparison valid. Furthermore, they are all areas in the same country, with the

same culture, development level and health services. Furthermore there were no change in number of beds or care policy during the study period.

4.3. Process evaluation

Descriptions of processes present particular challenges regarding validity. Above all, there is the risk of bias, people tending to record what is hoped for or socially desirable. One way to limit this is to set up a team of evaluators or research workers that is independent of the organizations involved in the intervention. The burden of ensuring validity then falls not only on the interviewer and the respondent, but also on the researchers who devise "measuring instruments", provide protocols, manipulate the resulting data, and submit their reports to external critique. In the analysis presented in this paper, we have chosen to report the process information before entering outcome data on incidence of injuries in order to avoid that bias.

In spite of the methodological problems of attributing effects in quasi-experiments, we believe there is some support for the claim that the declining trend of on average 6.6% per year for females (significant) and 5.4% for males in the incidence rate of falls leading to femoral fractures in Lidköping at the same time as a lower decrease in Skaraborg County and an increase in Sweden was largely the result of the LAPP. Just recently a report from the USA (Tinetti et al., 1994) showed that a multiple-risk-factor intervention strategy resulted in a significant reduction in the risk of falling among elderly persons in the community-a result further supporting attribute of our observations of injury reduction to the community intervention program.

5. Conclusions

Considering the validity problems with an administrative register, like the Hospital Discharge Register, there should be a further development of a specific surveillance system designed for the purpose of evaluation, like the one mentioned in 2.2. However, in the case of femoral fractures we believe that the Hospital Discharge Register show quite high validity compared to what "really" happened in the area.

We therefore argue that there are some results in this evaluation that links the process of LAPP to the decline in injury rates. In spite of these promising results, it is still too early to draw far-reaching conclusions. The surveillance system established in 1989 will probably provide an important means of obtaining more valid data for a future time period.

Acknowledgement

We are indebted to Anders Karlsson, B.Sc., Statistician at the Department of Public Health Sciences, for helping us with the calculations.

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