

# Why the elderly fall in residential care facilities, and suggested remedies

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## Abstract

**Objective** To study precipitating factors for falls among older people living in residential care facilities.

**Design** Prospective cohort study.

**Setting** Five residential care facilities.

**Participants** 140 women and 59 men, mean age  $\pm$  SD 82.4  $\pm$  6.8 (range, 65–97).

**Measurements** After baseline assessments, falls in the population were tracked for 1 year. A physician, a nurse, and a physiotherapist investigated each event, and reached a consensus concerning the most probable precipitating factors for the fall.

**Results** Previous falls and treatment with antidepressants were found to be the most important predisposing factors for falls. Probable precipitating factors could be determined in 331 (68.7%) of the 482 registered falls. Acute disease or symptoms of disease were judged to be precipitating, alone or in combination in 186 (38.6%) of all falls; delirium was a factor in 48 falls (10.0%), and infection, most often urinary tract infection, was a factor in 38 falls (7.9%). Benzodiazepines or neuroleptics were involved in the majority of the 37 falls (7.7%) precipitated by drugs. External factors, such as material defects

and obstacles, precipitated 38 (7.9%) of the falls. Other conditions both related to the individual and the environment, such as misinterpretation (eg, overestimation of capacity or forgetfulness), misuse of a roller walker, or mistakes made by the staff were precipitating factors in 83 (17.2%) of falls.

**Conclusion** Among older people in residential care facilities, acute diseases and side effects of drugs are important precipitating factors for falls. Falls should therefore be regarded as a possible symptom of disease or a drug side effect until proven otherwise. Timely correction of precipitating and predisposing factors will help prevent further falls.

For older people at increased risk of falling due to multiple predisposing risk factors, acute diseases and drug side effects are the most common precipitants for falls. Other individual and environmental factors identified here also cause falls, and their recognition can lead to quick diagnosis and remedy, and to careful supervision and environmental strategies that can prevent falls.

## ■ THE PROBLEM IN RESIDENTIAL CARE FACILITIES

Falls and their consequences—such as fractures and other injuries, fear of falling, impaired functions, and dependency—are serious health problems in the older population.<sup>1</sup> Older people living in residential care facilities and those

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receiving long-term institutional care seem particularly prone to falling and fractures caused by falls.<sup>2-4</sup>

Almost half of all patients with hip fractures in Umeå, Sweden, during the 1980s and the 1990s lived in residential care facilities, although fewer than 10% of the elderly population lived in such accommodations.<sup>4</sup> Falls among people aged 60 years and older have been estimated to account for one third of the total cost of medical treatment for all injuries in the Swedish population.<sup>5</sup>

## ■ PREDISPOSING AND PRECIPITATING FACTORS FOR FALLS

Falls have a number of causes—both chronic predisposing factors and acute precipitants.

### Chronic predisposing factors

Chronic predisposing factors increase the risk of a fall. The greater the number of predisposing factors, the greater the risk. Most research has focused on predisposing factors—diseases, previous falls, disorders of gait and balance, impaired neuromuscular function, and poor vision are rather well-known risk factors.<sup>6</sup> Treatment with drugs—such as neuroleptics, benzodiazepines, analgesics, digitalis, steroids, diuretics, and antidepressants—are also risk factors for falls.<sup>7-12</sup> Given these predisposing factors, rather small changes in medical status or environment may then precipitate a fall.

In geriatric medicine textbooks, falls have commonly been regarded as a symptom of disease,<sup>13</sup> but the evidence for this is supported by few studies.<sup>14,15</sup> External factors and environmental circumstances have been found to contribute to the risk of falls among the elderly, with or without injury, but have mostly been studied in the home environment.<sup>16-18</sup>

### Acute precipitating factors

Few studies have focused on precipitating factors for falls.<sup>14,16</sup> Several attempts to perform randomized fall prevention studies in residential care facilities have been unsuccessful in

reducing the number of fallers, falls, and injuries.<sup>19-23</sup> However, they have not included prevention and treatment of such precipitating factors as acute diseases and drug side effects.

### Aim of this study

This prospective cohort study aimed at identifying precipitating factors for falls among older people living in residential care facilities by analyzing the circumstances—related to the individual and to the environment—prevailing at the time of the fall.

## ■ METHODS

The design of this study was a prospective cohort study with baseline assessments, a prospective follow-up for falls, post-fall assessments, and post-fall conferences.

### Settings and participants

Residential care facilities in Sweden accommodate older people who are disabled because of cognitive or physical impairment and thus require supervision, functional support, or nursing care. Different settings may exist in the same facility or groups of facilities: senior citizens' apartments, old people's homes, and group dwellings for people with dementia.

In senior citizens' apartments, the residents live in private facilities with 1 or 2 rooms, a kitchen, and a lavatory. In the old people's home and the group dwelling, the residents live in private rooms including a lavatory, and have their meals in a communal dining room. In all facilities, residents have 24-hour access to assistance with activities of daily living, household issues, and medical care.<sup>24</sup> In Sweden 8% of people aged 65 years and older live in such accommodations, according to statistical reports from the National Board of Health and Welfare in Sweden.

Residents of 5 facilities, including senior citizens' apartments, old people's homes, and group dwellings for people with dementia, were asked to participate in the study. Informed

consent was obtained from the patient or proxy. The study was approved by the Ethics Committee of the Faculty of Medicine at Umeå University.

### Baseline assessments

All participants were assessed at the start of the study. Social and medical data (including medications) were collected from the participants, medical records, caregivers, and relatives. The Barthel activities of daily living (ADL) index was used to measure patients' ability to function on their own.<sup>25</sup> Cognitive function was assessed using the Mini-Mental State Examination (MMSE). Body mass index (BMI) was also measured.

Falls were recorded over 12 months or until participants died or moved. A fall was defined as any event in which the resident unintentionally came to rest on the floor regardless of cause; this included syncopal falls, falls resulting from acute disease or epileptic seizure, and unexplained falls after which the resident was found on the floor by staff. All drugs taken within 24 hours before a fall were documented.

This study was part of an intervention study targeting both general and resident-specific risk factors for falling. Interventions included staff education about falls, post-fall assessments and fall prevention, environmental modification, exercise programs, supply or repair of aids, review of drug regimens, hip protectors, post-fall problem-solving conferences, and staff guidance.<sup>24</sup>

Though a large proportion of the residents had multiple risk factors predisposing them to falls, the focus of this study was the precipitating factors—ie, the circumstances prevailing at the time of the fall.

### Follow-ups for falls

A report form developed from experiences in previous studies was used for post-fall evaluation. The first section of the form was structured with questions about the fall: date, time, activity, new symptoms, and external factors such as darkness, obstacles, footwear, and walking aids.

## Acute diseases and side effects of drugs are important precipitating factors for falls

The staff—licensed practical nurses and nurse's aides—filled in this section.

The last 3 parts of the form were filled in after evaluation of possible causes of the fall, by the registered nurse of the residential care facility (the same day), the physician responsible for the residents, and a physiotherapist employed part-time in the project (on the same day if possible, but at least within the same week).

The post-fall assessments included interviews of the resident, the staff, and sometimes relatives, as well as a physical examination and laboratory tests when indicated. To prevent further falls, the physician, nurse, and physiotherapist conferred and determined the most probable explanation of the fall and took appropriate preventive measures when possible.

After data collection, the research study group (1 physiotherapist [JJ] and 2 physicians [YG and KK]) evaluated the documentation on each fall and formed a consensus about the most probable precipitating factor for each fall. In some cases where consensus was not reached, the majority decided the precipitating factor, or more than 1 factor was assigned to the fall.

Injuries were classified according to the 7-grade Abbreviated Injury Scale (AIS), where MAIS indicates the most serious injury connected with the incident.<sup>26</sup> The injuries in this study ranged from MAIS 0.5 to 3, from minor (eg, superficial wounds) to serious (eg, hip fractures).

Acute disease or symptoms of disease were regarded as a precipitating factor when symptoms or changes in the medical condition before that fall disappeared with treatment. For example, several urinary tract infections were detected after a fall. The resident could have been feeling dizzy, anxious, and weak at the knees prior to the fall. These symptoms disappeared after treatment of the infection and were in some cases validated as a

TABLE 1

## Characteristics of the 199 residents at inclusion

	Any falls during follow up		No falls during follow up		P
	n=113	%	n=86	%	
Age (mean age $\pm$ SD)*	83.1 $\pm$ 7.0		81.4 $\pm$ 6.5		
Female*	78	69.0	62	72.1	.707
Fall in the last half year	62	55.8	20	23.5	<.001
Fracture in the last year	22	19.5	7	8.1	.027
<b>Function</b>					
Barthel ADL Index Md (IQR)**	15 (10–17)		17 (8.5–17)		.018
Independent walking with or without walking aid*	86	77.5	63	73.2	.494
MMSE, Md (IQR) <sup>§†</sup>	19 (15–23)		21.5 (15–26)		.042
Bed rails	8	7.1	12	14.0	.120
Geribelt	0	0	2	2.3	.189 <sup>  </sup>
<b>Clinical characteristics</b>					
Arthritis/Arthrosis*	32	28.6	26	30.6	.758
Dementia*	39	34.5	32	37.6	.649
Depression*	48	42.5	21	24.7	.009
Diabetes*	27	23.9	13	15.3	.136
Epilepsy*	6	5.3	3	3.5	.735 <sup>  </sup>
Heart disease*	70	61.9	47	55.3	.346
Previous stroke*	43	38.0	23	27.0	.104
Impaired vision <sup>§</sup>	32	29.6	18	22.5	.274
Urinary incontinence*	37	33.3	20	23.2	.645
Delirium last month <sup>§</sup>	42	38.2	21	24.7	.046
Abuse of alcohol	6	5.3	2	2.3	.470 <sup>  </sup>
<b>Prescribed drugs</b>					
Number of drugs, Md (IQR)	6 (4–9)		6 (4–8)		.161
Antidepressants	42	37.2	18	20.9	.013
Analgesics	76	67.2	58	67.4	.978
Neuroleptics	26	23.0	22	25.6	.674
Benzodiazepines	29	25.7	22	25.6	.989
Beta-blockers	22	19.5	21	24.4	.401
Laxatives	55	48.7	29	33.7	.034
Diuretics	64	56.6	37	43.0	.057

ADL, activities of daily living; Md (IQR), Median (Inter-Quartile Range); MMSE, Mini Mental State Examination

\*Data missing in 1 or 2 participants.

†Barthel ADL Index range 0–20. The maximum score, 20, implies independence in self-care and indoor gait.<sup>24</sup>

‡MMSE range 0–30. Scores  $\leq$ 23 indicates significant cognitive impairment.<sup>25</sup>

§Data missing in 4–12 participants.

||Fisher's exact test.

precipitating factor since recurrent urinary tract infections resulted in more falls. Similarly, in cases when a drug was judged to have precipitated the fall, drug side effects from a newly prescribed drug were reported, and the symptoms disappeared after

discontinuation of the drug treatment. Delirium was diagnosed according to *DSM-IV* criteria<sup>27</sup> by the physician of each residential care facility, and it was judged as a precipitating factor when the underlying cause of the delirium was unknown.

### Statistical analyses

The groups of fallers and nonfallers were compared using the chi-square test, the Fisher's exact test, the Student *t* test, and the Mann-Whitney U test when appropriate. Factors associated with being a faller in bivariate analyses were, after controlling for multicollinearity, included in logistic regression analyses to find factors independently associated with being a faller.

*P* values <.05 were regarded as statistically significant. The Statistical Package for the Social Sciences version 10.0 was used for all calculations.

## ■ RESULTS

Twelve residents declined to participate. Thirteen died or moved before baseline assessments. Eventually 140 (70%) women and 59 men with a mean age of 82.4 years (SD ± 6.8; range, 65–97) were enrolled in the study after their own (or, in patients with dementia, their relatives') informed consent had been obtained.

The clinical characteristics of the participants at inclusion can be seen in **Table 1**. One hundred thirteen (57%) residents sustained at least 1 fall during the 12 months of the study. Seventy-four of 113 (65%) fallers sustained at least 1 injury; 32% of the 482 falls resulted in an injury. Previous falls, impaired cognition and ADL ability, depression, delirium, treatment with antidepressants, and use of laxatives were associated with falling. A multiple logistic regression analysis revealed that falls within the last 6 months and treatment with antidepressants were the factors independently associated with falling (data not shown).

### Factors precipitating falls

The most probable precipitating factors for falls could be judged in 331 (68.7%; 95% confidence interval [CI], 64.6–72.8) of the 482 registered falls. In 297 falls, 1 factor was judged to be precipitating; in 28 falls, 2 factors; in 5 falls, 3 factors; and in 1 fall, 4 contributing factors were judged to be precipitating.

**Disease.** Acute disease or symptoms of disease, including exacerbations of chronic diseases and syncope, were judged to be precipitating factors in 186 (38.6%; 95% CI, 34.3–42.9) of all falls (**Table 2**). Thirty-eight of the total number of falls (7.9%; 95% CI, 5.9–9.9) were precipitated by infections, most often symptomatic urinary tract infections, and 11 (2.3%; 95% CI, 1.3–3.3) by acute stroke. Forty-eight falls (10.0%; 95% CI, 7.3–12.7) were precipitated by delirium. Seven residents, of whom 6 were known alcoholics, sustained 19 falls under the influence of alcohol.

**Drugs.** Drugs were judged to be a precipitating factor in 37 (7.7%; 95% CI, 5.7–9.7) falls (**Table 3**). Benzodiazepines or neuroleptics were involved in 32 of these 37 falls. Sleeping medicine given at the wrong time—too soon before the residents went to bed—resulted in 7 falls (in 7 residents).

In 7 of the falls precipitated by drugs, the judgment was that there had been an overdose (various combinations of benzodiazepines, dextro-propoxyphene, propiomazine, levomepromazine [not available in the US], and carbamazepine) in 1 resident who had problems with addiction to drugs and alcohol. At the time of 1 of these falls this resident was also under the influence of alcohol. In the fall precipitated by antibiotics, the reason was an allergic reaction.

**External factors.** External factors precipitated 38 falls (7.9%; 95% CI, 5.9–9.9), most often in the form of obstacles (12 cases) or material defects (8 cases) (**Table 4**).

Thirty-four residents were using hip protectors (18 all day and night, 11 all day, and 5 some days). Hip protectors were judged to have precipitated 3 falls as they became stuck at the knees when the wearer was dressing, often after visiting the bathroom. In all 3 falls, the hip protectors were a precipitating factor in combination with usual clothing.

**Other conditions.** Other conditions, due both to the individual and the environment, were judged to precipitate 83 falls (17.2;

TABLE 2

**Acute diseases and symptoms of disease precipitating falls**

	Falls (n=186)*	Injurious falls	Number of fallers
Infection	38	17	21
Urinary tract infection	20	11	12
Upper respiratory infection	5	1	4
Acute bronchitis	8	2	2
Gastroenteritis	2	1	2
Indeterminate infection	3	2	3
Acute stroke	11	4	8
Acute heart disease	4	3	3
Angina pectoris	2	1	2
Heart failure	2	2	1
Epilepsy	1	1	1
Delirium	48	17	20
State of alcohol intoxication	19	1	7
Psychotic symptoms	16	8	3
Dizziness	16	3	10
Anxiety	10	4	9
Sudden weakness in the legs	9	1	4
Symptoms of constipation	6	3	5
Syncope	6	1	5
Diarrhea	3	0	3
Anemia	2	0	2
Feeling of sickness, indisposition	2	1	2
Orthostatism	2	1	2
Urinary retention	1	0	1
Electrolyte disturbances	1	1	1
Hypoglycemia	1	1	1

Note: Symptoms of disease includes exacerbations of chronic diseases.

\*169 falls were precipitated by a single symptom of disease, 9 falls by 2 symptoms, and in 8 falls acute disease was precipitating in combination with other factors.

TABLE 3

**Acute drug side effects precipitating falls**

	Falls n=37	Injurious falls	Number of fallers
Benzodiazepines	21	4	11
Neuroleptics	16	4	6
Analgesics	7	1	3
Antiepileptics	2	0	1
Sympaticomimetics for treatment of glaucoma (brimonidine)	2	0	1
Cholinesterase inhibitors	1	0	1
Antibiotics† (sulfamethoxazole + trimethoprim)	1	0	0
Angiotensin-converting enzyme inhibitors (enalapril)	1	1	1

\*21 falls were judged to be precipitated by a single drug, 9 falls by 2 drugs, 1 fall by 3 drugs, and in 6 falls there was a combination with other factors.  
†Allergic reaction.

95% CI, 13.9–20.5) (Table 5). Errors of judgment/misinterpretation—eg, overestimation of one's own ability, or forgetfulness by the resident—such as not calling for help when moving despite an inability to move without assistance, precipitated 34 falls.

Misuse of a walker precipitated 15 falls. Miscalculation, probably because of perceptual disturbances, such as missing a step when leaving a car or the chair when sitting down, precipitated 14 falls.

Mistakes made by the staff, such as leaving a resident alone on the toilet, forgetting to put on parts of a wheelchair, or turning off the light at night—all in disregard of agreements—lay behind 12 falls. A lack of adequate facilities caused 3 falls. Mistreatment by other residents resulted in 2 falls. Falling asleep in a chair, a state of exhaustion after an eye examination, a frightening nightmare, and an unexplained sudden loss of balance lead to 1 fall each.

## ■ DISCUSSION

This study confirms that a large proportion of older people in residential care facilities suffer from falls and injuries. The most important predisposing factors for falls in this study were a history of previous falls and treatment with antidepressants, according to a logistic regression analysis that is supported in previous studies.<sup>28</sup> Major precipitating factors were acute diseases, drug side effects, external factors, and other conditions both related to the individual and the environment.

### Acute diseases usually detectable

Acute diseases, often commonplace and treatable, seem to be important precipitating factors for falls in this population, and the risk-factor profile with increased susceptibility is probably one explanation for this. The 39% of the falls precipitated by acute disease or symptoms of disease is even higher than the proportion

TABLE 4

### External factors precipitating falls

	Falls n=38*	Injurious falls	Number of fallers
Obstacle	12	9	11
Material defect	8	2	8
Bed defects	3	1	3
Roller walker defect	1	0	1
Wheelchair defect	1	0	1
Defective walking belt	1	0	1
Defective prosthesis	1	0	1
Elevator in wrong position at stop	1	1	1
Clothes	6	2	6
Bad shoes	5	1	5
Slipperiness	4	1	4
Hip protector	3	1	3
Bag of urinary tract catheter	1	1	1
Pushed by an automatic door	1	1	1
Crowd in a doorway	1	0	0

\*33 falls were judged to be precipitated by a single external factor, 1 fall by 2 factors, and in 4 falls there was a combination with other factors.

reported in earlier studies (9%–17%).<sup>14,29</sup>

Delirium, here the most frequent precipitating symptom, is by definition usually a symptom of an underlying disease. However, it was frequently impossible to determine the underlying causes of the delirium, which is also true regarding other symptoms such as anxiety.

One explanation for the higher proportion of acute diseases as precipitating factors in this study is probably the accuracy with which the falls were followed up by 3 different professionals. Many of the most common diseases and symptoms of diseases precipitating falls should be possible to prevent or diagnose quickly to prevent falls.

#### Drugs: first-dose and dosage-increase complications

Drugs precipitated almost 8% of the falls, a proportion that seems to correspond to the results of previous studies.<sup>14,29</sup> Benzodiazepines and neuroleptics were not significantly associated with falls as predisposing factors in this study, opposite to what has been previously reported.<sup>30</sup>

However, these drugs were important precipitating factors alone, in combination with each other or in combination with other drugs, and they accounted for 32 out of the 37 falls precipitated by drugs. These drugs have also



TABLE 5

**Other conditions precipitating falls**

	Falls n=38*	Injurious falls	Number of fallers
Error of judgment/misinterpretation	34	9	15
Misuse of roller walker	15	5	8
Miscalculation	14	4	11
Mistakes by the staff	12	4	10
Lack of adequate facilities	3	2	2
Mistreatment by other residents	2	1	1
Other (falling asleep in a chair, exhausted state after eye examination, frightening nightmare, and an unexplained sudden loss of balance)	4	2	4

\*74 falls were judged to be precipitated by a single condition, 1 fall by 2 conditions, and in 8 falls there was a combination with other factors.

previously been reported as important precipitating factors for falls among older people and should therefore be used with caution.<sup>30</sup>

Sleeping medicine (eg, zopiclone [a benzodiazepine not available in the US], zolpidem, and flunitrazepam) given at the wrong time and thereby causing falls, indicates that individual dispensing of medicines could probably prevent some falls. This conclusion is supported by the fact that none of these 7 residents fell again, for the same reason, after adjustments to the dispensing of their medicine.

Drugs as precipitating factors were mainly related to first-dose problems, but also to side effects at dose escalations. Many drug side effects are delayed, sometimes by several weeks, and it can be difficult to state with certainty that there is a correlation between the fall and the drug. This could indicate an underestimation of drugs as precipitating factors for falls. No fall, for instance, was judged to be precipitated by antidepressants, which is surprising since antidepressants are a well known predisposing factor

for falls among older people,<sup>8,9,11,30</sup> and a rather large proportion of the residents, especially of those who sustained a fall, had been prescribed antidepressants.

One explanation is probably the late onset of side effects with antidepressants; another possibility is that there may have been only a few new prescriptions during the study. Depression as well as use of antidepressants are well-known predisposing factors for falls. It is only the possible role of antidepressants as precipitating factors that is discussed here. In a previous study<sup>28</sup> we have distinguished between the depression and the treatment, showing antidepressants to be independently associated with falls.

Consequently, many of the symptoms described could be, and probably are, symptoms of diseases or drug side effects that are never diagnosed.

### External factors

External factors were judged to precipitate almost 8% of the falls. In some studies, 35%–45% of falls are attributed to home hazards,<sup>31,32</sup> but case

## Prevention of falls in those with cognitive impairment may be best ensured through better supervision

control studies have failed to find an association between environmental hazards and the occurrence of injurious or repeated falls in older people living in the community.<sup>33,34</sup>

Furthermore, external factors seem less important as precipitating factors among frail older people in institutions.<sup>35</sup> Material defects and obstacles account, in this study, for the half of the external precipitating factors and it ought to be possible to prevent such falls to a greater extent.

### Other conditions

Other conditions, such as errors of judgment/misinterpretation, miscalculation, and misuse of walkers by the residents are examples of conditions often related to the individual's reduced cognitive capacity, which are often difficult to prevent. Concerning roller walkers, a more critical judgment and a better follow-up when placing one at a resident's disposal could prevent falls, since a walker may even be a precipitating factor for falls in residents with dementia. Mistakes made by the staff and the lack of adequate facilities could be the result of anything from ignorance and carelessness to understaffing.

In addition, prevention of falls in people with cognitive impairment is probably best ensured through better supervision and—perhaps in some cases—by some kind of physical restraints, although some studies have shown that physical restraints can produce a higher risk for falls, especially injurious falls.<sup>36</sup> In the studied sample, only 20 (10%) residents had bed rails (7% of the fallers and 14% of the non-fallers), and 2 nonfallers were restrained by geribelts. No one had been prescribed restraints to prevent falls during the study. Instead, residents with a high risk of falling and sustaining hip fractures were offered hip protectors.

## CONCLUSIONS

The evaluation of precipitating factors were made by 3 different professionals (nurses, physiotherapists, and physicians), all with experience in care of older people. Our opinion is that the cooperation of these different competencies have resulted in valid judgments regarding precipitant factors for the falls despite that the evaluation of a precipitant for a fall always includes some degree of subjectivity.

The careful follow-up of the falls allowed a decision to be made concerning the most probable precipitating factor (or factors) for the fall in more than two thirds of the incidents, despite the inclusion of a rather large proportion of cognitively impaired residents in the study material. The proportion of falls that could be judged was the same in the cognitively well functioning as in the cognitively impaired residents.

### Intervention program significantly reduced the number of falls

This study was part of an intervention program that resulted in a significant reduction in the number of fallers, falls, and hip fractures.<sup>24</sup> The intervention program consisted of both general and resident-specific strategies: educating staff, modifying the environment, implementing exercise programs, supplying and repairing aids, reviewing drug regimens, providing free hip protectors, having post-fall problem-solving conferences and guiding staff.

These post-fall problem-solving conferences are what differs between this successful intervention study and other previously published randomized fall prevention studies in residential care,<sup>19-23</sup> which indicates that this might be an important fall prevention strategy.

However, this poses the greatest problem methodologically, since the follow-up of the falls led to an intervention to prevent further falls. This means that this study, if anything, underestimates the number of falls as well as precipitating factors for falls among older people in residential care.

### Potential problems with this study

Postprandial hypotension has been reported to be an important precipitating factor for falls in older people<sup>37</sup> but was not assessed for in this study. It cannot be excluded that other possible precipitating factors for falls also can have been overlooked or under diagnosed such as syncope, especially in frail cognitively impaired residents.

### Final thoughts

The cause of a fall in an older person is multifactorial including combinations of predisposing and precipitating factors often both related to the individual and the environment. An effective clinical strategy for risk assessment and management therefore must address both predisposing and precipitating factors.<sup>38</sup>

By analogy with accident research in general we think that our focus and analysis of the fall in itself is one fruitful way to approach more effective prevention of this health problem in the older population. It also gives the opportunity to an individualized secondary prevention.

### ACKNOWLEDGMENTS

The authors acknowledge Staffan Eriksson, Mai Matson, Ellinor Nordin, Erik Rosendahl, Olov Sandberg, and Monica Östensson for their contribution to the data collection. Preliminary results were presented as a poster at the 17th congress of the International Association of Gerontology, Vancouver, Canada, July 2001. This study was financially supported by grants from the County Council of Västerbotten, the Federation of County Councils in Sweden, the Umeå University Foundation of Medical Research, the Gun and Bertil Stohnes Foundation, the Swedish Foundation for Healthcare Sciences and Allergy Research and Erik and Anne-Marie Detlof's Foundation, Umeå University.

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## ■ Referral for small brain aneurysms

### TO THE EDITOR:

In reference to your article, "Is neurosurgery referral warranted for small brain aneurysms?" by Paul V. Aitken, Jr (*J Fam Pract* 2003; 52:560-563), may I refer you to an article by Dr. Russell et al.<sup>1</sup> In this article, the researchers demonstrated that a larger volume of subarachnoid hemorrhage occur from ruptured small aneurysm than associated larger aneurysms. This translates to greater risk of vasospasm.

In my clinical experience, and most neurosurgeons' experience generally, subarachnoid hemorrhages occur in aneurysms of less than 10 mm, and that most aneurysms that rupture are less than 10 mm in diameter.<sup>2</sup>

In regards to the recommendation from the Stroke Council of the American Heart Association, which based its data from ISUIA, one might consider what Dr Meyer noted in his editorial in *Journal of Neurosurgery*.<sup>3</sup> He noted that there was an underrepresented anterior communicating artery aneurysms—could it be that aneurysms hemorrhage and was not included in the study? This would certainly skew the data from ISUIA.

In conclusion: Given the above evidence, one may want to reconsider the statement that primary care physicians do not need to refer patients with small cerebral aneurysm (less than 10 mm).

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