Cognitive and physical resources are important in order to complete a geriatric fall prevention programme

Marianne Kirchhoff & Kirsten Damgaard

ABSTRACT

BACKGROUND: It is well documented that falls may be prevented, but effectiveness in reducing the risk of falling depends on the uptake of and the adherence to preventive actions.

METHODS: 65+-year-old fallers identified by screening for fall risk were offered referral to a geriatric fall clinic together with fallers referred from general practitioners (GPs). They were assessed to identify individual risk factors for falling, and appropriate interventions were planned, including exercise classes.

RESULTS: A total of 811 persons were identified by screening, 342 of whom accepted referral. Furthermore, 176 were referred from GPs. Only 402 of 518 fallers attended the clinic. A total of 65 dropped out by their own request, 29 stopped because they became seriously ill or died. Another62 patients were discharged before fulfilling the programme as they were unable to participate due to physical or cognitive problems. Indicators of cessation were cognitive or physical weakness.

CONCLUSIONS: Geriatric fall prevention is resource-consuming both in terms of staff needed and with respect to demands made on the patients, and the frailest part of the fall population cannot comply. It is necessary to differentiate fall prevention services for the population of elderly fallers as interventions in primary healthcare have been shown to be more effective among the most frail elderly fallers.

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Fall is a major problem in the elderly. One in three persons aged 65 years or more falls at least once a year, and falls are associated with increased mortality, morbidity, disability and loss of independence and thus have substantial socio-economic consequences [1]. As the proportion of elderly in the population is increasing, it is important to prevent falls to limit the associated burden and healthcare demand associated with falls.

The reasons for falling are varied. Some falls are accidental and occur even in old people without any balance problems. However, most falls in the elderly are caused by diseases that affect the ability to control balance or they are due to disturbances in heart rhythm or blood pressure. Thus, recurrent falls have a disease-related aetiology. Geriatric fall prevention based on comprehensive geriatric assessment supplemented with evaluation of underlying internal risk factors for falling followed by interventions targeting identified modifiable risk factors have proved effective in reducing the risk of falling in many studies [2, 3]. The participants in these studies have been cognitively intact. Geriatric fall prevention in elderly with dementia has not been shown to reduce the risk of falls [4]. Patients with severe dementia, patients with abuse of alcohol or medicine and weakened elderly people with terminal disease need other supportive actions [5, 6].

It is well documented that falls may be prevented [7]. Most interventions require a physical effort of the patient, e. g. strength or balance exercises, and require sufficient cognitive resources to understand or follow fall preventive advice. Therefore, the interventions that have proven effective in elderly living in the community are different from the interventions that are effective in frail nursing home residents [8]. Frail elderly people with severe medical or cognitive diseases need more indirect and supportive interventions. Several studies have shown an effect of intervention programmes comprising staff education, environmental adaptions and mild exercises, including exercises linked to functional lifestyle tasks such as safe transfer, which normally takes place in the context of home care service [9, 10].

To identify elderly at risk of falling, the Danish Health and Medicines Authority (DHMA) recommends systematic screening of 65+-year-old fallers visiting the emergency department. According to these recommendations, an elderly faller should be offered fall assessment if he/she answers “yes” to one or more of four questions about gait or balance problems, further falls within the past year, dizziness or possible syncope [11]. This assessment can be performed at a hospital, e.g. in a geriatric fall and syncope clinic, or in primary healthcare, e.g. by the patient’s general practitioner (GP) or by home care nurses. Guidelines [12] are in place on geriat-

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Medical Department C, Gentofte Hospital, Denmark

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ric fall assessment, and guidelines on fall prevention are currently being introduced in home care [13].

The effectiveness in reducing the risk of falling depends on uptake and adherence. Refusal to participate in fall prevention programmes, dropouts and low adherence to exercise or recommendations have frequently been reported [14]. There are various reasons for this, e.g. denial of falling risk and practical or psychological barriers [15].

We have previously described the result of screening for fall risk performed in four settings where health staff meets elderly fallers; emergency department for outpatients (ED-out), emergency department for inpatients, home care service (HCS) and preventive home visits. The screening was carried out according to the recommendation from the DHMA in order to identify elderly at risk of falling. Of 2016 persons aged 65+ years who were screened, 1,276 needed fall preventive actions. Of these, 811 met the study criteria. Inversely, 465 with dementia, abuse or terminal diseases needed other supportive actions offered by caregivers in primary healthcare.

The purpose of this study was to describe the rate of participation, the dropout rate and the prevalence of simple markers for physical and cognitive performance in dropouts and completers of the intervention.

MATERIALS

The screening and the results are described in detail elsewhere [16]. The screening was performed in the four settings using a structured questionnaire with information about general health and co-morbidity. If necessary, survey answers were supplemented with information from available records. If the patient was at risk of falling, (s)he was offered referral to a fall and syncope clinic. The exclusion criteria were dementia, abuse, terminaldisease or living in a nursing home. It was noted whether the patient accepted referral or refused the offer and the reason why. All who accepted referral were given an appointment in the clinic. Those who did not turn up for the examination were contacted to establish the cause of their non-attendance and to offer a new appointment.

In total, the study population consisted of 987 elderly persons; 811 elderly identified by screening and 176 elderly referred to the fall clinic by GPs or hospital doctors. Patients were assessed by a doctor, a nurse and a physiotherapist. The examination programme consisted of a thorough geriatric fall assessment including assessment of vision, somatosensoric and vestibular function, neurological and medical assessment, electrocardiography and laboratory screening and if necessary further investigations, e. g. event recording or tilt table, were planned. Physical, cognitive and self-care resources were evaluated by the 30-second chair stand test, Timed Up and Go, number of co-morbidities, Mini Mental State Examination, body mass index, the five-item geriatrics depression scale and by number of home care services.

Based on the findings, appropriate interventions were initiated. In addition to medical or other relevant treatment, the participants took part in exercise classes supervised by physiotherapists. Exercise classes were implemented in combination with an individualised home exercise programme. It was noted if the whole programme (assessment and intervention) was completed, and any reasons why this was not the case were noted when applicable. In case patients were discharged before completion of the planned intervention services,

FIGURE 1

Recruitment profile and reason for refusal of referral to the fall clinic. A total of 811 elderly identified by screening to be at risk of falling due to screening. Referring entities are emergency department for outpatients (ED-out), emergency department for inpatients (ED-in), home care service (HCS) and preventive home visits (PHV).

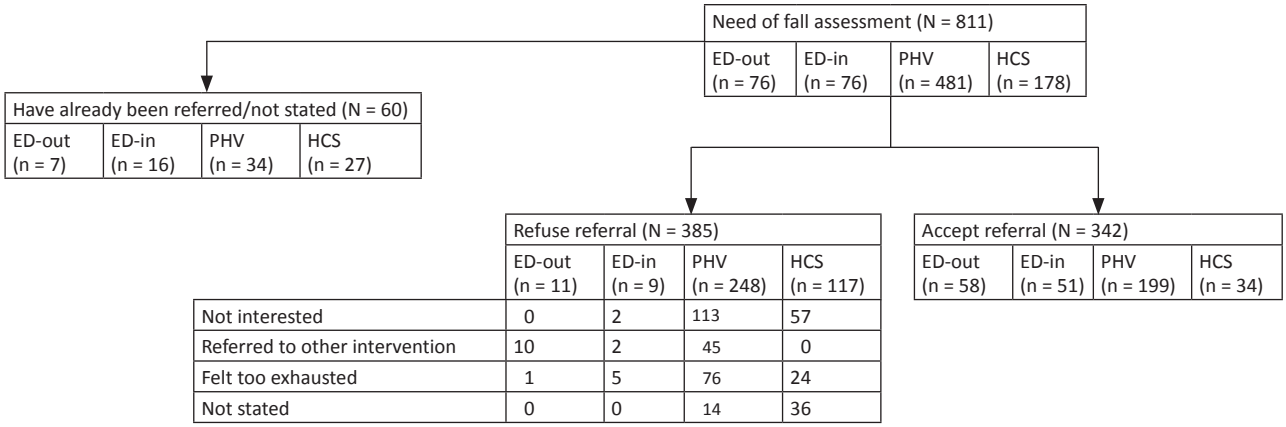

TABLE 1

	ED-out	ED-in	PHV	HCS	GP	Dept
Accepted referral, n	58	51	199	34	122	54
Gave attendance in fall clinic, n	39	25	167	18	112	41
Accepted referral to fall clinic, %	67	49	84	53	92	76
Needed fall assessment, %	51	33	35	10	-	-
Early dropout, n	19	26	32	16	10	13
Reason for non-attendance, n:						
Not interested	6	10	16	5	4	6
Felt too exhausted	6	6	7	3	2	2
Died	4	5	3	0	0	0
Referred to another entity	3	5	6	8	4	5
Late dropout, n	14	8	40	11	24	16
Attended, %	36	32	24	61	23	40
Reason, n:						
Belonged to exclusion group	2	1	4	2	4	3
Did not want to proceed	7	1	16	3	6	7
Felt too exhausted	1	3	9	3	5	4
Died	2	0	4	1	2	1
Became ill or moved	2	2	6	2	6	1
Lost …	0	1	1	0	1	0
Discharged before end of intervention and referred to a more suitable site, n	1	6	31	1	14	9
Completes the programme, n	24	11	96	6	74	16
Attended, %	62	44	57	33	66	39
Accepted, %	41	22	18	18	61	30

Attendance in the fall clinic after accepted referral and reason for early and late dropout in 518 elderly people referred from emergency department for outpatients (ED-out), emergency department for inpatients (ED-in), preventive home visits (PHV) and home care service (HCS), general practitioners (GP) and other hospital departments (dept).

primary healthcare was contacted to remedy the patient's problems. The study was conducted in the period from October 2006 to October 2009.

Data processing and statistics. The material was typed anonymously and analysed in SPSS. The statistical tests used were chi-squared, Mann-Whitney and logistic regression.

Trail registration: not relevant.

RESULTS

Acceptance and refusal of referral to assessment in the fall clinic

Of the 811 elderly who needed fall assessment, 342 (42%) accepted the offer (**Figure 1**). There were large differences in the degree of acceptance among elderly from each of the various screening settings. While 76% of the elderly fallers identified in ED-Out accepted, only 41% and 19% in the PVH and HCS, respectively, did ($p < 0.0001$). The mean refusal rate was 47%. Acceptance was highest in the HCS population (66%) and lowest in ED (14%). The most frequent reason for refusal was that the elderly persons felt that the referral was irrelevant, and almost one third stated that they did not have the energy to undergo examinations. Persons accepting referral were younger (mean 82.6 years) than persons who refused (mean 85.4 years) ($p < 0.000$)

Attendance to the fall clinic after referral

A total of 518 fallers were referred to the fall clinic, including 342 from the four settings and 176 from GPs and hospital departments. Only 402 (78%) attended the clinic, ranging from 92% of elderly referred from GPs to 49% from ED-Ward ($p < 0.0001$). The reasons for early dropout appear from **Table 1**. A total of 47 (40%) were not interested despite acceptance, 26 (22%) felt too exhausted and 31 (27%) had been referred to another entity in the meantime. Persons who attended the fall clinic were younger (81.2 years) than dropouts (83.9 years), $p < 0.000$.

Completion of the programme

In all, 113 of the 402 who attended the fall clinic did not complete the programme, including 65 patients who dropped out by their own request either because they did not want to proceed or because they felt too exhausted (Table 1). Another 62 patients were unable to participate in the exercise programme due to physical problems or problems understanding and complying with instructions, and they were referred to a more suitable intervention/care. Patients completing the programme were younger (80.5 years) than dropouts and those who were discharged from the exercise programme. The oldest group was the one with patients who dropped out because they felt too exhausted (83.7 years), $p < 0.000$.

TABLE 2

Differences in indicators of physical or cognitive impairment and need of help in daily living in completers and non-completers of the intervention programme[a]. The values are n (%).

	1) Dropped out "Feel too exhausted"	2) Dropped out "Do not want to proceed"	3) Discharged before end of programme	4) Died, became ill or moved to nursing home	5) Completed the whole programme	p-value[b]	p-value[c]
Underweight						0.086	0.04*
BMI < 21 kg/m²	8 (33)	4 (10)	11 (18)	3 (11)	22 (10)		
BMI ≥ 21 kg/m²	16 (67)	35 (90)	51 (82)	25 (89)	205 (90)		
Chair stand 30 sec.						0.644	0.000*
Norm or better	4 (27)	9 (35)	16 (29)	3 (18)	112 (51)		
Under norm	5 (33)	5 (19)	20 (36)	8 (47)	79 (36)		
Not able without using arms	6 (40)	12 (46)	20 (36)	6 (35)	27 (12)		
Timed Up and Go						0.248	0.000*
≤ 15 sec.	3 (20)	14 (50)	19 (35)	5 (33)	132 (62)		
> 15 sec.	12 (80)	14 (50)	36 (66)	10 (67)	80 (38)		
Mini Mental State Examination						0.265	0.000*
≥ 28 points	9 (38)	25 (64)	27 (44)	15 (54)	173 (77)		
26-27 points	8 (33)	6 (15)	13 (21)	7 (25)	34 (15)		
< 26 points	7 (29)	8 (21)	22 (36)	6 (21)	18 (8)		
Home care service						0.285	0.000*
No help	1 (4)	4 (10)	4 (7)	1 (4)	64 (28)		
Only practical help	16 (67)	31 (80)	38 (62)	18 (64)	137 (60)		
Help with personal hygiene	7 (29)	4 (10)	19 (31)	9 (32)	26 (12)		

BMI = body mass index.
*) Statistically significant difference.
a) Excluded were persons who where lost (n = 3) or did not meet inclusion criteria (n = 19).
b) Difference between the 4 dropout groups (groups 1-4).
c) Difference between completers (group 5) and the dropouts (groups 1- 4).

TABLE 3

Predictors for not completing the intervention programme, OR (95% CI), logistic regression.

	OR (95% CI)	p-value
Constant	0.069 (–)	0.000
Assistance from home care		
No help	1 (–)	0.020
Practical help	3.2 (1.4-7.6)	0.007
Personal hygiene	3.7 (1.3-10.5)	0.013
Mini Mental State Examination		
28-30 points	1 (–)	0.000
26-27 points	2.2 (1.2-4.3)	0.023
≤ 25 points	3.9 (1.9-8.0)	0.000
Chair stand		
Norm or better	1 (–)	0.000
Under norm	1.5 (0.8-2.7)	0.206
Not able without using arms	4.5 (2.3-8.9)	0.000
BMI < 21 kg/m²	–	0.132
Referral site	–	0.868
Age	–	0.480

The overall probability for not completing the intervention programme is given by the formula: $p = r/(1 + r)$, with the absolute odds for not completing: $r = r_0 \times r_1 \times r_2 \times \ldots \times r_n$.
r_0 is the constant and r1-rn are the odds ratio for the different classes in the explanatory variables. Thus the probability of not completing the program for a person with no home care, normal MMSE and normal chair stand is 6% according to the formula:

$$\frac{0.069 \times 1 \times 1 \times 1}{1 + (0.069 \times 1 \times 1 \times 1)}$$

The probability of not completing the program for a person who needs help to personal hygiene, MMSE under 25 and not able to rise from a chair without using arms are 82%:

$$\frac{0.069 \times 3.7 \times 3.9 \times 4.5}{1 + (0.069 \times 3.7 \times 3.9 \times 4.5)}$$

BMI = body mass index; CI = confidence interval; OR = odds ratio.

Patients referred from GPs (66%) and ED-out (62%) had the highest level of completion, whereas more than half of those referred from HCS dropped out, died, became seriously ill or moved ($p < 0.031$). Of the 811 who were offered referral to the fall clinic after screening, only 137 (17%) completed the programme. From HCS, only 3% completed.

Differences in indicators of physical, cognitive and self-care resources between those who completed the entire programme and various groups that did not.

There was no difference between the groups with regard to the number of co-morbidities and signs of depression. Significant factors are shown in **Table 2**. Patients who dropped out differed on all items from those who completed the programme by being physically and cognitively weaker and by needing more help. There were no differences between the dropout groups except that underweight occurred more frequently among those who dropped out because they felt too exhausted. The indicators were unevenly distributed in the different referring entities, and logistic regression showed that the cognitive and physical indicators were of significant importance, while the referring entity and age had no impact (**Table 3**).

DISCUSSION

The present study describes the level of acceptance and implementation of a geriatric fall assessment and intervention programme for older people identified as being in need of fall prevention either by screening for fall risk in different settings or because they were referred by GPs or hospital doctors.

The study shows large differences in the rate of acceptance of patients from different referring units. The rate of acceptance was lowest in HCS, which includes many frail patients with a low level of self-care. Also, the rate of early dropout and frail elderly who could not comply was highest in the HCS and ED-out. The participation rate was low as only 50% of the invited elderly accepted. Because only 36% were included, we only have detailed knowledge of less than one third of those who were at risk of falling according to the screening.

In many studies in which elderly have been offered hospital-based fall assessment, the rate of participation has been low, under 50% [2, 3, 17]. The exclusion criteria were largely the same as in the present study, and the exclusion rates were also comparable to ours. In one study, 82% accepted an offer of a home visit from a municipal fall consultant after screening in the ED, but this study had no exclusion criteria and the participants had a high occurrence of frailty indicators [18]. A possible explanation for the higher rate of acceptance in our group of frail elderly may be that it is easier for this group to accept a home visit. It is shown that practical problems such as transportation have an impact on participation and many prefer a home-based training program to group-based training [15, 17].

Although known barriers to attendance in frail patients were countered, e. g. by offering transport to both the patient and to family members, close to 30% did not complete the programme; 14% terminated because they could not find the energy, died or became ill; and another 15% were unable to finish focused training due to physical or cognitive reasons. There were large differences in completion rates among the various referring units, but a detailed analysis demonstrated that the dominant indicators for non-completion were physical or cognitive weakness. In relation to completion of training programmes, several studies have indicated that lack of physical energy has an impact and that the highest rates of completion were found in individuals who were more fit and more physically active at baseline [19].

Those who refused the offer of referral justified it with a lack of interest or energy, much in line with those who dropped out from the programme. As physical and cognitive impairment were indicators of dropout, it is possible that physical and cognitive weakening plays an important role in refusal of geriatric fall assessment. Patients referred from their GP have the lowest share of early dropout and the highest completion rate. This may be explained by the GP's knowledge of their patients.

Screening for fall risk is quick and can ensure early implementation of relevant initiatives and thereby reduce the risk of new falls. Although recommended by the DHMA, screening is done only sporadically [18], and it is worrisome that admissions for elderly due to fractures have increased continuously over the past six years [20], an increase that exceeds what than can be expected from the increase in the number of elderly people.

This study shows that geriatric fall assessment in conjunction with screening for fall risk is not appropriate. Geriatric fall assessment is resource-consuming, it drains staff resources and entails high demands on patients, and is relevant only to a limited part of the fall population. Of 811 who were in need of fall assessment according to the survey, only 137 (17%) completed the geriatric programme. The main reason explaining dropout was cognitive or physical weakness. This study identifies a considerable need for fall prevention offers tailored to the large group of frail fall patients who have a low level of self-care. In conclusion, we need a systematic and differentiated fall prevention programme to cover the whole range of fallers.

CORRESPONDENCE: *Marianne Kirchhoff.* E-mail: d171778@dadlnet.dk
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LITERATURE

1. Alexander BH, Rivara FP, Wolf ME. The cost and frequency of hospitalisation for fall related injuries in older aldults. Am J Public Health 1992;82:1020-3.
2. Close J, Ellis M, Hooper R et al. Patients with recurrent falls attending Accident & Emergency benefit from multifactorial intervention. A randomized controlled trial. Lancet 1999;353:93-7.
3. Davison J, Bond J, Dawson P et al. Patients with recurrent falls attending Accident & Emergency benefit from multifactorial intervention – a randomised controlled trial. Age Ageing 2005;34:162-8.
4. Shaw FE, Bond J, Richardson DA et al. Multifactorial intervention after a fall in older people with cognitive impairment and dementia presenting to the accident and emergency department: randomised controlled trial. BMJ 2003;326:73.
5. Faes MC, Reelick MF, Melis RJ et al. Multifactorial fall prevention for pairs of frail community-dwelling older fallers and their informal caregivers: a dead end for complex interventions in the frailest fallers. J Am Med Dir Assoc 2011;12:451-8.
6. Bunn F, Dickinson A, Simpson C et al. Preventing falls among older people with mental health problems: a systematic review. BMC Nurs 2014;13:4.
7. Gillespie LD, Robertson MC, Gillespie WJ et al. Interventions for preventing falls in older people living in the community. Cochrane Database Syst Rev 2012;9:CD007146.
8. Cameron ID, Gillespie LD, Robertson MC et al. Interventions for preventing falls in older people in care facilities and hospitals. Cochrane Database Syst Rev 2012;12: CD005465.
9. Dyer CA, Taylor GJ, Reed M et al. Falls prevention in residential care homes: a randomised controlled trial. Age Ageing 2004;33:596-602.
10. Becker C, Kron M, Lindemann U. Effectiveness of a multifaceted intervention on falls in nursing home residents. J Am Geriatr Soc 2003;51:306-13.
11. The fall patient in clinical practice. www.sst.dk (17 Nov 2015).
12. Guideline for the prevention of falls in older persons. American Geriatrics Society, British Geriatrics Society and American Academy of Orthopaedic Surgeons Panel on fall prevention. JAGS 2001;49:664-72.
13. www.patientsikkerhed.dk/projekter-og-redskaber/projekter/i-sikre-haender.aspx (17 Nov 2015).
14. Nyman SR, Victor CR. Older people's participation in and engagement with falls prevention interventions in community settings: an augment to the Cochrane systematic review. Age Ageing 2012;41:16-23.
15. Yardley L, Bishop FL, Beyer N et al. Older people's views of falls-prevention interventions in six European countries. Gerontol 2006;46:650-60.
16. Kirchhoff M, Melin A. Screening for fall risk in the elderly in the capital region of Copenhagen: the need for fall assessment exceeds the present capacity. Dan Med Bull 2011;58(10):A4324.
17. Vind AB, Andersen HE, Pedersen KD et al. An outpatient multifactorial falls prevention intervention does not reduce falls in high-risk elderly Danes. J Am Geriatr Soc 2009;57:971-7.
18. www.regionh.dk/menu/sundhedOghospitaler/Politikker+planer+og+strategier/DenAeldreMedicinskePatient.htm (11 Jan 2015).
19. Martin KA, Sinden AR. Who will stay and who will go? A review of older adults adherence to randomized controlled trial of exercise. J Aging Phys Act 2001:9;91-114.
20. www.statistikbanken.dk/statbank5a/default.asp?w=1680 (17 Nov 2015).