

2014

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Recommended Citation

Marks, Ray, "Falls Among the Elderly: Multi-factorial Community-based Falls- Prevention Programs" (2014). *CUNY Academic Works*.
https://academicworks.cuny.edu/yc_pubs/236

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Falls Among the Elderly: Multi-factorial Community-based Falls-Prevention Programs

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Owing to their widespread occurrence, deleterious impacts and consequences, falls injuries continue to present a major public health challenge in the context of the older individual, worldwide [1]. In the United States (U.S.) for example, it is estimated that about one in three adults over age 65 will experience a fall each year [2,3], and that among those who survive, up to 30% of cases will suffer moderate to severe injuries that commonly reduce mobility and independence. Moreover, about 42% of cases will warrant hospital admissions, and approximately 50% of home based fall injuries will result in a hospital discharge to a nursing home [2]. Additional falls-related complications that contribute to high disability levels include hip fractures, joint dislocations, and joint injuries other than dislocations, brain injuries, lacerations, internal injuries, dehydration, muscle wasting, and pressure sores due to "long lie times." Other complications include fear of falling and dependence [4-6], all of which result in enormous physical, social, and morbidity costs [7].

The identification and treatment of risk factors for falls other than age is thus of considerable import and among the factors identified as amenable to intervention are a vast array of factors including visual impairments, inappropriate eyewear usage [8], psychoactive medication over use [9], prevailing difficulties with gait and balance [10,11], comorbid conditions and being underweight [12] or overweight with severe polyneuropathy [13]. In addition, environmental factors such as slippery surfaces, uneven floors, poor lighting, loose rugs, unstable furniture items, and a variety of obstacles and objects on floors may pose further risks to falling and incurring a serious injury [13,14]. Other documented risk factors for falls include physical frailty, physical inactivity, alcohol misuse, cognitive and sensory impairments [15]; poor health and functional status [16]; recent adverse life events [17]; and individual behavioral factors such as risk taking [18]. The failure to seek appropriate assistance from health care professionals and to employ prescribed preventive strategies [19] coupled with the lack of targeted preventive and treatment services and other community resources are socioeconomic risk factors [20] that may also influence the risk of falls.

Based on an understanding of the risk factors for falling, documented strategies to reduce such potentially modifiable risk factors include physical activity programs to improve strength [21], balance and coordination [22], supervision to minimize the use of psychoactive medications [23], interventions that maximize control of comorbid conditions [23], and environmental assessments and modifications [24]. Others include the use of hip protectors [12], as well as specific shoe types and dietary amendments and supplementation [25].

This editorial discusses relevant public health research literature on falls prevention efforts among community-dwelling older adults that might assist in efforts to reduce mobility problems that arise due to falls among the elderly. Since many falls that lead to injury occur in the community, this review specifically examines some primary prevention strategies that have been implemented to prevent or reduce community-based falls injuries among the elderly, in particular. To gain some insight into what can be done to reduce the burden of falls injuries

among community-dwelling older adults evidence-based implications for health promotion practices and policy to reduce the burden of falls injuries located in the ACADEMIC PREMIER COMPLETE, CINAHL, COCHRANE, EMBASE, HEALTH SOURCE: NURSING/ACADEMIC EDITION, MEDLINE, and PUBMED, SOCSCIENCE INDEX computerized databases were accessed. The research literature review focused on falls epidemiology, injury mechanisms, and falls-prevention strategies published in the English language as full reports during between 1996-2014 using key words: community, elderly, falls injuries, hip fracture, multifactorial interventions, and prevention. In terms of interventions examined, only prospective multi-faceted falls-prevention programs related to community-dwelling elders were considered. Excluded were interventions that took place in nursing homes and those that were not multi-faceted.

The literature search revealed more than 15 meta-analyses examining multi-faceted interventions for preventing falls in the elderly community dweller. We also identified 25 published reports on community-based efforts to reduce the risk of falls using multi-factorial approaches.

Of these, 17 were conducted in countries other than the United States including:

- Australia (n=3)
- Canada (n=2)
- Finland (1)
- France (n=1)
- Germany (n=1)
- Holland (n=1)
- Japan (n=1)
- New Zealand (n=3)
- Scotland (n=1)
- Spain (n=2)
- Taiwan (1)

Of the many meta-analyses specifically related to falls-related prevention programs, the most comprehensive review was conducted

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Received January 28, 2014; **Accepted** January 29, 2014; **Published** February 02, 2014

Citation: Marks R (2014) Falls Among the Elderly: Multi-factorial Community-based Falls-Prevention Programs. *Aging Sci* 2: e109. doi: [10.4172/2329-8847.1000e109](https://doi.org/10.4172/2329-8847.1000e109)

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by Gillespie et al. [25]. Gillespie and his colleagues examined the efficacy of 159 trials of interventions designed to minimize risk factors for falls among the community-dwelling, including the institutionalized and hospitalized elderly. The main outcome of interest across studies was the number of falls. The data from this meta-analysis revealed weak evidence for the effectiveness of multifactorial interventions in preventing falls risk. The authors noted that providers contemplating implementation of falls-prevention programs the benefits of group and home-based exercise programs, and home safety interventions, plus Tai Chi. a summary of the key findings from controlled multifactorial studies is shown in Table1.

As outlined in Table 1, which provides a snapshot of various interventions over time designed to abate falls injuries in the community, there are many diverse approaches and samples that have been studied, along with varied durations, but no universal consensus on their efficacy. In light of the challenges of conducting these studies, and of offering the same intervention to individuals with differing risk factors, and that multiple diverse risk factors are implicated in any falls injury, it seems that individually tailored multifactorial falls intervention

programs rather than group activities involving the same paradigm are strongly indicated. To this end, and in light of the growing proportion of elderly people worldwide, and the likelihood of falls injuries among this group, it appears that health promotion policies that both permit and actively facilitate community health agencies and related medical personnel to more adequately define and identify community-dwelling individuals at high risk for falls, and to intervene on the basis of these specific findings is clearly indicated. Providing support for community-wide implementation by well-trained personnel both for purposes of specific evaluative and screening programs for identifying individuals at risk, as well as for intervening to ameliorate salient risk factors through well-organized and managed health screening centers is also highly critical to community based falls prevention efforts.

Moreover, even though there is mounting evidence that assessments of home environmental risk factors and their remediation can abate the incidence and magnitude of falls injuries [26], this approach alone may not be universally helpful, nor may it be warranted for all potential fallers. As well, given that a high percentage of falls occur outside of the home, those environmental risk factors that are highly significant

Authors	Country	Sample	Intervention	Outcome
Hornbrook et al. [32]	United States	N=1611-E N=1571-C	Removal home hazards, reducing risk taking behaviors, improving physical fitness	At 1 year odds of being a faller were less in E group
Tinetti et al. [14]	United States	301 community dwelling men and women aged 70 years N=153-E N=148-C	Home visits, exercises, medication adjustments, behavioral instructions	At 1 year there was a significant reduction in the proportion of fallers in the E group plus falls risk factors
Wagner et al. [33]	United States	1559 seniors	Nurse assessment, nurse visit, interventions targeting risk factors	The intervention had lower falls incidence than controls
Conroy et al. [34]	Great Britain	172 E and 172 C subjects mean age 79 years with a median of 3 falls risk factors	Day hospital multifactorial program of strength and balance training, medical review, home hazard assessment	Falls rate over 12 months in E group was 1.7, and 2.0 in control group, a 27% improvement in the E group, compared to the C group
Markle-Reid et al. [35]	Canada	A randomized controlled 6 month study of 92 home care adults 75 years and older, baseline fall rate of 72% in six Months	Both groups received standard home care services, the E group also received visits by a specialized team at least once a month for 6 months and a tailored care program	Self-reported falls were similar in both groups at six months. Subgroup analyses showed intervention was effective for men. Improvements in slips and trip rates were noted.
Moore et al. [36]	United States	Primary care patients of a geriatric clinic in a public hospital in community setting, 43 adults aged 65 and older-E subjects; and 86 age, gender, race matched controls	Falls Prevention Clinic visitors were prescribed different interventions and controls received standard intervention	Percentage experiencing falls in follow up period was comparable in both groups, but rate of injurious falls may have been reduced.
Lee et al. [37]	Taiwan	616 community dwelling elders who had fallen in the past year or at risk for falling were studied	Eligible subjects were randomly assigned to an intervention or control group; the intervention group received a 3month multifactorial intervention program including exercise, health education, home hazards evaluation and modification, medical and ophthalmic reviews. The control group received written materials and recommendations	The 1 year fall incidence was 25% in the intervention group and 27% in the control group. The intervention group improved more favorably overall on falls related indices. It was concluded that the program improved functional performance at 3 months, but did not reduce falls at 1 year
Perula et al. [38]	Spain	404 elders 70 years or older were studied	Eligible subjects were randomized to an intervention or control group; the intervention group received advice, exercise, and home visits, the control group received brief advice and a pamphlet	Around 33% in the intervention group and 30% in the control group had had a fall the previous year after 12 months the rate was approximately 17% in the intervention group and 23% in the control group; incidence of falls at home was 27 in the intervention group and 49% in the control group However, the multifactorial intervention was no more effective than the brief intervention as regards overall falls risk
Palvanen et al. [39]	Finland	Home-dwelling elders 70 years or older attended a falls clinic between January 2005 and June 2009; 1314 high risk fallers randomized into the intervention group or the control group completed a 12-month program	The multifactorial program focused on exercise, balance training, medical review and referrals, medication review, nutrition, and home hazard assessments and modifications in the intervention group	At a 1 year follow up there were 608 falls in the intervention group and 825 in the control group. It was concluded the program was effective

E=experimental group; C=control group

Table 1: Summary of selected multifaceted community-based falls prevention programs showing highly diverse inputs and outputs across time.

to predisposing the elderly to falls in the community should also be assessed and targeted for abatement where feasible.

In addition since individuals in poor health are at higher risk for falling, individualized assessments that include an array of screening exams followed by salient intervention strategies directed towards enhancing their nutritional, physical and mental status, as well as their vision and walking patterns and balance may be helpful. As well, other forms of intervention designed to reduce potentially modifiable falls risk factors, are the use of adequate indoor and outdoor lighting, appropriate footwear or stability devices, supplemented by education that reduces fear of falling and risk reduction behaviors.

This review focused on falls in the community because research shows that although falls-prevention programs in nursing homes have been reasonably well developed in recent years, it is the vigorous, healthy and non-institutionalized elderly person living in the community that may be at a greater risk of incurring more serious injuries than nursing home residents, who typically have poor functional status due to the potentially greater impact of falling [14]. Given that approximately half of the community-dwelling population older than 85 years of age will fall each year [15], the specific needs of this group should therefore not be overlooked. Furthermore, although fewer people below age 85 living in the community appear to be falling each year, with only a relatively small proportion of fallers experiencing multiple falls, the psychological consequences of falling and injuring oneself should not be underestimated because falling can markedly reduce one's self-confidence, the threshold for future injury, survivorship, and morale [27], and can severely limit activities and independence among the elderly [14].

To this end, partnerships between different players in the healthcare system are desirable along with policy changes that minimize the presence of environmental hazards associated with falls. Moreover, making investments in training community-based personnel to implement recommended screening approaches and treatment pathways as well as risk reducing strategies that have been identified as best practices is recommended. These strategies should include tailored falls-related health education, counseling, physical activity, and group activities and other forms of intervention that have the potential to reduce individual-level risk of falling. In addition, the necessary equipment and environmental modifications both in and outside of the home and that constitute system-level changes must be forthcoming.

Finally, to reduce falls among community-dwelling elderly, adequate funding support to build community capacity to address the problem of falls and for evaluating compliance with prescribed therapeutic regimens, is warranted. Moreover, legislation to optimize safety and falls prevention in existing and new facilities that house or serve the older person, and providing adequate medical coverage, plus funding for counseling to overcome the fear of falling, promoting exercise programs to improve strength and balance, and providing public financial support to subsidize desirable indoor environmental modifications must be forthcoming.

Because more than a million people suffer from a slip, trip, or falling injury each year, and falls have come to be recognized as a major threat to the safety, health and independence of elderly persons, media and political advocacy campaigns to broaden the public's understanding of the impact of falls and how to prevent these should also be a high priority.

Such efforts can yield more efficient use of limited societal resources, reduce morbidity and mortality rates attributable to falls among

community-dwelling elderly at high risk for falling, improve functional status and promote independent living, while reducing societal costs.

As outlined in the literature and Table 1, program components that have some empirical support include:

- A comprehensive multifactorial risk assessment
 - An individualized treatment plan
 - A comprehensive multifactorial management plan
 - Anti-slip shoe devices and multifaceted podiatry to patients with specific foot
 - First eye cataract surgery and pacemakers in patients with cardio-inhibitory carotid sinus hypersensitivity [28]
 - Exercise, muscle strength training, endurance building exercises, balance training
 - Education
 - Home safety inspection and home modifications
 - Vitamin D supplementation
 - Withdrawal of psychotropic medications
- Individuals who should be specifically targeted are-
- Those with mobility problems
 - Those with co morbid conditions or multiple pathologies
 - Previous fallers
 - Adults older than 80 years of age
 - Those who are depressed or have dementia
 - Those with impaired vision
 - Those who are weak and frail
 - Those taking diuretics, sedatives, narcotics, psychotropic, antihypertensive drugs
 - Potential improvements include physical, mental, and financial

In sum, due to the devastating impact of falls injuries, there is a strong need in the aging society to make societal investments in those falls prevention strategies shown to be efficacious in the community such as those advocated by Michael et al., Karlsson et al. and Robertson and Gillespie [28-30]. However, at present there is a discrepancy between what is desirable, and what efforts are in place to deal with this enormous burgeoning public health challenge. Implementing the results of research also constitutes an enormous challenge, because samples in need may not be similar to those studied in controlled venues. Hence resources are also urgently needed to enable researchers not only to conduct well controlled studies that can be better generalized than is presently the case, but to test novel paradigms perhaps, including case studies, and single case prospective studies. Attention to all the methodological issues raised by Balzer et al. [31] and more inclusive interventions in large group studies, for example more emphasis on vision and nutrition issues, is also strongly indicated in this regard.

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