

Attaining a 64% Reduction in Fall-Caused Hospitalizations among Community Resident Elders: Two Multifactorial Studies

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Abstract Objective: The purpose of the studies reported here is: 1.) to evaluate the effectiveness of a multifactorial, socio-medical fall prevention program among 1,894 community-resident elders in Philadelphia; 2.) to present the data from a replicative study among 1,053 identically selected and identically treated elders. Methods: In study #1, a random sample of Medicaid-eligible seniors, geographically representative of Philadelphia County's dual-eligible, was selected using a geographic density procedure by zip code. Subjects participated in informational workshops, non-invasive somatic fall risk factor analysis, HIPPA compliant sharing of risk reports with physicians and pharmacists, in-home environmental fall risk analysis, pre- and post-fall counseling, and periodic safety grams. The treatment group was compared with two (2) large scale control groups for: a.) reduced hospitalizations for all injurious falls; and 2b) reduced hospitalization for fall-caused fractures. In study #2, 1,054 community-resident elders were selected via similar procedures and accorded to identical arrays of interventions. Results: In study #1, using Medicaid claims data, the treatment group was shown to have significantly fewer instances of healthcare utilization due to injurious falls compared to the control groups ($p < 0.05$): hospitalizations for fractures were 55% lower and hospitalizations for all fall-caused injuries were 65% lower. In study #2, participants who accepted all offered interventions were 400% less likely to suffer a self-reported fall than were non-participants. Conclusions: Multi-disciplinary, socio-medical fall prevention programs for community-resident elders can significantly reduce healthcare utilization due to injurious falls.

Keywords: *elderly falling, economic benefit, fall prevention*

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1. Introduction

Geriatric fall injuries are a large, serious, costly and deadly public health crisis in America. Using data from CDS, WISQARS, HCUP and from recent professional literature, the following annual fall outcomes are documented nationally: [1-10]

- 15+ million U.S. residents 65 or older suffer a fall,
- Up to 9 million suffer medically attended falls,
- 2.5 million of these elders are treated/seen in U.S. Emergency Departments (EDs),
- 730,000 elders are hospitalized from the EDs,
- 400,000 + elders are institutionalized in rehab facilities and/or nursing homes,
- 25,000 elders die of these fall injuries.

These numbers are skyrocketing. From 2001 to 2013, while the number of persons aged 65+ increased by 27% in America:

ED visits for fall related causes rose by 52% for elders;

Hospitalization for fall injuries, after being seen in the ED, waxed by 93% among elders;

Hospitalizations for all geriatric fall injuries went up by 102% to 116%;

Deaths due to falls rose by 119% among elders;

Direct costs of care for fall injuries, as documented by CDC, rose from \$19B to \$34+B. [1,3,4,6,7,8]

Falls among elders are now the leading cause of injury ED visits, the leading cause of injury hospitalizations, a leading cause of hospital readmissions, the leading cause of hospitalizations from nursing homes; and a major cause of nursing home admissions. [8]

Falls among older residents are preventable. [2,3,9] For example, a study published in the June 2015 issue of *Health Affairs* showed that multifactorial interventions were associated with a reduction in fall-caused injuries of 13% and with a reported reduction in long-term care utilization of about 33%, over 3 years. [10]

Here we evaluate a multifactorial set of 10 interventions (SAFE: Stopping Accidental Falls Among Elders), which obtained a 54% reduction in fall-caused hospitalizations among the treatment groups compared to a series of

control groups. The SAFE program was associated with a 64% reduction in fall-caused hospitalizations in the treatment groups compared to control groups.

2. Methodology

A randomized experimental trial was used to assess program outcomes. Three arms were created to test the intervention's efficacy—a treatment group and two control groups. Comparisons were made at baseline and at 6-months.

Sampling

Using a geographic density sampling procedure, 1,894 subjects were recruited for the experimental Group. In geographic density sampling, addresses of Medicaid-eligible elders were selected at random by zip codes. Persons were then recruited to participate proportionality to the zip code density of eligible participants.

The control group had two arms. First, a proportionate mirror control group—defined operationally as a group of 44,034 Medicaid elders whose pre-program falls, injuries and healthcare utilization to Pennsylvania Medicaid exactly matched the total Medicaid elder population of Philadelphia County was created. To look at changes at six months a random sample of 1,019 Medicaid elders not participating in but eligible for the program was selected. This group was created via a computer-generated random start and a standardized “skip” interval.

Intervention

The Safe Program (Safety and Fall Efficacy) intervention consisted of two components.

1. Face-to-Face Quantitative Fall Risk Assessment
 - a. Balance was measured by use of computerized, dynamic posturographic analyzer—a force plate inflatable to different levels of flexibility/rigidity permitting observation on an eyes open/eyes closed; one-legged stance/bi-pedal stance, etc.
 - b. Gait capabilities were measured via sit-to-stand and timed get-up-and-go tests.
 - c. Medication-driven fall risk was analyzed by a self-learning logistic regression analysis for every class of drug, every dose, every dose of every drug, every diagnosed disease, and every assessed disease state in the treatment group.
 - d. Falls history: a nominal scale including 1) *fell without medical intervention*, 2) *falls/saw doctor*, 3) *falls/E.R.*, 4) *falls/hospital admission*, 5) *falls/hospital/home health*, 6) *falls/hospital /inpatient rehab*.
 - e. Frequency of recent hospitalizations.
2. Face-to-face counseling of patient as to fall risk level.
 - a. With patient's permission, communication of observed fall risk level to physicians(s).

- b. With patient's permission, communication of observed fall risk level to pharmacist.
- c. With patient's permission, communication of observed fall risk level to patient's support network.
- d. Patients attend group fall prevention workshop.
- e. In-home environmental assessment.
- f. In-home individualized, one-on-one fall counseling.
- g. 12 “Safetygrams” (mailed).
- h. 12 or more telephone “Safetygrams.”

Persons not in the treatment group received the routine care afforded to them by Pennsylvania Medicaid.

Outcomes

Comparisons were made between the treatment and the large control group (N=44,034) in terms of hospitalizations due to falling and hospitalizations due to injurious falling. A comparison was also made at six-months between the treatment group and the smaller control group (N=1,019) for self-reported falls. The outcome data for the control groups are taken from Medicaid claims data.

To look at the program's efficacy a comparison was made between those subjects who received a risk-screen only (N = 1,089) and those who received a risk-screen and attended the workshop (N = 805). The outcome measures were self-reported falls and actual falls—confirmed by primary care provider.

Outcomes and Analysis

Frequencies were calculated for all study outcomes. An independent sample proportions test was used to compare the treatment and control groups across the three measures—hospitalizations, hospitalizations due to injurious falling, and number of self-reported falls.

3. Results

Results are broken down into three areas—hospitalizations, self-reported falls, and number of self-reported falls.

Between Groups Comparisons

The percent of subjects hospitalized for falling was significantly lower in the SAFE treatment group (4.8%) than in the large (N=44,034) control group (10.5%), $z = 59.42, p < .001, [95\% \text{ CI}: 1.9\%,4.3\%]$. The percent of subjects hospitalized for injurious falling was significantly lower in the SAFE treatment group (0.4%) than in the large (N=44,034) control group (1.0%), $z = 8.20, p = 0.004, [95\% \text{ CI}: 1.5\%,4.3\%]$. The percent of subjects reporting falling after six-months was significantly lower in the SAFE treatment group (8.6%) than in the small (N=1,019) control group (14.5%), $z = 8.21, p = 0.004, [95\% \text{ CI}: 1.5\%,3.9\%]$ —see [Table 1](#).

Table 1. Comparison of Hospitalization for Fractures and for Injurious Falls Between Control Group and Treatment Group.

	Control Group N = 44,034	Treatment Group N = 1,894
Hospitalization for Fracture (ICD-800-829 code)	4,630 (10.5%)	91 (4.8%)
Hospitalization Due to Injurious Falls (880-888 E codes)	450 (1.02%)	7 (0.37%)
	Control Group N = 1,019	Treatment Group N = 1,503
Self-Reported Falls	148 (14.5%)	130 (8.6%)

Within Groups Comparisons

The percent of subjects who reported falling in the Workshop and Risk Screening group was significantly lower (3.4%) than the number of subjects who reported falling in the Risk Screen Only group (9.3%), $z = 77.21$, $p < 0.001$, [95% CI: 3.1%,7.3%]. The percent of subjects

who actually fell in the Workshop and Risk Screening group was significantly lower (2.9%) than the number of subjects who actually fell in the Risk Screen Only group (8.3%), $z = 114.24$, $p < 0.001$, [95% CI: 2.7%,7.9%] — see [Table 2](#).

Table 2. Comparison of Single Interventions and Multiple Interventions on Frequency of Falls and Fallers

	Risk Screen Only (N = 1,089)	Workshop and Risk Screening (N = 805)
Self-reported Falls	101 (9.3%)	27 (3.4%)
Fallers	90 (8.3%)	23 (2.9%)

4. Discussion

Results indicate that the most basic interventions in the fall prevention program were successful in reducing the incidence of self-reported falls among Medicaid elders. Furthermore, multi-factorial, socio-medical fall prevention programs can achieve statistically significant fall reduction outcomes including:

1. The treatment group was 55% lower in hospitalization rate due to fractures than the control group and 64% lower in hospitalization for fall-caused injuries.
2. The incidence of self-reported falls in the treated population is more than 60% lower than the percentage of falls in the control population.
3. The percentage of self-reported falls and fallers among those Medicaid elders who received both workshops and a PCP referral were approximately 2/3 fewer than among those Medicaid elders receiving only one of these interventions.

Overall we also find that the that Medicaid elders who attended one of 106 workshops were almost 300% less likely to suffer a self-reported fall than were Medicaid elders who did not attend a workshop. The PCP Referral plus Workshop intervention data—taken together—document the combinatorial effectiveness of both the workshop and physician referral interventions. Medicaid elders who received both of these interventions were 400% less likely to suffer a self-reported fall than were Medicaid elders who received neither intervention.

The study possessed limitations inclusive of community-based work. Although attempts were made to match the groups, drop-outs and self-report data will affect study outcome. Given the nature of the study we recommend the study be replicated in other states.

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