Achieving a 54% Reduction in Geriatric Fall-Caused Hospitalizations and a 65% Reduction in Fall-Caused Injuries Requiring Long-Term Care: A Multifactorial Program Conducted Among 6600 Community Resident Elders in Florida

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Abstract Background: Falls among the elderly are expensive and debilitating. Falls among elders are now the leading cause of injury ED visits, the leading cause of injury hospitalizations, a leading cause of hospitalization readmissions, the leading cause of hospitalizations from nursing homes, and a major cause of nursing home admissions. But, they are preventable. Design and Methods: A representative random sample of Medicaid-eligible seniors was selected proportionately by geographic density (i.e., zip code) in Miami-Dade and Broward Counties. Subjects participated in informational workshops; non-invasive somatic fall risk factor analysis; HIPPA-compliant sharing of risk reports with their physicians; in-home environmental fall risk analysis; pre- and post-fall counseling; periodic telephone calls to the elders' support network (including physicians) and periodic safetygrams for an average of 28 months. Using 1.3 billion claims from the Florida Medicaid Data Warehouse, the participant groups were compared with several control groups on 1.) hospitalizations for injurious falls; 2.) nursing home stays for fall-caused injuries and 3.) Medicaid savings as a proportion of program costs. The study was carried out in 2015. Results: The treatment groups had statistically significantly lower healthcare utilization due to injurious falls than did various control groups: hospitalizations were lower; nursing home stays were lower; independent audits showed a savings of $2.40 for every $1.00 invested. Conclusions: Multi-disciplinary, socio-medical fall prevention programs for community-resident elders can significantly reduce healthcare utilization due to injurious falls among dual eligible elders.

Keywords: aging, falls, public health, prevention

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1. Introduction

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

a. 15+ million U.S. residents 65 or older suffer a fall;

b. Up to 9 million suffer medically attended falls;

c. 2.5 million of these elders are treated/seen in U.S. Emergency Departments (EDS);

d. 730,000 elders are hospitalized from the EDS;

e. 400,000 + elders are institutionalized in rehab facilities and/or nursing homes;

f. 25,000 elders die of these fall injuries.

The statistics 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 hospitalization 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 reportable reduction in long-term care utilization of about 33%, over 3 years. [10]

Here we evaluate a multifactorial set of 13 interventions (SAFE: Steps Adequate for Falls Among Elders); which obtained a 54% reduction in fall-caused hospitalizations among treatment group compared to a series of control groups. The SAFE program (that is the 13 interventions) was associated with a 65% reduction in nursing home stays due to falls. An independent audit of the program (in addition to Federal and State audits) found the rate of savings to the public sector to be at least $2.40 for every $1 invested.

2. Design and Methods

2.a.   Experimental Group Selection

6,600 Medicaid-eligible elders were selected at random using a geographic density sampling procedure (in which the addresses of all eligibles were arrayed by zip codes and persons were then recruited to participate proportionately to the zip code density of eligibles).

2.b.   Control Group Selection -

This program compared the clinical outcomes, healthcare utilization, and Medicaid expenditures of the 6,600 member treatment group to the following control groups.

1.   A proportionate mirror control group - - defined operationally as the total group of 144,000 Medicaid elders in Miami-Dade and Broward counties whose score on each variable of interest was computed and arrayed in exact proportionality to the size of the treatment group (N=6,624).

2.   A random sample control group - - defined operationally as a group of 5,500 Medicaid elders not participating in, but eligible for, the program. The group was selected via a computer-generated random start and a standardized "skip" interval. This entity may be deemed a "true" control group in that: a.) no member of the group knew of the existence of the analytic group or his/her "membership" in the group; b.) selection of the control group's members was 'blind' to the investigators; c.) demographic comparability between treatment and control group was assured via Medicaid eligibility and identical geographical criteria.

3.   A proportionate mirror control group so selected that their long-term care and hospital utilizations were set equal to that of the treatment group for two years prior to the onset of the program (so that it could be shown that it is the interventions, not prior trends, that account for the successes of the project [fewer falls, lower healthcare utilization, savings to Medicaid]).

Comparing the treatment group to the proportionate mirror control group is the simplest and most persuasive way of drawing conclusions from these data. Because there was no sampling in selecting the proportionate mirror group, there are no computer-generated selection biases (i.e., no computer-weighting of the control group or the treatment group).

We believe the reasons for the use of the other control groups are clear: the random sample is familiar to most public healthcare researchers; the computer-weighting to control for prior healthcare utilization indicates that it is the program, not prior trends, that produces the outcomes reported in this study.

3. Interventions

1.   Face-to-Face Quantitative Fall Risk Assessment

a.   Balance was measured by use of a standard, portable, computerized, dynamic posturographic device -- a force plate, inflatable to different levels of flexibility/rigidity—permitting observation on an eyes open/eye closed; one-legged stance/bi-pedal stance, etc. The device has a false positive history of 1 in 2 million.

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 drug, every dose of every drug, every diagnosed disease, and every assessed disease state in the treatment group.

d.   Falls history: a nominal scale including fell without medical intervention; falls/saw doctor; falls/E.R.; falls/hospital admission; falls/hospital/home health; falls/hospital/inpatient rehab.

e.   Frequency of recent hospitalization.

2.   Face-to-face counseling of patient as to fall risk level.

3.   With patient's permission, communication of observed fall risk level to physicians(s).

4.   With patient's permission, communication of observed fall risk level to pharmacist.

5.   With patient's permission, communication of observed fall risk level to patient's support network.

6.   Group fall prevention workshop.

7.   In-home environmental assessment.

8.   In-home individualized, one-on-one fall counseling.

9.   12 "Safetygrams" (mailed).

10.   12 or more telephone "Safetygrams".

11.   Strength/agility exercise programs.

12.   Informational program on nutrition and supplementation.

13.   Patients have option to see fall prevention physician specialist for consult.

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

4. Results

A.   Comparing the Treatment Group to Proportionate Mirror Control Group (see Table 1 and Table 2)

1.   Table 1 shows the treatment group was 59% lower in hospitalization rate than proportionate mirror control group.

2.   Table 2 shows that comparing the treatment group to the proportionate mirror control group yields reductions in long-term care utilization of 65%.

Comparison #2:

Comparing the Treatment Group to the Proportionate Mirror Control Group, Controlling for Long-Term Care and Hospital Utilization Prior to the Onset of the Program

Table 3 and Table 4 show a decreased rate in the long-term care utilization of our treatment group, which decreased rate ranged between 79% and 86%. Table 4 also indicates a reduction in hospitalization utilization ranging from 34% to 72%.

Comparison #3:

Comparing the Treatment Group to the Random Sample Control Group

Table 5 shows that comparing the treatment group to the randomly selected control group yields reductions in long-term care utilization of 64% and yields reductions in hospitalizations of 35%.

Table 1. Inpatient Hospital Utilization During Program, Program Participants vs. All Miami-Date and Broward Medicaid Elders—03/01/2003 to 06/30/2005

	Elders	Observed Elder Utilization Rate	Elder Rate Reduction	Elders Utilizing Inpatient Facilities	Hospitalizations For Fractures %
Program Participants	6,624	1.92%	59%	127	54%
Analytic Control Group of Medicaid Elders	6,624	4.62%	0%	310	0%

Table 2. LTC Admissions During Program, Program Participants vs. All Miami-Dade and Broward Medicaid Elders - 03/01/2003 to 06/30/2005

	Elders	Observed Elder LTC Admission Rate	Elder Rate Reduction	Elders Admitted to LTC	Average Age	Total Elders Utilizing LTC
Program Participants	6,624	2.61%	65%	173	82.8	173
Analytic Control Group of Medicaid Elders	6,624	7.51%	0%	497	83.0	497

Table 3. Proportionate Mirror—Controlling for 2 Years of Prior Health Status (Excludes Recipients with any LTC Claims Prior to 03/2003) Utilization - 2000 through 2002 Compared to 2003 through 2004

Treatment vs. Control	Relative Improvement
Long Term Care in 2003-2004	79%
Inpatient Claims (Facility)	34%

Table 4. Proportionate Mirror—Controlling for 2 Years of Prior Health Status (Excludes Recipients with any Hospital Inpatient Claims Prior to 03/2003) Utilization - 2000 through 2002 Compared to 2003 to 2004

Treatment vs. Control	Relative Improvement
Long Term Care in 2003-2004	86%
Inpatient Claims (Facility)	72%

Table 5. (Comparison 3). Comparison from Program Participants to Random Control Group (n=5443) Comparing 2 years, 4 months of claims (3/1/2003 – 6/30/2005) – Elders Screened 3/1/2003 – 6/30/2005

	Utilization Rate Improvement	Per Case Cost Improvement
Long Term Care	64%	60%
Inpatient Facility Claims	35%	31%

5. Discussion

The package of 13 interventions reported here is associated with statistically significant reductions in falls, injurious falls, hospitalizations due to falls, and nursing home stays due to falls. The magnitude of fall risk reduction (50% to 65%) found in this project appears to be higher than the magnitude found in much of the previously published literature. Use of a multiplicity of control groups and the similarity of findings across all of the possible comparisons between treatment and control groups may be deemed useful or persuasive.

More specifically, the results of this project seem to differ somewhat from those reported in the 19 "multi-factorial and management trials" for falls recently summarized for the U.S. Preventive Services Task Force where the pooled estimates of probable fall reductions were not statistically significant. [2,3,9] The results of this project seem also to differ somewhat from the pooled estimate of "six comprehensive trials" which also produced no statistically significant findings of fall reduction from their interventions. [2,3,9] The results of this project also seem to vary somewhat from the summarized results of Cohen et al. [10]

Finally, this Florida project was subject to independent performance and financial audit by the Statistical Consulting Center, Health Professions Division of Nova Southeastern University in Fort Lauderdale, Florida. With the permission of the authors, we report here all the five (5) major findings of that report:

Independent Audit of the SAFE Program in Florida

"We conducted a health economic and pharmacoeconomic evaluation of your fall prevention program. Results of our empirical analysis revealed five significant findings:

1. The program significantly reduced the frequency of falls;

2. The program significantly reduced the frequency of injurious falls;

3. The program significantly reduced the number of prescription drugs consumed;

4. The program significantly reduced the amount of money spend on prescription drugs;

5. Our findings confirm the conclusions that the program achieved significant savings. Our calculations demonstrate a savings on average of $2.40 per every dollar invested.

It should also be noted from our research that the modeling of chronic disease, select demographic variables and prescription drug use used in the program accurately predicts health outcomes. The combined efforts of your predictive models and intervention endeavors are having a positive effect on your patients.

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