Brief Report

SGS SOUTHERN GERONTOLOGICAL SOCIETY

Journal of Applied Gerontology
1–13

DOI: 10.1177/0733464817721113
journals.sagepub.com/home/jag
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Intervention to Prevent Falls: Community-Based Clinics

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Abstract

Purpose: The purpose of this study was to document results of State funded fall prevention clinics on rates of self-reported falls and fall-related use of health services. **Methods:** Older adults participated in community-based fall prevention clinics providing individual assessments, interventions, and referrals to collaborating community providers. A pre–post design compares self-reported 6-month fall history and fall-related use of health care before and after clinic attendance. **Results:** Participants (N = 751) were predominantly female (82%) averaging 81 years of age reporting vision (75%) and mobility (57%) difficulties. Assessments revealed polypharmacy (54%), moderate- to high-risk mobility issues (39%), and postural hypotension (10%). Self-reported preclinic fall rates were 256/751(34%) and postclinic rates were 81/751 (10.8%), (p = .0001). Reported use of fall-related health services, including hospitalization, was also significantly lower after intervention. **Implications:** Evidence-based assessments, risk-reducing recommendations, and referrals that include convenient exercise

Manuscript received: February 3, 2017; **final revision received:** May 31, 2017; **accepted:** June 10, 2017.

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opportunities may reduce falls and utilization of health care services. Estimates regarding health care spending and policy are presented.

Keywords
fall prevention, state policy, health care costs

Purpose

Research to identify risks and reduce older adult falls has spanned decades (Nevitt, Cummings, Kidd, & Black, 1989; Ory et al., 1993); however, transforming this evidence into practice and reducing fall rates has yet to be fully realized (Centers for Disease Control and Prevention, 2016). We describe self-reported changes regarding falls and fall-related use of health services after participation in state-funded, community-based fall prevention clinics.

Background

The Yale Frailty and Injury Cooperative Studies of Intervention Trials (Yale FICSIT), demonstrating a reduction in falls (Tinetti et al., 1994), was followed by the Connecticut Collaboration for Fall Prevention (CCFP; Baker et al., 2005) demonstrating a reduction in fall-related use of health services (Murphy, Baker, Leo-Summers, Allore, & Tinetti, 2013a; Tinetti et al., 2008). These findings stimulated State fall prevention legislation and funding (Murphy et al., 2013b). A Visiting Nurse Association (VNA) participant in CCFP (Baker et al., 2005; Fortinsky et al., 2008) was recruited. Their staff had training regarding fall prevention guidelines (American Geriatrics Society, British Geriatrics Society, 2010), chronic disease self-management (Lorig et al., 1999), and motivational interviewing (Miller, Yahne, Martinez, & Pirritano, 2004). Using this background, VNA registered nurses (RN) and physical therapists (PT) developed fall prevention clinics to provide community-dwelling older adults with CCFP clinical assessments, Tinetti Balance and Gait (TBG) screenings (Tinetti, 1986), education, interventions, and referrals.

Method

Falls were defined as unintentionally coming to rest on the floor or lower level (Buchner et al., 1993). Targeted risks were postural hypotension, polypharmacy (4+ prescriptions), sensory impairments (eyes/ears/feet), mobility (balance/gait/transfer) issues, and unsafe shoes or assistive devices (Baker et al., 2005).

Older adult participation was promoted by community-based collaborators hosting clinics in familiar sites. No preregistration, prescreening, or referral was required. In clinic, each participant met with an RN who obtained informed consent and fall history. Each participant received a checklist for recording personal risks and recommendations after which a group presentation provided State data regarding the magnitude, consequences, and costs of falls, punctuated by quotes from local first responders, emergency department staff, orthopedic surgeons, and geriatricians. Each risk was explained emphasizing that the likelihood of falling increases with the number of risks (Tinetti, Speechley, & Ginter, 1988). Procedures to get up after a fall and, if unsuccessful, preplanning how to summon help, were also presented.

Participants progressed through risk-specific assessment stations, receiving recommendations for removing or managing each risk (Baker et al., 2005). For example, after medication review using the Beer's list (American Geriatrics Society 2012 Beers Criteria Update Expert Panel, 2012) if indicated, medication reconciliation software provided recommendations for review with primary care providers (PCP) or pharmacists. Mobility assessments examined difficulties with walking, arising from seated position and unsafe use, fit, or repair of assistive devices. Ambulatory, consenting participants received TBG screening to identify mobility issues (Tinetti, 1986). Exercise interventions included state-funded, evidence-based community classes led by VNA staff certified in Tai Ji Quan: Moving for Better Balance (Li et al., 2005) or Tai Chi for Arthritis (Song, Roberts, Lee, Lam, & Bae, 2010). Otago Exercise (Campbell et al., 1997) instructions were provided to those preferring to home-based exercise. Participants at high-fall-risk were encouraged to request PCP referrals for skilled outpatient or homecare therapy. State-funding covered home safety evaluations and equipment for those lacking other resources. After completing assessments, participants met individually with an RN to have questions answered and review their personalized list of recommendations.

Data

Clinicians collected self-reported data describing participants, their fall risks, previous 6-month fall history, and fall-related use of health services. These were manually linked with assessment results, recommendations, and end-of-session TBG retesting results, for those who exercised with clinicians. Clinician interviews collected follow-up data or alternatively, trained staff telephoned to ascertain efforts undertaken to reduce each risk, falls, and fall-related use of health services in the 6 months postclinic.

A VNA data manager entered de-identified individual data into a Microsoft Access database, transmitted via a secure network to a data analyst at Yale School of Medicine. Procedures were approved by the Yale Institutional Review Board.

Statistical Analysis

Analyses are based on comparisons of baseline and 6-month follow-up data. Characteristics of participants with 6-month follow-up were compared with those lost to follow-up. Means of age and number of risk factors were compared with a Student's *t* test. Frequencies and proportions for categorical characteristics were compared with a chi-square test as were pre- and post-clinic rates of falls and related health care utilization. Between-group TBG differences were compared using confidence intervals (CIs) and the Kruskal-Wallis tests. Cost savings were estimated using published data.

Results

Figure 1 presents the derivation of analytical data for the 751 participants receiving initial assessments and 6-month follow-ups. Between July 2013 and January 2015, 949 people 55+ years of age had clinic evaluations and were eligible for the 6-month follow-up. Of these, 751 (79%) had initial and 6-month assessments, with nonresponders either withdrawing (5) or lost to follow-up (193). Among the 751 participants, 697 were ambulatory and consented to baseline TBG screening. Among these, 301 participants received exercises that were clinician-directed and, upon completion, had TBG retesting.

Table 1 compares participants with and without 6-month follow-up. The two groups did not differ by gender, age, type, or number of risk factors. Older participants and those with low-risk TBG scores were more likely to participate in 6-month follow-up interviews.

The final sample of 751 participants was predominantly female (82%), over 70 years of age (88%), and 34% reported falling in the previous 6 months (median 1 fall; range 1-14). Mobility risks were identified in 57% of participants, 54% reported using 4+ prescriptions, and 10% had postural hypotension. Self-reported concerns involved vision (75%), feet/footwear (33%), hearing (32%), and home safety (12%). Over half (57%) of participants had 3+ of the 8 risk factors. Among the 697 (93%) ambulatory persons who consented to TBG testing, 39% scored at moderate- to high-risk of falling.

Table 2 presents significant differences among the three levels of TBG. Those classified low-risk were, on average, younger, had two fall risk factors,

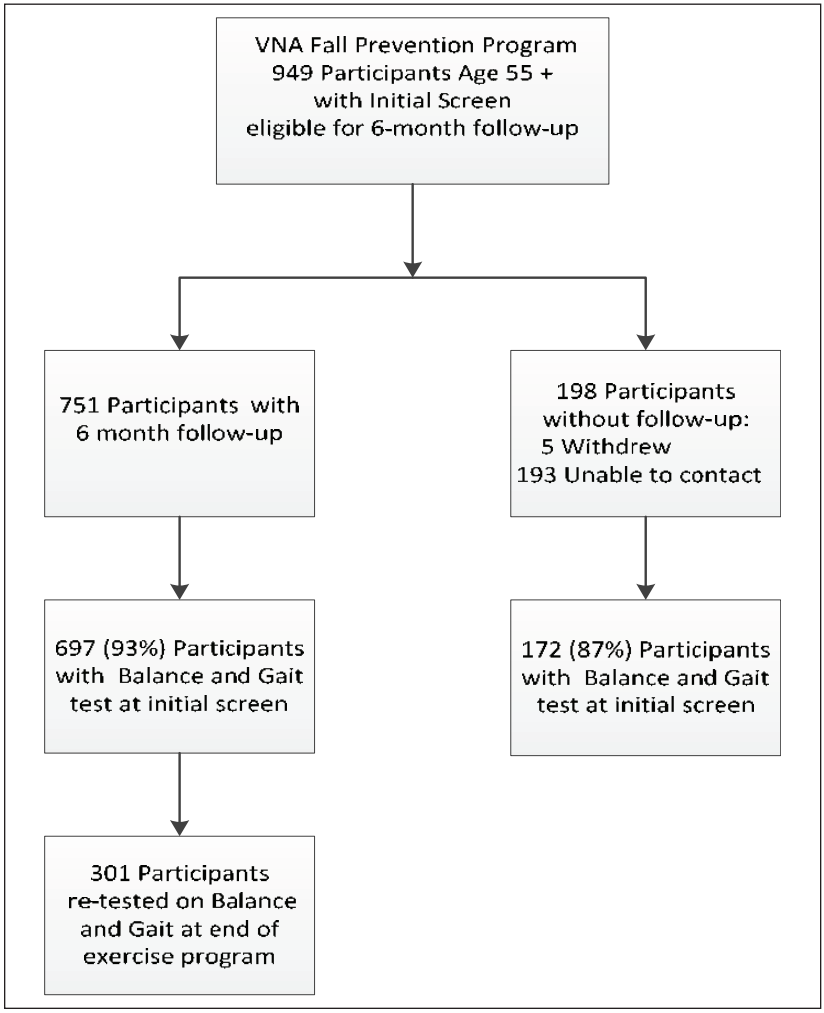

Figure 1. Participant enrollment process.
VNA = Visiting Nurse Association.

and 23% reported falling in the previous 6 months. Those screening at moderate- to high-risk were, on average, older, had a higher number of fall risks, and a greater proportion reported falling, both before and after clinic attendance.

The 301 participants (43%) in clinician-directed exercise had TBG retesting. Results indicate that 90 participants (30%, 95% CI: 20, 35) scored

Table 1. Baseline Characteristics of Clinic Participants Comparing Final Sample to Those Lost to Follow-up.

Characteristic	Participants with initial screen and follow-up (*n* = 751)	Participants with initial screen only (*n* = 198)	Chi-square or *t* test *p* value
Gender (female)	623 (81.5)	149 (75.3)	.050
Mean age (*SD*)	80.7 (9.0)[a]	79.4 (11.0)[b]	.138
55-69	88 (12%)	44 (23%)	.0003
70-79	233 (31%)	41 (21%)	
80-89	293 (39%)	69 (36%)	
90+	134 (18%)	37 (19%)	
Risk factors			
4 or more prescription medications	374 (54%)[c]	101 (56%)[d]	.520
Mobility risk[e]	428 (57%)	117 (59%)	.595
Orthostatic blood pressure change	74 (10%)	17 (09%)	.590
Hearing impairment	243 (32%)	61 (31%)	.678
Vision difficulty	566 (75%)	144 (73%)	.447
Feet and footwear problem	251 (33%)	65 (33%)	.875
Home environment concerns	87 (12%)	23 (12%)	.990
Fall in last 6 months	256 (34%)[f]	75 (41%)[g]	.209
Number of risk factors, *M* (*SD*)	2.9 (1.7)	2.8 (1.7)	.903
0-2 risk factors	325 (43%)	89 (45%)	.899
3-4 risk factors	297 (40%)	77 (39%)	
5-8 risk factors	129 (17%)	32 (16%)	
Tinetti Balance and Gait Score	*N* = 697	*N* = 172	
Low-risk	424 (61%)	81 (47%)	.005
Moderate-risk	142 (20%)	45 (26%)	
High-risk	131 (19%)	46 (27%)	

[a]Three missing age.
[b]Seven missing age.
[c]Fifty-five missing medication count.
[d]Nineteen missing medication count.
[e]Feel unsteady walking; use assistive device/wheelchair; difficulty arising from chair/bed.
[f]Thirty-nine missing response.
[g]Fifteen missing response.

Table 2. Descriptive Statistics by Baseline Tinetti Balance and Gait Risk Group.

	Baseline TBG risk group (N = 751)			
	Low (n = 424)	Moderate (n = 142)	High (n = 131)	p value
Mean age (*SD*)	78.6 (8.6)	84.5 (8.1)	83.7 (8.6)	<.0001[c]
Mean number of fall risk factors (*SD*)	2.3 (1.6)	3.4 (1.6)	4.2 (1.4)	<.0001[c]
Persons reported falling during 6 months preclinic, *n* (%)	92 (23.1)[a]	60 (46.2)[b]	84 (64.1)	<.00011[d]
Persons reported falling during 6 months postclinic, *n* (%)	2.7 (6.4)	2.0 (14.1)	28 (21.4)	<.00011[d]

Note. TBG = Tinetti Balance and Gait.
[a]Missing n = 26.
[b]Missing n = 12.
[c]Kniskal-Wallis test of equality across three levels of TBG.
[d]Chi-square test of equality across three levels of TBG.

moderate-high fall risk at baseline, reduced to 49 (16%, 95% CI: 12, 20) retesting moderate- to high-risk. Among those initially scoring high-risk, 18 (53%) retested low-moderate risk. Among those scoring moderate-baseline-risk 71% improved to low-risk.

Self-Reported Adherence

Participants received on average 3 (maximum 8) fall risk reduction recommendations. Tracking adherence was beyond the scope of this effort, therefore, 6-month follow-up data relied on self-report regarding if and how participants had addressed each risk, without referencing clinic findings.

Ninety-two percent (691) of participants reported specific efforts to reduce fall risks (average 3; range 1-8) and described undertaking a greater number of interventions than had been specifically recommended. Exercise to improve mobility, the most frequently recommended intervention, was specifically advised for 344 persons, and 78% (268) reported adherence. However, another 256 persons, not so specifically advised, reported starting fall prevention exercises.

Among those advised to request PCP referrals 23% reported receiving outpatient therapy; 73% received homecare and 46% obtained home safety evaluations. Three-quarters of those with vision problems reported actions, for example, scheduling surgeries or ophthalmology visits. Among those with medication risks 22% reported a pharmacist medication review. A third

Table 3. Self-Report of Falls and Use of Fall-Related Health Services 6 Months Before and After Clinic (N = 751).

	Six months before clinic	Six months after clinic	p value[a]
Persons who reported falling	2.56 (34%)	81 (10.8%)	<.0001
Used health care services for fall	154 (20.5%)	40 (5.3%)	<.0001
Called 911	71 (9.5%)	21 (2.8%)	<.0001
ED visit	84 (11.2%)	17 (2.3%)	<.0001
Hospital admission	62 (8.3%)	12 (1.6%)	<.0001
MD visit	88 (11.7%)	18 (2.4%)	<.0001
Home care service	51 (6.8%)	20 (2.7%)	.0002
Outpatient PT	38 (5.1%)	11 (1.5%)	<.0001

[a]Chi-square test of equality of proportions before and after. ED = emergency department; MD = physician ; PT = physical therapy.

(35%) of participants obtained an emergency response system, and 83% correctly described maneuvers to get up after a fall.

Falls and Use of Fall-Related Health Services

Table 3 compares the proportion of persons reporting any falls and fall-related use of health care before and after the clinics. At baseline, 256 (34%) participants reported having fallen in the previous 6 months, contrasting with 81 (10.8%) people reporting falls during the 6 months postclinic (p = .0001). Whereas 20.5% (154 persons) reported fall-related health care utilization before clinic, only 5.3% (40 persons) reported such utilization after program participation (p = .0001). Fall-related use of 911 calls, emergency department, outpatient and physician visits (p = .0001), and homecare services (p = .0002) decreased in the 6 months postclinic. At baseline, 62 persons (8.3%) reported a fall-related hospitalization in the 6 months prior; 12 (1.6%) reported fall-related hospitalizations occurring within 6 months following clinic (p = .0001).

Limitations

Caution is warranted in interpreting these results given that this was an observational study and reliance on self-reported data is an unavoidable limitation. Daily fall calendars provide more reliable data (Ganz, Higaski, & Rubenstein, 2005) but are prohibitively expensive. Analyses comparing daily-gathered fall data to recall over the same time period report sensitivity of 74% and

specificity of 94% (Sanders, Hayles, Kotowicz, & Nicholson, 2009). Recall of health care utilization varies by type, with hospitalizations most accurately reported (Petrou, Murray, Cooper, & Davidson, 2002). Acknowledging these potential measurement errors, our primary outcomes are participant reports of any falls or related use of health care, rather than event counts.

Discussion

In 1 year, the fall prevention clinics recruited 949 participants averaging 81 years of age, 34% of whom reported falling in the previous 6 months. Clinical testing aligned with the self-reports in that younger participants (age 70s) averaged 2 risk factors, low-risk TBG scores and 23% reported a 6-month history of falling. In contrast, older participants (age mid-80s), averaged 4 fall risk factors, higher TBG risk scores, and were most likely to report falling before (64%) intervention.

There were 751 (79%) participants who provided 6-month follow-up data, and of these 92% reported risk-reduction activities. This admittedly high rate may be partially attributed to participants' unmeasured, underlying motivations for attending community-based clinics and exercise opportunities which minimized the physical and financial barriers to participation. The group setting made it financially feasible for clinicians to fully explain fall prevention evidence and then provide personalized advice.

Policymakers are generally aware of the direct relationship between falls and long-term care demand. The relationship between falls and other state fiscal issues is less familiar. For example, municipal employees are commonly first responders to rising numbers of 9-1-1 calls from older adults who have fallen, increasing both call volume and municipal costs (Cone et al., 2013). Falls are also a major contributor to emergency department overcrowding (Albert, McCaig, & Ashman, 2013).

Among the 751 participants with 6-month follow-up, self-reports indicate a significant association between participation and decreased rates of falls ($p = .0001$), and fall-related health care utilization ($p = .0001$). The 3-month total health care costs (Bohl et al., 2010) precipitated by 62 fall-related hospitalizations would total $1,720,190. In comparison, 12 fall-related hospitalizations after intervention would cost $332,940. The reduction of $1,387,250 in health care spending was achieved by a program averaging costs of $55,000 per year.

Conclusion

Using evidence-based protocols, VNA clinicians developed community collaborations and fall prevention clinics that engaged 941 older adult

participants. Among 751 participants providing 6-month follow-up data, 92% reported fall risk-reduction efforts. Comparisons of 6-month self-reports before and after program participation show significant reductions in fall rates (from 34% to 10.8% of participants), and fall-related health care utilization (from 20.5% to 5.3%), perhaps stimulating further investigation.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by a grant from the Connecticut State Department on Aging to the CCFP at Yale University School of Medicine (PI: Baker) and by a grant from the National Institute on Aging (1R21AG033130-01A2, PI: Murphy). The study was conducted at the Yale Claude D. Pepper Older Americans Independence Center (P30AG21342). The original CCFP effort was supported by the Donaghue Medical Research Foundation (DF#00-206, PIs: Tinetti & Baker). This publication was partially supported by a Clinical Translational and Science Award from the National Center for Research Resources (UL1 RR024139, PI: Murphy). Its contents are solely the views and opinions of the authors and not those of the State of Connecticut Department on Aging, the State of Connecticut, the National Center for Research Resources or the NIH.

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