

# Veterans Geriatric Multifactorial Falls Assessment Clinic is Associated with Lower Fall Rate

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## Abstract

**Objective:** To examine the impact of a Geriatric Multifactorial Falls Assessment Clinic (FAC) intervention on the rate of falls per patient.

**Design:** Prospective observational cohort.

**Setting:** Single-site Veterans Health Administration (VHA) Outpatient Clinic.

**Participants:** Fifty-four (54) Veterans who had a recent fall and were referred to the Geriatric Multifactorial Falls Assessment Clinic (FAC) were compared to 42 Veterans with a recent discharge from an Acute Care for the Elderly (ACE) Inpatient Unit.

**Intervention:** The FAC included individualized management focused on the assessment and treatment of fall risk. Individualized treatment plans included medication adjustment or reduction, referral to physical therapy, and arrangement of community services.

**Measures:** Falls per patient per month during 1 year of follow-up.

**Results:** We enrolled 54 FAC patients and 42 ACE patients as comparators. FAC patients were similar to ACE patients; median age was 77.5 (Interquartile Range (IQR): 68.2, 84.8) vs. 74.0 (IQR: 69.0, 81.0) years. At baseline, 20% of FAC patients used no assistive device vs. 14% of ACE patients. The median number of falls per patient per month was 0.0 (IQR: 0.0, 0.4) among FAC patients versus 0.2 (IQR: 0.1, 0.2) for ACE patients ( $p = 0.027$ ). Forty-eight percent vs. 81% of patients had any fall among FAC and ACE patients respectively ( $p < 0.001$ ). In adjusted analyses, FAC patients had a fall rate approximately half of the ACE group, with a rate ratio of 0.524 (95% confidence interval [0.266, 1.031];  $p = 0.061$ ).

**Conclusions:** Our single-site multifactorial falls assessment clinic was associated with reduced rate of falls per month in the year following treatment.

**Keywords:** Falls assessment; Community-Dwelling; Elderly

approximately 30% of community-dwelling individuals over age 65 experience a fall [1–3]. Approximately 10–20% of falls among older adults result in serious injury [4], and complications from falls are the leading cause of death from injury in this age group [5]. The causes of a fall often involve a complex interaction among multiple factors intrinsic to the individual (age-related functional decline, chronic diseases, acute illness(es), medications), challenges to postural control (environment, changing position, normal activities), and mediating factors (risk-taking behaviors, mobility, gait and balance) [6–9].

Systematic reviews of interventions to reduce the new incidence of falls reveal a number of efficacious strategies to identify those at high risk for falls and to reduce new incident falls for community-dwelling elderly [10–17]. Based on the results of systematic reviews, most successful interventions for fall reduction have been multifactorial interventions. Meta-analysis of multifactorial assessment and treatment for patients who fall suggest a 30–50% reduction in subsequent fall risk [10,13]. Yet clinical trials of multifactorial assessment and treatment have not proven effective possibly due to low treatment adherence and/or insufficient follow-up [18,19].

Based on the evidence that falls among geriatric patients typically require multifactorial assessment and treatment, the VA healthcare system recently established Geriatric Multifactorial Falls Assessment Clinics (FACs) nationwide. However, the impact of these clinics on the rate of falls among elderly Veteran out-patients has not been evaluated, to date. The purpose of this study was to examine the impact of a Geriatric Multifactorial Falls Assessment Clinic for geriatric out-patients within a VA healthcare system on the subsequent rate of falls per patient. Falls Assessment Clinic (FAC) patients were compared to a similar group of geriatric patients discharged from an Acute Care for the Elderly (ACE) Inpatient Unit followed-up during a 12-month time period. We hypothesized that the FAC patients would show a lower rate of falls compared to the ACE unit patients.

## Methods

### Study Design and Setting

This study was a prospective, observational cohort study of patients at the Veterans Health Administration Tennessee Valley Health System in Nashville from 2009–2016. The Nashville facility includes 133 acute care beds, as well as medical and surgical intensive care units. Patients were prospectively recruited from the Geriatric Multifactorial Falls Assessment Clinic (FAC) (intervention group) or the Geriatric Acute Care for the Elderly (ACE) inpatient unit (comparison group).

## Abbreviations

ACE: Acute Care for Elderly; COPD: Chronic Obstructive Lung Disease; CPRS: Computerized Patient Record System; FAC: Falls Assessment Clinic; Geri-PACT: Geriatric Patient Aligned Care Team; IQR: Interquartile Range; LB: Lower Bound; PACT: Patient Aligned Care Team; RR: Rate Ratio; UB: Upper Bound; VA: Veterans Administration; VHA: Veterans Health Administration.

## Introduction

A fall, defined as an accidental change in upright position resulting in bodily contact with the ground, floor, furniture, or other objects, constitutes one of the most common events threatening the independence of older adults. Each year self reports indicate,

## Participants

Study inclusion criteria required Veterans to be aged 60 or over, with a history of falls in the last 12 months based on medical record documentation and/or a Morse Fall Risk Assessment score of 25 or greater, which is indicative of fall risk. The Morse Fall Risk Assessment (score range 0–125, with scores < 25 indicating low fall risk) was calculated at the point of care based on patient report of falls, the presence of comorbidity, and functional assessment performed during the evaluation [20]. Patients who had medical record documentation of being bedbound were excluded from participation, due to their reduced opportunities for falls. FAC patients were referred to the FAC by primary care providers due to a recent fall event. Eligible FAC patients were invited to participate by the principal investigator during their initial FAC visit following their initial referral. Eligible patients discharged from the ACE unit were invited to participate by mail.

The Tennessee Valley Healthcare System Institutional Review Board approved this study, which is also registered at clinicaltrials.gov. (Identifier: NCT02356211). Participants provided written informed consent for study participation.

## Intervention: Geriatric Multifactorial Falls Assessment Clinic (FAC)

The Geriatric Multifactorial Falls Assessment Clinic intervention provided the following components to FAC patients: a complete history and physical exam to assess underlying causes; calculation of the Morse Fall score; review and adjustment (i.e., dose reduction or removal, if possible) of medications associated with falls [21]; timed “Get Up and Go Test” to assess gait and mobility (described in greater detail below) [22]; targeted laboratory evaluation; referral to physical therapy; and patient and caregiver education about fall risk and preventative measures such as a home safety evaluation. Additionally, based on individual assessment, FAC-recommended services could include any of the following: home safety evaluation, supportive device needs (e.g., walker, shower seat, bathroom bars), home health care and telephonic disease-specific management services. The timed Get Up and Go Test identifies individuals prone to falls and assesses lower extremity strength, coordination, and balance. Patients are asked to rise from a seated position, ambulate 3 meters (10 feet) and return to the seated position with time measured in seconds. Patients with Get Up and Go Test time of 20 seconds or greater are at extremely high risk for falls.

The FAC is a component of the Geriatric Patient Aligned Care Team (GERI-PACT) within the VA. The GERI-PACT model is that care is provided by an inter-professional team consisting of a geriatrician, geriatric nurse practitioner, clinical pharmacist, licensed practical nurse, Registered Nurse care manager, social worker, and dietitian. GERI-PACT operates with increased ancillary support compared to Primary Care PACT [23].

## Comparison Group

Patients discharged from the ACE unit returned to the care of their primary physicians and usual outpatient care services. Prior to discharge home, these patients received inter-professional (physician, nursing, social work, pharmacy, nutrition, physical and occupational therapy) geriatric team assessment, treatment, and discharge planning. All ACE patients also received medication reconciliation prior to discharge. ACE patients did not receive a focused multifactorial falls assessment by the inpatient team, although their fall risk was determined by the PI via the Morse Falls Risk Assessment.

## Data Collection

All eligible, consented patients received a systematic medical

record review and a standardized patient interview. The following data were abstracted from the VHA Electronic health record–Computerized Patient Record System (CPRS): age, gender, race, and comorbidities (incontinence, diabetes mellitus, cardiac disease, neurological disease, arthritis, COPD), medications, living arrangement, hospitalization within the 12-month follow-up period, and death. Comorbidities were assessed by the investigators by a review of the electronic health record in the following sections: Admission history and physical examinations, discharge summaries, notes from outpatient encounters, and problem lists for the two years preceding the study enrollment to determine if the patient had a particular diagnosis. A standardized patient interview was conducted with each participant at one year following either their initial FAC out-patient visit (intervention group) or discharge from the ACE unit (comparison group) via telephone to assess functional status (ambulation, dressing, continence, toileting, eating, transfers), living arrangement (alone versus with someone), need for ambulatory assistance device (e.g. walker, cane), and fall history (having experienced a fall in the last 12 months, and if yes, how many; was there any injury or was medical attention sought?)

## Primary Outcome

The main study outcome was the average number of falls per patient per month in the 12 months following the patient’s out-patient FAC visit (intervention) or discharge from the ACE unit (comparison). For participants who remained in the study for the full 12 months, we conducted a standardized patient interview at one year to obtain the self-reported number of falls in the preceding 12 months; we then divided that number by 12 to get the average number of falls per patient per month. For participants who expired (N = 6 FAC, 9 ACE patients) before 12 months, the number of falls was obtained based on medical record review and that number was divided by their respective number of months in the study.

## Statistical Analysis

We conducted a visual comparison of baseline characteristics of the two groups (FAC and ACE) (Table 1). To allow for the length of time in the study (0.6 to 12 months) and address overdispersion in the outcome data, we conducted a negative binomial regression analysis to model the relationship between treatment group (FAC versus ACE) and expected number of falls. The analysis was adjusted for patient age (single linear term), Morse Falls Risk Assessment (single linear term), living alone (yes/no), and history of neurological problems (yes/no), as these are key factors that can influence a person’s number of falls and on which the two groups differed. The analysis included the number of months that each subject was included in the study as an offset, a fixed-coefficient term that allows patients with different follow-up lengths to be included in the same analysis.

## Results

### Study Population

There were 57 FAC referrals of which one was ineligible (1 bedfast patient) and 2 withdrew consent so were excluded from the analysis. Our initial ACE sample had a potential 256 patients, of whom 204 did not respond to a letter request for interview, two withdrew consent, and eight were excluded for having Morse Falls Risk Assessment scores below 25. Thus the primary analyses included 54 FAC intervention patients and 42 ACE comparison patients (Figure 1).

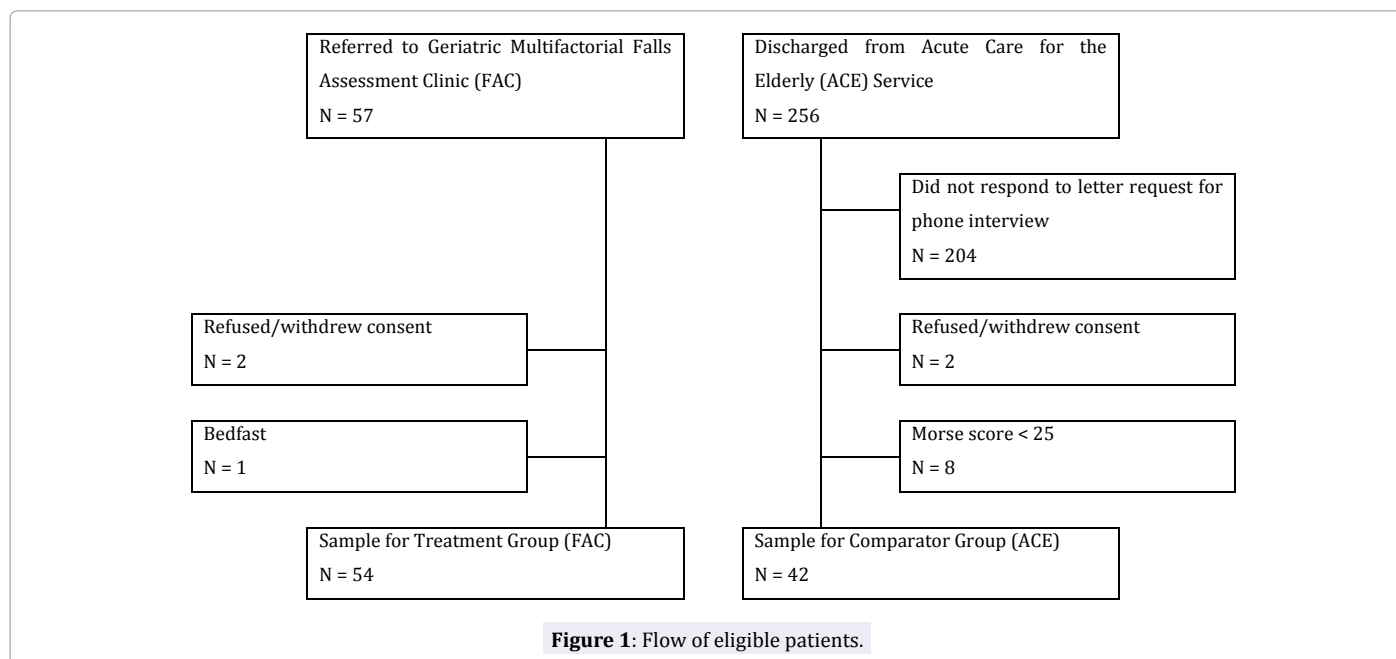
### Baseline Characteristics

Table 1 shows the demographic, functional and medical characteristics for each group. Most characteristics were

	FAC Treatment Group N = 54	ACE Comparator Group N = 42
Age in years, median (IQR)	77.5 (68.2, 84.8)	74.0 (69.0, 81.0)
<b>Age category in years, proportion (N)</b>		
60–74	0.39 (21)	0.52 (22)
75–84	0.35 (19)	0.40 (17)
85+	0.26 (14)	0.07 (3)
Sex, male, proportion (N)	0.98 (53)	0.98 (41)
Morse score, median (IQR)	65 (55, 75)	55 (40, 55)
Lives alone, proportion (N)	0.31 (17)	0.55 (23)
<b>Assistive device, proportion (N)</b>		
Scooter/wheelchair	0.11 (6)	0.19 (8)
Cane/quad cane	0.31 (17)	0.24 (10)
Walker	0.37 (20)	0.43 (18)
None	0.20 (11)	0.14 (6)
Number of medications, median (IQR)	10 (7, 12)	11 (9, 14)
<b>Use of high-risk medications, proportion (N)</b>		
Warfarin	0.07 (4)	0.19 (8)
Antidepressant	0.33 (18)	0.38 (16)
Antipsychotic	0.06 (3)	0.05 (2)
Narcotic	0.20 (11)	0.31 (13)
Diuretic	0.52 (28)	0.36 (15)
Benzodiazepine	0.07 (4)	0.10 (4)
<b>Comorbidities, proportion (N)</b>		
Incontinence	0.28 (15)	0.26 (11)
Diabetes	0.39 (21)	0.52 (22)
Cardiac disease	0.20 (11)	0.62 (26)
Neurological disease	0.43 (23)	0.19 (8)
Arthritic disease	0.17 (9)	0.07 (3)
COPD	0.02 (1)	0.07 (3)

**Table 1:** Unadjusted baseline characteristics by treatment group. (FAC: Falls Assessment Clinic; ACE: Acute Care of the Elderly Inpatient Unit Discharges; IQR: Inter-Quartile Range; COPD: Chronic Obstructive Pulmonary Disease.

Definitions: Cardiac disorders included atrial fibrillation, atherosclerotic coronary vascular disease, aortic valve replacement, bradycardia, congestive heart failure, and peripheral vascular disease. Neurologic disorders included amyotrophic lateral sclerosis, Alzheimer’s disease, stroke, dementia, Huntington’s disease, multiple sclerosis, neuropathy, Parkinson’s disease, and seizure disorder included degenerative joint disease, rheumatoid arthritis, and gout. The Morse Falls Risk Assessment score is 25 or above for all patients per study inclusion criteria).



**Figure 1:** Flow of eligible patients.

comparable between the two groups at the time of study enrollment. The FAC group was slightly older on average, with a median age

of 77.5 years (interquartile range (IQR): 68.2, 84.8) vs. 74.0 years (IQR: 69.0, 81.0) in the ACE group. The FAC group had a higher

average Morse Fall Risk Assessment (median 65 [IQR: 55, 75]) vs. ACE patients (median 55 [IQR: 40, 55]); and the FAC group had a lower proportion of patients living alone, and a higher proportion with history of any neurological diagnosis. FAC patients included 19 (35%) who had been hospitalized in the year prior to enrollment. There were some minor differences in fall associated medications between ACE and FAC patient groups.

**Intervention characteristics**

FAC (intervention) patients received an average of 2 clinic visits per person (range 1,3). Components provided were medication management (received by 51% of intervention patients), physical therapy referral (40%), equipment recommendations (25%), home care services (11%), and specialty care referral (7%). Ninety-four percent of ACE patients received only home physical therapy services.

**Primary Outcome: Falls within 12 Months**

The median number of falls per patient per month was 0.0 (IQR: 0.0, 0.4) among FAC patients versus 0.2 (IQR: 0.1, 0.2) for ACE patients ( $p = 0.027$ ). Forty-eight percent vs. 81% of patients experienced one or more falls among FAC and ACE patients respectively ( $p < 0.001$ ) (Table 2). In the adjusted analysis (Figure 2 and Supplementary Table 1), the rate of falls per month for FAC patients was approximately half the rate in the ACE comparison group, with a rate ratio of 0.524 (95% confidence interval: 0.266, 1.031;  $p = 0.06$ ). For FAC patients there were no injurious falls. For ACE patients two falls were injurious falls resulting in hip and foot fractures, respectively.

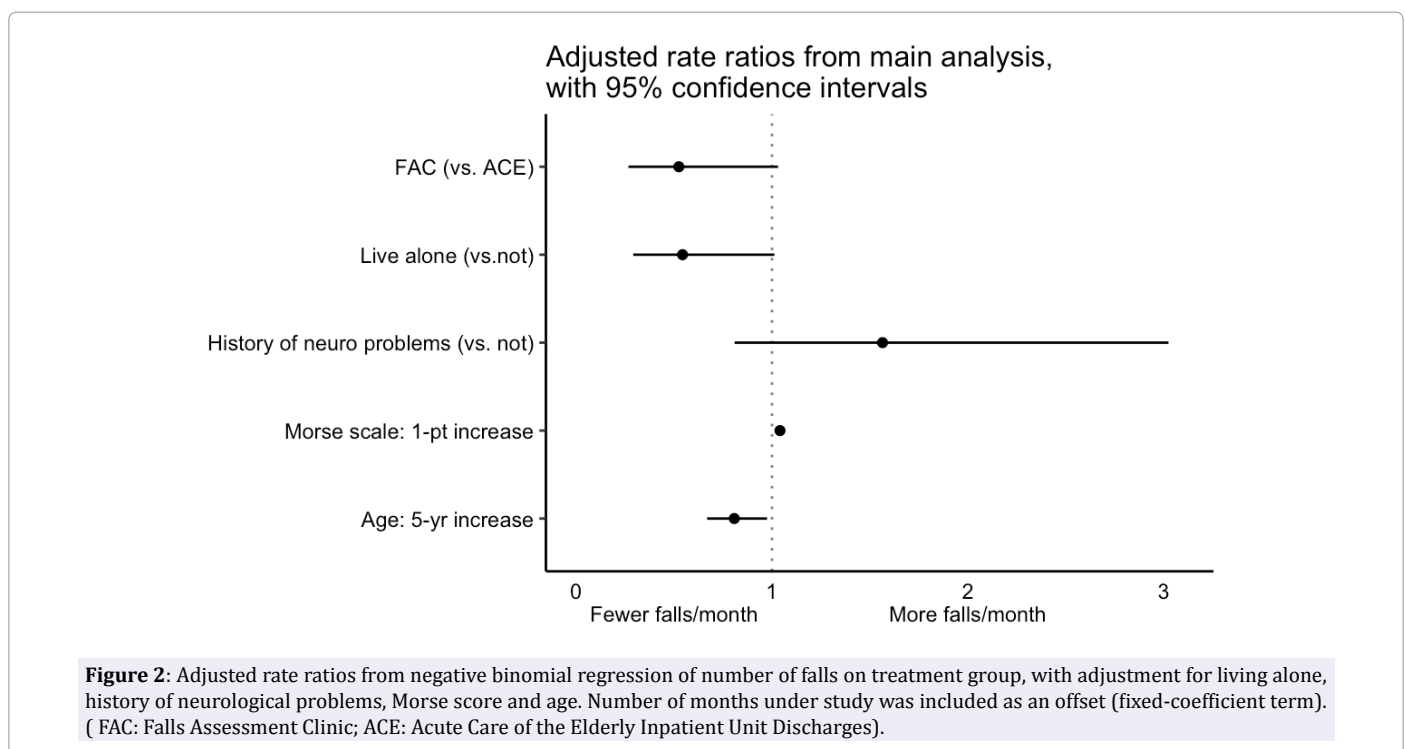
**Discussion**

The results of this prospective observational cohort study showed that a geriatric multifactorial falls assessment clinic was associated with a lower rate of subsequent falls in the next 12 months compared to patients recently hospitalized on a Geriatric Acute Care for the Elderly unit. Because other studies have shown that adults aged 65 or older with multiple risk factors for falls are expected to have a 65% to 100% (mean 82.5%) subsequent fall risk over the next 12 months [7], an intervention that reduces the rate of falls can have a broad impact.

These findings should be considered in the context of two prior randomized controlled trials for multifactorial falls assessment, both of which demonstrated negative results. A Danish trial recruited 392 patients admitted to the emergency room or hospital due to a fall and randomized patients to a falls assessment clinic intervention or usual care. The results of this study showed no difference in the rate of falls between the two groups within one year [24]. However, this study had a 35.5% enrollment of eligible patients, and patients who were high functioning or frail tended to refuse participation. An Australian trial recruited 712 patients who came to the emergency room due to a fall and randomized patients to usual care or a referral group. The referral group received an array of services including referral to their primary care physician and/or other community services in conjunction with health education about ways to prevent future falls. Within the referral group, only patients deemed at 'high risk' for falls, as determined by study clinicians, were referred to a falls assessment clinic [25]. The results of this study showed no difference between the two groups for falls within one year. However, patients

	FAC Treatment Group N = 54	ACE Comparator Group N = 42	P-value
Number of months in study, median (IQR)	12 (12, 12)	12 (12, 12)	
Died within 12 months, proportion (N)	0.11 (6)	0.21 (9)	
Number of falls per month, median (IQR)	0.0 (0.0, 0.4)	0.2 (0.1, 0.2)	$p = 0.027^1$
Presence of falls within 12 months, proportion (N)	0.48 (26)	0.81 (34)	$p < 0.001^2$

**Table 2:** One-year unadjusted outcomes and other post-baseline variables, by treatment group. (FAC: Falls Assessment Clinic; ACE: Acute Care of the Elderly Inpatient Unit Discharges; IQR: inter-quartile range. Test Statistic Used: <sup>1</sup>Wilcoxon Test <sup>2</sup>Pearson Test).



randomized to the intervention group did not all receive the same referral or support services.

In contrast, the current study followed elderly patients with multiple comorbidities for one year and compared the outcome of a falls assessment clinic to a similar population of older patients who received geriatric inpatient care but without a systematic multifactorial assessment to address fall risk. This study examined the impact of a multifactorial approach as implemented by a Geriatric Falls Assessment Clinic on the subsequent rate of falls among older at-risk patients. These results suggest that a Geriatric Multifactorial Falls Assessment Clinic may be associated with a lower rate of falls during the subsequent 12-month period in community-dwelling elderly. Other studies including group education to prevent falls among frail elderly have failed to show a reduction in fall rates with these interventions [26–28]. The introduction of PQRS falls quality indicators to primary care practices did not reduce subsequent fall rates [29]. Proactive falls risk screening and multifactorial interventions to reduce subsequent fall risk have been suggested, but this approach remains untested [30]. A recent meta-analysis of Tai Chi suggests that this intervention may be an effective primary falls preventive strategy in the community-dwelling elderly at risk for falls [31].

Another meta-analysis including 54 randomized trials and 41,595 participants with 39 interventions plus usual care suggested that exercise alone and various individualized combinations of interventions were associated with lower risk of injurious falls compared to usual care alone [32].

While promising, our study has important limitations. First, this study was a prospective observational study and we did not randomize patients to an intervention, rather we selected an appropriate comparator group who also had a high risk of falls. Secondly, this was a single-site study with a small group of patients in each group. Furthermore, enrollment into the FAC group was dependent upon a referral to the FAC clinic by providers, which may have created a biased sample of patients. However, patients recruited from the FAC remained comparable to those who were discharged from the ACE unit for most characteristics. Because the total number of falls per patient was determined at the end of a one-year study period via telephone interview for most patients, the number of falls may be underestimated; however, we do not expect that this underestimation occurred differentially between the groups. Similarly, there were 6 FAC and 9 ACE patients who died and did not have the telephone interview. For these patients fall information was collected from the medical record and may systematically underestimate the number of falls because injurious falls would more likely be documented with Emergency Department visits or hospitalizations. Again we do not think there was differential underestimation of the collection of these fall outcomes. Finally, we are unable to isolate the potential benefit of each intervention component as the components varied by the patient based on need. Despite these limitations, this study demonstrates a lower rate of falls for older patients referred to the FAC relative to similar patients discharged home with primarily physical therapy services alone.

In conclusion, these findings in a carefully followed intervention group support a multifactorial assessment and treatment approach to falls for community-dwelling older adults.

## Trial Registration

Clinicaltrials.gov Identifier: NCT02356211

## Conflict of Interest

The authors declared there is no conflict of interest.

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