Rehabilitation Services Use of Older Adults According to Fall-Risk Screening Guidelines

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OBJECTIVES: To characterize rehabilitation services use of older adults according to fall-risk classification based on screening guidelines.

DESIGN: Cross-sectional analysis of 2015 National Health and Aging Trends Study.

SETTING: Study participants' homes.

PARTICIPANTS: National sample of 7,440 community-dwelling Medicare beneficiaries.

MEASUREMENTS: In-person interviews and functional assessments. Based on Centers for Disease Control and Prevention Stopping Elderly Accidents, Deaths and Injuries criteria, participants were classified as low, moderate, or high fall risk.

RESULTS: Twenty-three percent of older adults classified as moderate fall-risk (n = 2602) and 40.6% of those at high fall-risk (n = 940) reported rehabilitation services use in the past year. Among older adults who reported rehabilitation services in the past year (n = 1,505), treatment to address falls was reported by 2.8%, 12.6%, and 34.7% of those classified with low, moderate, and high fall-risk, respectively (p < 0.001). Older adults with high fall-risk who did not receive rehabilitation services had significantly better self-reported physical capacity (p = 0.02) but comparable physical performance (all p's > 0.05) relative to those who received rehabilitation.

CONCLUSION: Older adults at high risk for falls were significantly more likely to report rehabilitation services use compared to those with low and moderate risk of falling. The findings also indicate that there is low adherence to national clinical recommendations for rehabilitation services use in older adults vulnerable to falls-related injury. Among the high fall-risk group, those who did not receive rehabilitation services had similarly low physical function as compared with those who received rehabilitation, indicating potential unmet need to address physical impairments related to fall-risk. J Am Geriatr Soc 00:1–8, 2018.

Key words: rehabilitation; falls; health services; older adults; geriatrics

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Falls are a leading cause of injury, morbidity, and functional impairment in older adults.[1–4] An estimated 30% of people aged 65 and older experience a fall annually, with significant public health implications. More than one-third of falls cause injury requiring medical treatment or activity restriction in older adults.[1] In addition, healthcare costs associated with fatal and nonfatal falls approaches $50 billion annually.[5] The substantial effect on quality of life, mortality, and health-related expenditures necessitates proactive implementation of evidence-based, fall-risk reduction strategies in older adults.

Clinical practice guidelines recommend that older adults at low and moderate fall risk participate in community-based exercise and fall prevention programs.[6,7] For older adults who are unable to participate in community-based exercise programs (e.g., those with severe mobility limitations), rehabilitation services are recommended to address modifiable fall-risk factors and improve ability to participate in community-based programs for maintenance. Little is known about rehabilitation services use of older adults at high risk of falling (whether those

at higher risk receive rehabilitation services as recommended). We recently estimated that 20% of older adults in the United States undergo rehabilitation annually (including physical, occupational, and speech therapy) across all clinical settings.[8] Seventy percent cite musculoskeletal problems and joint replacement as the primary reason for rehabilitation services use, whereas 14% report falls as a primary target for rehabilitation.[8] A study using Medicare fee-for-service claims data highlights potential underuse of rehabilitation for older adults vulnerable to recurrent falls and fall-related injuries.[9] The authors noted that 10.7% to 18.5% of older adults who sustained an upper extremity fracture underwent fall risk assessment (evaluation of fall risk, balance, and gait disorders) or physical therapy treatment for fall risk or gait problems, despite the fact that falls are the leading cause of fractures. Also of concern are social disparities in rehabilitation services use. For example, it has been reported that Hispanic and less-educated older adults were less likely to undergo fall-related rehabilitation.[10] To our knowledge, no study has specifically investigated rehabilitation services use of older adults classified according to fall-risk screening criteria.

Identifying individuals who are at high risk of falling and targeting appropriate services is a high priority. Accordingly, the Centers for Disease Control and Prevention (CDC) and the American Geriatrics Society (AGS) have published screening guidelines for falls prevention. In older adults who screen positive for high fall risk, both guidelines recommend rehabilitation to improve functional mobility; balance, strength, and gait training; and home safety,[6,7] but adherence to these guidelines is unknown. Therefore, the aims of this study were to determine the association between fall risk level (low, moderate, high) and rehabilitation services use, characterize rehabilitation services (e.g. duration of rehabilitation, treatment targets) that older adults at high risk of falling received, and determine whether physical function differed between older adults who did and did not receive rehabilitation services according to fall risk.

METHODS

We analyzed data from the 2015 wave of the National Health and Aging Trends Study (NHATS). The NHATS uses a multistage, nationally representative sample of Medicare beneficiaries for investigating trends in late-life disability.[11] Annual data collection began in 2011, with replenishment of the cohort in 2015 (Round 5). Using an age-stratified three-stage sample design with the Medicare enrollment file as the sampling frame, 8,245 participants were recruited in 2011 (Round 1), with a 71% survey response rate. Proxy respondents were used when participants could not respond for themselves. In 2015, the sample was replenished, resulting in 4,129 (50.1%) new participants in addition to 4,026 from the original sample (74% overall weighted response rate). Only community-dwelling older adults with complete interviews were included in the current analysis, resulting in an analytical sample of 7,440. In-person interviews and physical function assessments were conducted in study participants' homes during a single visit. Written informed consent was

obtained from all study participants or their proxy respondents, and the Johns Hopkins University institutional review board approved the study protocol.

Measures

Demographic Characteristics, Medical Conditions, Sensory and Impairment Symptoms, Fall History

Demographic information was collected during the interview on age, sex, self-reported race and ethnicity (categorized as white non-Hispanic, black non-Hispanic, Hispanic, other), and highest education level attained. Participants were asked whether a doctor had ever told them that they had certain medical conditions, including arthritis, osteoporosis, diabetes, heart disease, stroke, cancer, and pulmonary disease. Body mass index (BMI) was calculated from measured height and weight, and obesity was defined as a BMI of 30.0 kg/m² or greater. Participants were asked whether they had experienced bothersome pain in the last month or had balance or coordination problems in the last month. Participants also answered a series of questions about falls and worry about falls, including, "In the last 12 months, have you fallen down?" (Yes/No); "In the last 12 months, have you fallen down more than one time?" (Yes/No); and "In the last month, did you worry about falling down?" (Yes/No).

Physical Performance

Physical performance measures included grip strength testing, the five-times-sit-to-stand test, usual gait speed, and a multistage balance test. The higher value from 2 trials of grip strength testing using a hand dynamometer (in kilograms) was used for analysis. Usual gait speed was assessed in meters per second over a 3-m course from a standing start, with the higher value of 2 trials used for analysis. For the five-times-sit-to-stand test, participants started in a seated position with arms folded across the chest and were instructed to stand up and sit back down again 5 times as quickly as possible. The time to complete the test was recorded. For the balance test, participants progressed through a series of balance challenges and were instructed to hold each position for 10 seconds. If a participant could not hold a position for 10 seconds in 1 attempt, they were not asked to perform the more challenging position. The most difficult position held for the specified time was recorded as the final result. Participants progressed from standing with feet side by side to semitandem to tandem stand.

Fall-Risk Classification

We adapted criteria from the CDC Stopping Elderly Accidents, Deaths, and Injuries (STEADI) algorithm to classify participants as low, moderate, or high fall risk (Figure 1).[6,12] The STEADI algorithm involves a combination of self-reported information on falls history and performance-based assessment of physical function. According to the STEADI algorithm,[6] participants are asked whether they have fallen in the past year, worry about falling, and have problems with their balance. If they respond no to these questions, they are classified as low fall risk.
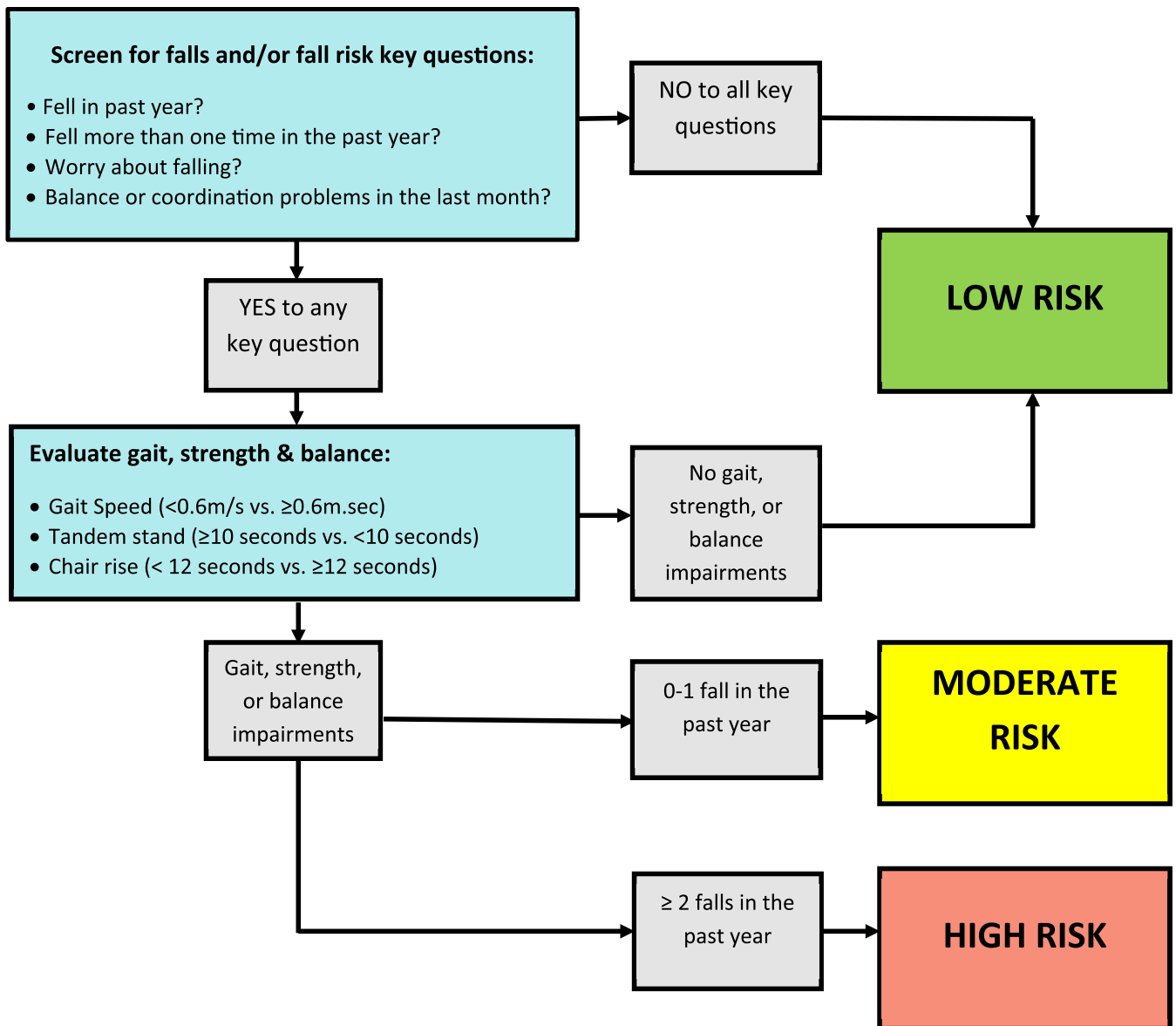
Figure 1. Centers for Disease Control and Prevention Stopping Elderly Accidents, Deaths and Injuries algorithm adapted for National Health and Aging Trends Study. [Color figure can be viewed at wileyonlinelibrary.com]

Also in accordance with the STEADI algorithm, participants who reported a fall in the past year, worry about falling, or a balance problem were evaluated for functional impairments using performance-based testing. Participants who demonstrated no balance or strength impairments (defined further below) were classified as low fall risk. Participants with an impairment in balance, chair rise, or gait speed testing were classified as moderate fall risk if they did not report 2 or more falls in the past year. Participants with an impairment on the performance-based tests and who reported 2 or more falls in the past year were classified as high fall risk. Consistent with STEADI, participants who failed to hold a tandem stand for 10 seconds or failed an easier balance test (side-by-side or semitandem stand) were considered to have a balance impairment. A score of 12 seconds or more for completing the five-times-sit-to-stand test was used as an indicator of a lower extremity strength or balance impairment.[13] A score of less than 0.6 m/s in gait speed was also used to identify mobility limitation.[14] Previous work demonstrated that usual gait speed in older adults has screening properties comparable with those of the Timed-Up-and Go Test[15] recommended in STEADI.

Rehabilitation Services Use

Questions on rehabilitation use were asked in 2015 (Round 5). After receiving a description of physical rehabilitation, participants were asked whether they had received any "rehab services" in the last year (Yes/No). Those who responded "yes" were then asked "which problems were they trying to improve" during rehabilitation, with the option to select all that applied from a comprehensive list. The selected targets for rehabilitation included addressing falls, lower extremity strengthening, treatment for balance and coordination, gait training, and transfer training. Additional questions addressed total time spent in rehabilitation

and whether the therapist recommended assistive devices or home modifications to reduce fall risk. (See Supplementary Appendix S1 for the NHATS rehabilitation questions used in this study.)

Depression and Anxiety

Symptoms of anxiety and depression were assessed using the Patient Health Questionnaire-4.[16,17] The anxiety and the depression subscales have a score range of 0 to 6; a score of 3 or higher has been validated and is considered positive for screening purposes.[16,17]

Cognitive Status

Cognitive status was classified using the AD8 Dementia Screening questionnaire.[18] Based on a previously established algorithm, participants were classified as having no dementia, possible dementia, and probable dementia.[19]

Supplemental Insurance

Participants were asked whether they had supplemental insurance coverage to Medicare, including Medigap and Medicaid.

Physical Capacity

The self-reported measure of physical capacity has previously been validated in older adults.[20] An index of physical capacity was computed from 6 pairs of tasks assessing a range of functional abilities (e.g., ability to walk 3 or 6 blocks; ability to reach overhead or place a heavy object overhead). For each pair, if a participant reported that he or she was able to perform the more challenging task then he or she was not asked about the easier version of the task and was assumed to be able to perform it. A composite score was calculated by summing the total number of activities a respondent reported that he or she was able to perform (range 0 to 12), with higher values indicating greater physical capacity.

Data Analysis

Analyses were performed using Stata version 15.1 (Stata Corp., College Station, TX). Analytical weights were used to account for survey nonresponse and oversampling of the oldest adults and racial and ethnic minorities. Taylor series linearization, incorporating the complex sample design, was used to calculate variance estimates with 95% confidence intervals. We estimated the prevalence of rehabilitation services use according to fall risk (low, moderate, high) and participant characteristics for the community-dwelling, older adult population. Within each fall-risk category, we used adjusted Wald statistics to test differences in rehabilitation use according to participant characteristics (Table 1). We used multivariable Poisson regression models to examine the association between fall risk and rehabilitation services use, adjusting for sociodemographic characteristics, health conditions, and supplemental insurance (Table 2). To further characterize rehabilitation services use, we calculated the percentage of participants reporting treatment received during rehabilitation that targets fall-risk reduction (Table 3). Within each fall-risk group, we used linear and Poisson regression to model the association between

rehabilitation services use and physical performance measures (tandem stand, gait speed, five-time sit-to-stand, grip strength) and self-reported physical capacity, adjusting for age and sex (Table 4).

RESULTS

Applying the STEADI algorithm to a representative population of Medicare beneficiaries, 29.9% (n = 2,602) were classified as being at moderate risk of falling and 11.6% (n = 940) at high fall-risk. Of those at moderate risk, 23.3% (n = 597) reported rehabilitation services use in the past year, and of those at high risk, 40.6% (n = 372) reported rehabilitation services. Of those at high risk, rehabilitation services use was associated with older age, higher education, non-Hispanic white race and ethnicity, a diagnosis of arthritis, and being overweight or obese (Table 1).

After adjusting for sociodemographic characteristics, rehabilitation services use was 70% higher for older adults classified as being at moderate risk than for those at low risk and 3 times higher for those at high risk (Model 1; Table 2). In the fully adjusted model, which also included health conditions, symptoms, and sensory impairments, rehabilitation services use remained significantly higher in older adults at moderate and high risk of falling than in those at low risk. In Models 1 and 2, those at high risk of falling were significantly more likely to use rehabilitation services than those at moderate risk (P < .001).

Of participants classified as being at moderate risk of falling, 2.9% (n = 81) had received rehabilitation services to address falls in the past year, and of those at high risk, 14.1% (n = 137) had received services (see Supplementary Figure S1). Table 3 shows that, of older adults who received rehabilitation services, 12.6% of those at moderate risk of falling and 34.7% of those at high risk had falls addressed explicitly during rehabilitation. Forty-five percent of those at moderate risk and 57% of those at high risk reported treatment to address balance, whereas 58% of those at moderate risk and 66% of those at high risk worked on strengthening during rehabilitation (Table 3). Fewer than half of those at moderate and high risk of falling reported a prescription for a mobility device, such as a walker, during rehabilitation. In addition, approximately one-third of those at moderate and high risk received rehabilitation treatment that addressed leaving home or climbing stairs; 48% of those at moderate risk and 58% of those at high risk received treatment that targeted walking inside the home.

Physical function was significantly poorer in those at moderate fall risk who received rehabilitation than in those who did not, adjusting for age and sex (Table 4). Physical function measures were comparable (statistically non-significant) between older adults at high fall risk who had and had not received rehabilitation services in the past year (Table 4), although those who received rehabilitation services had significantly poorer self-reported physical capacity compared to those who did not (6.7 vs 5.9, p = .02), adjusting for age and sex.

DISCUSSION

According to the CDC STEADI and AGS and British Geriatrics Society recommendations, older adults who screen positive for being at high risk of falling should be referred

Table 1. Rehabilitation Services Use According to Participant Characteristic and Fall Risk in Adults Aged 65 and Older

	Low		Moderate		High	
	No	Yes	No	Yes	No	Yes
Characteristic			n (Weighted %)			
Age						
65–69	641 (35.7)	92 (35.1)	162 (18.4)	44 (17.3)	70 (26.8)	26 (16.2)
70–74	982 (30.3)	150 (31.4)	332 (21.7)	95 (21.7)	109 (23.5)	74 (27.3)
75–79	764 (17.9)	110 (18.5)	398 (21.0)	111 (18.1)	109 (17.9)	68 (18.5)
80–84	535 (9.5)	68 (8.1)	441 (17.1)	145 (20.3)	109 (14.0)	88 (19.1)
85–89	316 (4.9)	50 (5.0)	381 (13.7)	113 (13.5)	94 (10.6)	54 (9.7)
≥90	154 (1.8)	24 (1.9)	291 (8.3)	89 (9.1)	77 (7.2)	62 (9.2)[1]
Sex						
Male	1,625 (49.3)	208 (44.6)	712 (38.3)	189 (32.6)	253 (44.8)	150 (43.0)
Female	1,767 (50.7)	286 (55.4)	1,293 (61.7)	408 (67.4)[1]	315 (55.2)	222 (57.0)
Race and ethnicity						
Non-Hispanic white	2,250 (79.8)	376 (87.4)	1,353 (77.7)	428 (83.7)	379 (79.2)	274 (83.1)
Non-Hispanic black	754 (8.7)	83 (6.4)	415 (9.2)	110 (7.9)	121 (9.1)	49 (4.6)
Hispanic	192 (7.2)	16 (3.8)	139 (8.8)	25 (5.0)	39 (7.3)	26 (7.7)
Other	109 (4.4)	9 (2.4)[2]	65 (4.3)	14 (3.4)	17 (4.4)	12 (4.6)[2]
Education						
< High school	277 (6.4)	15 (2.1)	260 (11.8)	50 (7.4)	103 (15.6)	36 (8.8)
9–11 years	324 (7.2)	36 (5.0)	294 (13.2)	71 (10.4)	78 (11.6)	42 (9.7)
High school graduate	843 (23.7)	106 (22.0)	574 (29.6)	171 (30.1)	163 (31.8)	94 (27.7)
Some college	920 (30.8)	137 (26.9)	477 (25.8)	141 (25.2)	135 (26.1)	91 (26.0)
College grad	463 (16.0)	87 (20.3)	220 (12.6)	73 (13.5)	48 (8.2)	47 (13.3)
Advanced degree	478 (15.8)	102 (23.7)[2]	143 (7.1)	70 (13.5)[2]	32 (6.7)	50 (14.4)[2]
Has Medicaid	397 (8.5)	33 (4.9)[2]	326 (14.8)	92 (13.4)	127 (19.4)	78 (21.5)
Has Medicare supplement	2,059 (63.0)	320 (65.9)	1,156 (58.7)	374 (63.3)	303 (54.0)	223 (59.8)
Arthritis	1,673 (44.8)	326 (62.2)[2]	1,387 (64.5)	445 (72.3)[2]	429 (74.2)	301 (80.9)[1]
Heart disease	630 (16.9)	117 (21.0)	569 (27.4)	215 (35.7)[2]	194 (33.5)	148 (34.3)
Stroke	99 (3.0)	26 (3.9)	145 (8.4)	77 (11.9)	58 (13.7)	57 (16.6)
Osteoporosis	598 (16.7)	122 (21.4)[1]	583 (27.3)	211 (32.7)	164 (27.8)	137 (30.9)
Weight						
Normal	1,077 (31.7)	152 (30.2)	633 (29.3)	178 (25.7)	167 (26.7)	115(27.6)
Underweight	49 (1.6)	7 (1.5)	53 (2.4)	17 (2.6)	12 (1.5)	21 (4.8)
Overweight	1,279 (38.8)	197 (41.1)	652 (33.5)	198 (34.5)	177 (30.7)	118 (35.6)
Obese	909 (27.9)	132 (27.2)	587 (34.8)	191 (37.2)	189 (41.2)	109(32.1)[1]
Bothersome pain	1,365 (40.1)	293 (57.7)[2]	1,262 (64.1)	439 (76.0)[2]	415 (76.5)	286 (81.5)
Depressive symptoms	231 (6.1)	35 (6.8)	349 (17.8)	110 (17.6)	169 (29.9)	108(29.3)
Anxiety symptoms	155 (4.5)	30 (6.3)	309 (16.7)	89 (14.5)	135 (25.8)	91 (24.9)
Cognitive status						
No dementia	2,897 (90.2)	443 (92.8)	1,451 (76.7)	437 (76.5)	386 (74.2)	247 (70.4)
Possible dementia	307 (6.7)	24 (3.8)	274 (12.1)	74 (11.7)	80 (11.7)	47 (11.3)
Probable dementia	186 (3.1)	27 (3.4)	278 (11.1)	86 (11.7)	102 (14.2)	74 (18.3)

$P <$ [1].05; [2].01.

to rehabilitation. Important findings of our study of Medicare beneficiaries in 2015 show that fewer than half of older adults at high fall risk reported rehabilitation services use in the past year, indicating limited adherence to clinical practice guidelines, and that of those at high fall risk who received rehabilitation services, just over one-third reported that their treatment addressed falls, and approximately half received balance training. Although it is reassuring that older adults at high fall risk are significantly more likely to receive rehabilitation services than those at low or moderate risk, the percentage of moderate- and high-risk older adults who did not have strength, balance, or falls addressed during rehabilitation is a serious concern. Although the original reason for rehabilitation may not have been fall related, rehabilitation services use for reasons other than a fall

Table 2. Association Between Undergoing Rehabilitation in Past Year and Fall Risk

		Model 1[1]	Model 2[2]
Fall Risk	n (%)	Prevalence Ratio (95% Confidence Interval)	
Low	494 (13.5)	1.0	1.0
Moderate	597 (23.3)	1.7 (1.5–2.0)	1.5 (1.3–1.7)
High	372 (40.6)	3.1 (2.6–3.6)[3]	2.3 (1.9–2.8)[3]

[1]djusted for age, sex, race, ethnicity, and education.
[2]Adjusted for age, sex, race, ethnicity, education, arthritis, stroke, bothersome pain, weight status, multimorbidity, Medicaid supplement, Medigap supplement, depression, anxiety, dementia classification.
[3]$P < .001$ for rehabilitation services use of those at moderate risk versus high risk of falling.

Table 3. Characterization of Rehabilitation Services Use Stratified According to Fall Risk in Participants Who Reported Rehabilitation Services Use in 2015 (N = 1505, a subpopulation of the total sample of 7428)

Rehabilitation Service Use	Low, n = 499	Moderate, n = 615	High, n = 391	*P*-Value
Time in rehabilitation, months				.62
<1	122 (24.8)	129 (23.4)	81 (23.4)	
1–3	302 (62.5)	354 (57.9)	213 (57.3)	
>3	66 (12.7)	108 (18.6)	75 (19.3)	
Reported goal of rehabilitation treatment				
Address falls	18 (2.8)	81 (12.6)	137 (34.7)	<.001
Balance, coordination	79 (13.4)	270 (45.0)	217 (57.2)	<.001
Strengthening	227 (44.8)	344 (58.1)	242 (65.6)	<.001
Improve function in legs	101 (18.6)	258 (38.9)	186 (46.8)	<.001
Functional limitations addressed in rehabilitation				
Bed transfers	70 (15)	119 (20.4)	101 (26.5)	<.001
Walking inside home	148 (27.8)	294 (48.4)	221 (57.9)	<.001
Leaving home	106 (20.0)	172 (28.6)	133 (34.9)	<.001
Walking outside	217 (42.9)	277 (49.6)	157 (43.2)	.20
Climbing stairs	146 (28.6)	172 (31.4)	123 (33.6)	.32
Therapist-recommended assistive device in past year				
Cane or walker	113 (18.8)	260 (40.6)	193 (48.0)	<.001
Wheelchair or scooter	23 (4.3)	88 (11.8)	82 (19.2)	<.001
Entrance ramp	8 (1.5)	38 (6.3)	36 (8.2)	<.001
Stair lift	2 (0.1)	8 (2.0)	6 (1.2)	.02
Grab bar (shower, tub)	66 (11.4)	176 (26.9)	165 (39.1)	<.001
Toilet modification (raised, bar)	53 (8.8)	141 (20.5)	108 (25.4)	<.001

should not preclude screening for fall risk, with subsequent referral for treatment of risk factors (e.g., strength and balance deficits), or addressing modifiable risk factors during the current episode of care. Thus, despite public health campaigns promoting falls screening and prevention services, greater efforts are needed to refer older adults at high fall risk to rehabilitation services that directly address functional impairments and other risk factors.

Older adults at high risk of falling who did not receive rehabilitation services had significantly better self-reported physical capacity than those who reported rehabilitation services use. In contrast, multiple objective measures of physical performance were comparably low in those who did and did not receive rehabilitation services, underscoring

the potential unmet need in this vulnerable population. These findings suggest that referral for and uptake of rehabilitation services may depend on perception of need for services. Clinicians who rely solely on self-report of physical function when screening for fall risk (do not use performance-based assessment of physical function) may miss critical opportunities to identify fall risk and make referrals for effective interventions. Severe underreporting of fall-related injuries, particularly in nonwhite and healthier older adults, is further reason for including performance-based measures of fall risk screening in clinical practice.[21] Further research is needed to better understand older adult and clinician perceptions of need for rehabilitation services.

Table 4. Physical Function Characteristics According to Rehabilitation Services Use and Fall Risk

Physical Function Characteristics	Low Fall Risk		Moderate Fall Risk		High Fall Risk	
	No	Yes	No	Yes	No	Yes
Unable to hold tandem balance for 10 seconds, n (%)	928 (20.9)	123 (16.8)[1]	1384 (64.0)	435 (71.4)[1]	422 (69.2)	296 (76.3)
Gait speed, m/s						
Mean (SE)*	0.93 (0.01)	0.95 (0.01)	0.69 (0.01)	0.67 (0.01)	0.67 (0.01)	0.64 (0.02)
<0.8 m/s, n (%)	1,277 (29.6)	156 (23.5)[1]	1,546 (74.6)	488 (79.3)	457 (77.5)	301 (78.6)
<0.6 m/s, n (%)	584 (11.5)	76 (9.4)	928 (40.3)	327 (48.4)[1]	321 (52.1)	227 (57.5)
Five-time-sit-to-stand, seconds						
Mean (SE)	10.8 (0.2)	10.5 (0.2)	13.5 (0.2)	13.7 (0.2)[1]	14.3 (0.3)	14.3 (0.5)
≥12, n (%)	1,204 (29.9)	173 (28.8)	1,442 (73.7)	473 (81.4)[2]	434 (78.6)	292 (82.1)
Grip strength, kg, mean (SE)	29.4 (0.2)	28.1 (0.5)[1]	24.7 (0.4)	22.5 (0.5)[2]	25.2 (0.7)	23.1 (0.9)
Self-reported physical capacity, mean (SE)	10.8 (.04)	10.4 (0.1)[2]	7.8 (0.1)	6.4 (0.2)[2]	6.7 (0.2)	5.9 (0.2)[1]

P < [1].05, [2].01 comparing older adults who used rehabilitation services in the past year with those who did not, adjusted for age and sex.
*SE=standard error.

There are several strengths and weaknesses to consider when interpreting the current study results. The cross-sectional design limits any claims of a relationship between rehabilitation services use and timing of fall occurrence. Although study participants were asked a range of questions about rehabilitation services, they were not asked about the type of clinician who provided rehabilitation services (physical, occupational, or speech therapist). In addition, we were not able to discern how many older adults at high fall risk were participating in community-based fall prevention programs or in exercise programs such as the Otago Program, which results in some limitations in distinguishing the rehabilitation services received and characterizing unmet need. Another limitation is that self-report of falls and rehabilitation services use may result in underestimation, although similar estimates were made of rehabilitation services use in the past year when comparing self-report with Medicare claims data for the overall NHATS sample,[22] which supports the validity of self-reported rehabilitation services data. A major strength of this study was the inclusion of several falls-related questions and a combination of self-reported and performance-based measures of physical functioning, enabling use of the CDC STEADI algorithm in a nationally representative sample of older adults. There are some differences between the physical function measures used in NHATS and those recommended in the CDC STEADI toolkit that might result in misclassification of fall-risk, but the validity of using the NHATS physical performance measures to adapt the STEADI algorithm and predict future falls was previously demonstrated.[23]

Deaths attributable to falls in the United States increased by 31% between 2007 and 2016, and fall-related mortality increased the most in the oldest old.[24] Improvements in screening and referrals to evidence-based programs, including community-based fall prevention programs, exercise, and rehabilitation, are a critical component of reducing the alarming upward trend in fall-related mortality,[25,26] The Medicare-sponsored annual wellness visit is a primary opportunity to conduct a fall-risk screening. Although the STEADI toolkit was designed for broad dissemination and implementation by healthcare providers, the current study findings indicate limited uptake. Improvements in fall-risk screening of older adults may help to mitigate the unmet need for services and identify older adults who could benefit from targeted balance, strength, and functional training and home assessments for safety.

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REFERENCES

1. Bergen G, Stevens M, Burns E. Falls and fall injuries among adults aged ≥65 years—United States, 2014. MMWR Morb Mortal Wkly Rep 2016;65:993–998.
2. Sattin RW, Lambert Huber DA, Devito CA et al. The incidence of fall injury events among the elderly in a defined population. Am J Epid 1990;131:1028–1037.
3. Gill TM, Allore HG, Holford TR et al. Hospitalization, restricted activity, and the development of disability among older persons. JAMA 2004;292:2115–2124.
4. Kannus P, Parkkari J, Niemi S et al. Fall-induced deaths among elderly people. Am J Public Health 2005;95:422–424.
5. Florence CS, Bergen G, Atherly A et al. Medical costs of fatal and nonfatal falls in older adults. J Am Geriatr Soc 2018;66:693–698.
6. Make STEADI Part of Your Medical Practice|STEADI—Older Adult Fall Prevention|CDC Injury Center (online). Available at https://www.cdc.gov/steadi/ Accessed April 15, 2017.
7. Panel on Prevention of Falls in Older Persons AGS and BGS. Summary of the updated American Geriatrics Society/British Geriatrics Society clinical practice guideline for prevention of falls in older persons. J Am Geriatr Soc 2011;59:148–157.
8. Gell NM, Mroz TM, Patel KV. Rehabilitation services use and patient-reported outcomes among older adults in the United States. Arch Phys Med Rehabil 2017;98:2221–2227.
9. McDonough CM, Colla CH, Carmichael D et al. Falling down on the job: Evaluation and treatment of fall risk among older adults with upper extremity fragility fractures. Phys Ther 2017;97:280–289.
10. Moreland BL, Durbin LL, Kasper JD et al. Rehabilitation utilization for falls among community-dwelling older adults in the United States in the national health and aging trends study. Arch Phys Med Rehabil 2018;99:1568–1575.
11. Kasper JD, Freedman VA. National Health and Aging Trends Study Round 1 User Guide: Final Release. Baltimore: Johns Hopkins University School of Public Health, 2012.
12. Stevens JA, Phelan EA. Development of STEADI: A fall prevention resource for health care providers. Health Promot Pract 2013;14:706–714.
13. Tiedemann A, Shimada H, Sherrington C et al. The comparative ability of eight functional mobility tests for predicting falls in community-dwelling older people. Age Ageing 2008;37:430–435.
14. Cummings SR, Studenski S, Ferrucci L. A diagnosis of dismobility—giving mobility clinical visibility: A mobility working group recommendation. JAMA 2014;311:2061–2062.
15. Viccaro LJ, Perera S, Studenski SA. Is timed up and go better than gait speed in predicting health, function, and falls in older adults? J Am Geriatr Soc 2011;59:887–892.
16. Kroenke K, Spitzer RL, Williams JBW et al. An ultra-brief screening scale for anxiety and depression: The PHQ-4. Psychosomatics 2009;50:613–621.
17. Löwe B, Kroenke K, Herzog W et al. Measuring depression outcome with a brief self-report instrument: Sensitivity to change of the Patient Health Questionnaire (PHQ-9). J Affect Disord 2004;81:61–66.
18. Galvin JE, Roe CM, Powlishta KK et al. The AD8: A brief informant interview to detect dementia. Neurology 2005;65:559–564.
19. Kasper JD, Freedman VA, Spillman B. Classification of Persons by Dementia Status in the National Health and Aging Trends Study. Technical Paper #5 (online). Available at http://nhats.org/scripts/documents/DementiaTechnicalPaperJuly_2_4_2013_10_23_15.pdf Accessed October 17, 2017.
20. Freedman VA, Kasper JD, Cornman JC et al. Validation of new measures of disability and functioning in the national health and aging trends study. J Gerontol A Biol Sci Med Sci 2011;66A:1013–1021.
21. Hoffman GJ, Ha J, Alexander NB et al. Underreporting of fall injuries of older adults: Implications for wellness visit fall risk screening. J Am Geriatr Soc 2018;66:1195–1200.
22. Freedman VA, Kasper JD, Jette A. Can older adults accurately report their use of physical rehabilitation services? Arch Phys Med Rehabil 2018;99:1507–1513.
23. Lohman MC, Crow RS, DiMilia PR et al. Operationalisation and validation of the stopping elderly accidents, deaths, and injuries (STEADI) fall risk algorithm in a nationally representative sample. J Epidemiol Community Health 2017;71:1191–1197.
24. Burns E, Kakara R. Deaths from falls among persons aged ≥65 years—United States, 2007–2016. MMWR Morb Mortal Wkly Rep 2018;67:509–514.
25. El-Khoury F, Cassou B, Charles M-A et al. The effect of fall prevention exercise programmes on fall induced injuries in community dwelling older adults: Systematic review and meta-analysis of randomised controlled trials. BMJ 2013;347:f6234.

26. Hauer K, Rost B, Rütschle K et al. Exercise training for rehabilitation and secondary prevention of falls in geriatric patients with a history of injurious falls. J Am Geriatr Soc 2001;49:10–20.

SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article.

Supplementary Appendix S1. Subset of National Health and Aging Trends Study Round 5 Rehabilitation Questions (www.nhats.org)

Supplementary Figure S1. Prevalence (95% confidence interval) of older adults receiving fall-related rehabilitation treatment (N = 7,428): National Health and Aging Trends Study, 2015.