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Circumstances of falls and fear of falling in community-dwelling older adults with cancer: Results from a mixed-methods study

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ABSTRACT

Background: Falls are common among older adults and are of added concern among those with cancer due to cancer and its treatments. Knowledge on circumstances surrounding falls and fear of falling is vital for understanding how various factors may precipitate falls and for informing development of effective fall prevention interventions. The aim of the study was to explore circumstances of falls and fear of falling in community-dwelling older adults with cancer.

Method: A convergent-parallel mixed-methods design was used in this cross-sectional study. Community-dwelling older adults (aged ≥65) with cancer who experienced ≥1 fall in the past year were recruited ($N = 100$) from the Princess Margaret Cancer Centre in Toronto, Canada. Data collection included patient self-reported survey and open-ended interview. Descriptive statistics for quantitative data and thematic analyses for qualitative data were conducted.

Results: One hundred sixty-eight falls were recalled. Falls occurred mostly indoor, during the day and during normal, non-hazardous activities. Many participants had a fall when not using their walking aid. While some participants (15%) attributed their falls to bad turns or tripping, others blamed themselves for being careless or foolish. Themes from qualitative interviews included 'cognitive appraisal of falls', 'mobility-related fall reasons', and 'opportunity for health-teaching'.

Conclusion: Circumstances of falls seem to be similar to those in the general geriatric population. Strategies for fall prevention and management used in the general geriatric population may potentially benefit this population as well. Attention may be warranted specifically regarding medication review, health-teaching on fall safety, home safety evaluation, and balance training referral.

1. Introduction

Falls are a major health concern in individuals ≥65 years of age, with at least one in three elders who live in the community sustaining a fall each year [1,2]. Older adults with cancer have added risks of falling due to the cancer itself and/or the toxicities of cancer treatments [3,4]. Research suggests that nearly 20% of newly diagnosed older cancer patients have ≥1 fall in a six-month period [5], and the fall rate in those with advanced cancer can be as high as 53% over six months [6]. Consequently, increase in the population of those who are older with cancer may lead to an increase in those who fall within the oncology setting.

Research shows that falls can lead to fear of falling (FOF), which can portend activity restrictions and subsequent falls [7]. Additionally, the activity an individual is conducting at the time the fall occurs has long been established as an important component of evaluating a fall [8]. Knowledge regarding the circumstances surrounding falls is vital for understanding how various factors (e.g., intrinsic, environment, and behaviors) may precipitate a fall as well as for informing development of effective interventions to prevent falls in older adults [9]. This paper reports on findings on circumstances of falls and older patient FOF in the post-fall context, which is part of the investigation of a larger, mixed-methods study exploring assessment, management, and impact of falls [10].

Fall assessment in an older person should include a detailed description of the symptoms preceding the fall, as well as circumstances of the fall [11]. This information is particularly important in older cancer patients due to their added vulnerability related to their cancer and cancer treatment. A recent systematic review [12] revealed that there is a paucity of published information on circumstances related to a fall in older cancer patients. The current study seeks to address this gap.

The research questions were:

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1. What are the circumstances of falls in community-dwelling older adults with cancer (who are on treatment or referred for treatment)?
2. What is the level of fear of falling (FOF) in the post-fall context in this population?

2. Methods

2.1. Study Design

Utilizing a convergent parallel mixed methods design [13], this cross-sectional study collected quantitative and qualitative data concurrently regarding circumstances of falls and FOF. A mixed methods approach was used to provide a more thorough understanding of the research questions compared to either quantitative or qualitative approach alone [13].

2.2. Research Ethics Boards Approval and Informed Consent

Approvals were obtained from the Research Ethics Boards at the University Health Network (UHN) and the University of Toronto prior to the start of the study. Written informed consent was obtained from all participants prior to data collection (including audio-recording the interview).

2.3. Sample and Setting

The sample size of this exploratory study was 100.
Inclusion criteria:

- community-dwelling and aged 65 and older;
- receiving/planned cancer treatment at the medical or radiation oncology clinics of Princess Margaret Cancer Centre, Toronto;
- diagnosed with any solid tumor or hematological malignancy;
- a fall within the past 12 months;
- life expectancy >6 months
- able to communicate in English and provide informed consent.

2.4. Recruitment Procedures

Patient recruitment took place from October 27, 2016 to November 29, 2017. Staff in the medical and radiation oncology clinics and the Older Adults with Cancer Clinic (OACC) were asked daily during weekdays if there was any older patient deemed eligible. Those fitting the inclusion criteria were asked by a member of the patient's circle of care team for permission to be approached to explain the study. Ten eligible patients did not participate: refusal ($n = 4$), 'not interested' (n = 4), 'already in another study' ($n = 1$), and deemed unfit by oncologist (n = 1). One participant under 65 was mistakenly recruited due to miscommunication with clinic staff.

2.5. Data Collection Procedures

Data collection occurred during the clinic visit. Patients completed a survey and a semi-structured interview with the study PI (SS) after survey completion. The survey and the interview took place during the same encounter. As there were no existing tools to measure circumstances of falls, the patient survey and interview guide were developed with expert consensus of the research team and based on the fall preventions guidelines of the American Geriatrics Society/British Geriatrics Society (AGS/BGS) [11]. Patients were given the options to fill out the survey themselves or to complete it verbally (with the PI asking them the questions and writing down answers) to ensure flexibility [14]. On average it took 20–30 min to complete the survey and interview.

2.6. Measures

Falls were assessed retrospectively for 12 months by self-report. Information on circumstances of falls, including time, location, physical sensations, physical environment and activities at the time of the fall were collected via a survey developed following the Clinical Practice Guideline by the AGS/BGS [11]. Open-ended interview questions (developed also following the AGS/BGS guideline) [11] asked patients to elaborate on the circumstances of their fall. See Supplementary File 1 for interview guide and Supplementary File 2 for patient survey.

2.6.1. Fear of Falling

The Fall Efficacy Scale-International (FES—I) [15] was used to assess for current attitude toward fall safety. This validated instrument [16] and has been used in cancer population in Canada [17]. The level of fear of falling was dichotomized as high/low based on the cut off score of 23 to distinguish level of concern about falls [16].

2.7. Data Analysis

For the quantitative data, descriptive statistics (means, frequencies, and proportions) were used to describe participant characteristics, circumstances of falls, location, timing, activity, physical sensation, and use of walking aid when the falls occurred utilizing SPSS version 20. Qualitative data were examined using thematic analysis following the 6-phase step-by-step guide to thematic analysis as prescribed by Braun & Clarke [18]. To ensure quality and rigor, the Good Reporting of a Mixed Methods Study (GRAMMS) framework was used to guide this study at every stage of this study's development and execution [19].

3. Results

A total of 100 older adults participated (62% male). See Table 1 for participant characteristics. The median age was 76 years. The most common cancer sites included prostate (34%), breast (12%), and hematological (10%). A total of 168 falls were described by the participants (see Table 2). The number of falls per participant ranged from one fall to >10 falls. The majority (66%) fell more than once.

3.1. Research Question 1: What Were the Circumstances of Falls?

Sixty-one (36%) of the falls occurred at home (see Table 3). The majority of the falls (47%) occurred in the afternoon. The most common locations of falls were living room (14%), bathroom (13%), bedroom (10%), staircase (9%), and sidewalk curb (10%). Forty-five percent of the falls were not accompanied by any particular physical sensations before falling. Of those who reported physical sensations prior to a fall (n = 91), feeling weak (16%), dizzy (12%), unsteady/difficulty balancing (11%) were the most common sensations. Walking (31%), changing position (getting up from sitting or from standing to sitting) (8%), going up/down stairs (7%), negotiating curb/step (7%), and turning (4%) were the most common activities at the time of the fall. Of those who had a fall on the stairs (n = 15), one-third was carrying large, bulky objects (e.g., suitcase, sewing machine). Among those for whom normally used a walking aid (n = 52), 19 (37%) were not using their walking aids when their falls occurred. Among those with serious injurious (e.g., fractures and head injuries) (n = 21), 25% had used psychotropics and 25% had used diuretics at the time of the falls.

Themes from the open-ended interviews were: 'cognitive appraisal of the fall' (blaming self for bad choices and not talking about things regarding their physical capacity and power [n = 9]; willingness to take extra cautions to avoid further falls [n = 39]); 'mobility-related fall reasons' (participants described tripping and/or not being good at turns [n = 12]; many participants acknowledged that they did not use their

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Table 1
Participant characteristics.

Participant characteristics	N = 100 (%)
Median age, years	76 (SD 7.5)
Women	38 (38%)
Living alone	18 (18%)
Years of education	
0–4	6 (6%)
5–8	8 (8%)
9–12	29 (29%)
13 or more	57 (57%)
Fall frequency in past 12 months	
1 fall	44 (44%)
≥ 2 falls	56 (56%)
Injurious fall rate[a]	45%
Cancer diagnosis	
Prostate	34 (34%)
Gynecological	14 (14%)
Breast	12 (12%)
Hematological	10 (10%)
Others	10 (10%)
Lung	7 (7%)
Head & neck	5 (5%)
Pancreatic	5 (5%)
Skin Melanoma	2 (2%)
Colorectal	1 (1%)
Cancer stage	
1–2	19 (19%)
3–4	81 (81%)
Treatment at time of fall[b]	
Chemotherapy	38(38%)
Hormone	31(31%)
Targeted therapy	9(9%)
Radiation	8(8%)
Others	3(3%)
Chemoradiation	3(3%)
Radiation + hormone	2(2%)
Chemotherapy + targeted therapy	2(2%)
Pre-treatment	2(2%)
Chemotherapy + hormone	1(1%)
Hormone + targeted therapy	1(1%)
Functional status	
Use of walking aid[c]	55 (55%)
IADL impairment	66 (66%)
Comorbidities & medications	
Median number of comorbidities	3 (SD 2.4)
Depression	12 (12%)
≥ 5 medications	65 (65%)
Anti-hypertensives	45 (45%)
Psychotropic medications	26 (26%)
Diuretics	25 (25%)

[a] Based on 76 injurious falls out of 168 total falls.
[b] Based on 100 participants.
[c] At time of survey.

walking aid [n = 19]); and 'opportunity for health-teaching' (older patients may benefit from reminders regarding safety [n = 6]). Table 4 provides an overview of themes and quotes.

Table 2
Number of falls sustained by participants within the past 12 months.

Number of falls	n (%)
1	44 (44%)
2	34 (34%)
3	12 (12%)
4	4 (4%)
≥ 5	6 (6%)

3.2. Research Question 2: What Is the Level of Fear of Falling (FOF) in the Post-Fall Context?

More than half of the participants (55%) reported a high level of FOF based on the FES-I cut-off [15] (mean score 26.41 ± 10.44). Under the theme "cognitive appraisal of fall", the notion of taking extra caution (as mentioned above) to avoid further falls was pervasive across participants. Participants described being extra careful or taking up strategies (e.g., putting in new carpet, moving furniture out of the way) since the falls. However, while FOF was high, reducing activities in the post-fall context was rare. Some participants even reported that, rather than reducing activities, they had actually become more active, albeit being more careful (e.g., enlisting a 'gym buddy' to avoid work out together).

4. Discussion

This study found that falls in community-dwelling older adults with cancer occurred most often indoors, during the day and when conducing non-hazardous activities, such as walking. Falls on staircases and at sidewalk curbs were also common. The most commonly reported physical sensation preceding fall were weakness, dizziness, and difficulty balancing. Participants also alluded to tripping/not lifting foot high enough, and bad turns. Self-blaming for the falls were common. Many participants did not use their walking aids at the time of the fall. Cancer-related symptoms such as cancer-related pain and peripheral neuropathy were not commonly reported as sensations preceding falls. Circumstances of falls as alluded to by participants such as dizziness, balance difficulties, falling while walking, falling at home, falling in the bathroom all align with findings in the general geriatric population [9,20,21].

Falling while walking was also a theme in a previous qualitative study exploring circumstances of falls in community-dwelling older adults with cancer [22]. The majority of the falls occurred during the day, which is not surprising since that is the time period during which most activities normally occur for older adults [23]. Furthermore, in our study, 16% of injuries occurred in the bathroom at home. In fact, evidence shows that the likelihood of sustaining an injury from falling in the bathroom was nearly 2.5 times higher than the living room [9]. Over half (60%) of our participants who had a fall in the bathroom sustained injuries. This indicates that improvements in the bathroom to promote safety (e.g., occupational therapist assessment) could be beneficial to reduce future injurious falls. Active, healthy older adults are more likely to fall outdoors [24]. The fact that many had a fall indoor highlights the vulnerability of this group [25]. Over half of our participants had >1 falls, which made them a person who had recurrent falls [20]; the proportion recurrent fallers in our study is somewhat higher than previously reported in the general geriatric population [26,27]. This suggests that fall assessment may be important to identify this vulnerable sub-group so that timely interventions could be carried out to mitigate falls and associated injuries. Falls prevention programs and other targeted interventions have been found to be most effective in recurrent fallers [28]. Moreover, those who had falls more frequently may have viewed the falls differently than those who had only one fall. The single fallers seemed to view their falls as one-off incidents and did not think much of it. As for the participants who had multiple falls, some may have accepted that falls are a part of life in old age. As for falls that were 'one-off' incidents, the 'randomness' of such falls may be something that could be a good starting point of conversation when exploring with patients (in particularly those of more robust health and functional status) regarding their attitudes toward fall safety – as falls may not necessarily happen exclusively to frail older adults only.

Many of our participants blamed not being good at turning for the fall. This may be related to reduction of resources to adapt to changes due to aging. About one-third of falls in the general older population are related to tripping or slipping [9]. Older individuals have increased

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Table 3
Overview of circumstances of falls.

Circumstances of falls	168 falls (%)
Location	
Indoor	
At Home	
Living room	24 (14%)
Bathroom/shower	21 (13%)
Bedroom	16 (10%)
Staircase	15 (9%)
Kitchen	13 (8%)
Hallway/corridor	5 (3%)
Other areas at home	3 (2%)
Hospital locations	7 (4%)
Other public buildings	8 (5%)
Outdoor	
Sidewalk curb	17 (10%)
On sidewalk	9 (5%)
Backyard	8 (5%)
Park/Golf course	7 (5%)
Parking lot/driveway	6 (4%)
Other outdoor locations	6 (4%)
Front/back door (house)	3 (2%)
Time of the day	
Morning	61 (36%)
Afternoon	79 (47%)
Evening	11 (7%)
Night	10 (6%)
Can't recall	7 (4%)
Activity	
Walking	52 (31%)
Can't recall	24 (14%)
Changing position[a]	14 (8%)
Negotiating curb/step	11 (7%)
Standing	10 (6%)
Performing task	8 (5%)
Going up/down stairs/steps	8 (5%)
Turning	7 (4%)
Getting in/out of bed	6 (4%)
Other activities	6 (4%)
Getting in/out of vehicle	4 (2%)
Using stairs while carrying objects	4 (2%)
Gardening	3 (2%)
Showering	3 (2%)
Hiking	2 (1%)
Reaching for phone/blind	2 (1%)
Carrying stuff and walking	2 (1%)
Chasing runaway pet	1 (<1%)
Dodging an active pet	1 (<1%)
Physical sensations	
None	77 (46%)
Weak	27 (16%)
Dizzy	20 (12%)
Difficulty balance/unsteady	18 (11%)
Tired	10 (6%)
Can't recall	5 (3%)
Pain	4 (2%)
Numbness/tingling	3 (2%)
Hallucinating	2 (1%)
Didn't feel good in general	2 (1%)
Environment	
None in particular	88 (52%)
Stairs/step	31 (18%)
Slippery surface (wet, icy etc.)	16 (10%)
Uneven surface	11 (7%)
Dark	9 (5%)
Can't recall	6 (4%)
Clutter	3 (2%)
Furniture in the way	2 (1%)
Slope	1 (<1%)
Rug	1 (<1%)
Use of walking aid at time of fall[b]	
Yes	31 (60%)
No	19 (37%)
Can't recall	2 (4%)

[a] Changing from sitting to standing or from standing to sitting.
[b] For those who had normally been using a walking aid prior to the time of the fall (n=52).

vulnerability to trips due to aging and the associated decreased clearance height of the recovery foot of the swing phase during walking [29], which might be exacerbated by effects of treatment-related neuropathy and diminished sensation. Falls on stairs and sidewalk curbs was disproportionately high considering the time one normally spends in these places over the course of a day. Evidence shows that older individuals do not prefer to present as being 'the type who falls', but instead tend to blame themselves for not taking care and attribute the fall to their own behavior [30]. Being at risk for falls is viewed as synonymous with lack of control, which may sound unpalatable to older adults [30]. This may in part explain why participants chastised themselves for being 'stupid'/'dumb'/'foolish', and attributed their falls to carelessness or bad choice.

Reluctance to use their walking aid was a common phenomenon in this study. Although assistive devices are among the methods found to reduce the rate of falling [31], research in the general geriatric population shows that many older individuals are reluctant to use them due to social stigma associated with the use of devices such as cane and walkers [32]. Drugs that were used by participants appear to be similar to those in other studies such as psychotropic medications, diuretics, and antihypertensives [33,34].

Our mean FOF score was above the cut-off for high FOF, and was similar to previous findings in the general older population (mean score 27.1 ± 10.7) [35]. Interestingly, while the literature shows that FOF among older adults leads to restriction of activities [7], our findings seem to differ as activity restriction was not common among participants. Of note, while healthcare professionals describe FOF as activity restriction; for older adults, on the other hand, FOF may mean finding a balance in everyday life (i.e., to discipline one's daily life, and to adapt to living with the challenge such as being vulnerable to fall and losing control) [36]. This is evident in our study, as the majority of participants did not limit/reduce activities, but rather continued their usual activities, albeit acknowledging that they were more careful nowadays and had taken steps to help mitigate falls (e.g., enlisting work-out buddy, changing rug, taking time). However, these participants might have already adopted a significantly lower activity pattern due to treatment-related health teaching (e.g., avoid crowds, public transit etc.)

4.1. Clinical Implications

This study suggests that effective interventions to prevent falls in the general geriatric population could potentially be applied to help mitigate falls in older adults with cancer since most risk factors, circumstances and location appear to be similar in the two groups. Teaching during clinic appointments regarding fall safety when conducting daily activities is essential, in particular on use of walking aid, carrying bulking objects while using stairs, negotiating steps and sidewalk curbs, the 'randomness' of falls, and being cognizant about falls in both normal and potentially riskier activities. It is also important to routinely remind patients who are on active treatment that common side effects of cancer treatment such as weakness and fatigue could place them at higher risk for falls and fall injuries. With regard to tripping, among promising interventions are teaching techniques in laboratory settings on how to regain balance [37,38]. Referral for laboratory-based training that simulate slipping and induce backwards falls by way of surface perturbations, which has been shown to improve both proactive (i.e., pre-slip) and reactive (i.e., post-slip) balance and reduce backward falls

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Table 4
Themes, subthemes and quotes from interviews.

Themes and subthemes	Quotes
Cognitive appraisal of fall 1. Self-blaming (blaming self for bad choices and not talking about things regarding their physical capacity and power) 2. Willingness to take extra caution (participants are willing to be extra careful to avoid further falls)	Self-blaming "I was rushing to go over to my brother's place, so dumb, dumb, dumb, dumb! Impatience, anyways." (Female, 77, gynecological cancer) "I thought it was a stupid thing on my part too." (Female, 88, breast cancer) "I didn't see the step! It was my fault." (Female, 78, breast cancer) Willingness to take extra caution "I am more careful to avoid fa lls. And I don't move the furniture around anymore". (Female, 81, skin melanoma) "…much, much more cautious. And I look around me and I go slowly." (Female, 72, breast cancer) "I hang onto the railing. I make sure I'm holding on." (Female, 67, gynecological cancer)
Mobility-related fall reasons (participants described tripping, and not being good at turns; many participants did not use their walking aids)	"I didn't lift my foot high enough when I was in the bathroom." (Male, 71, head and neck cancer) Family: "It was the so-called 'foot drop' that he has, so he didn't realize that he couldn't lift up his foot normally." (Male, 79, liver cancer) "I don't do turns very well." (Male, 78, prostate cancer) "Well, one was in my garden, I was working outside, and just turned around……. I guess I was too fast." (Female, 84, hematological cancer) "I was doing pretty good with my walking at that time. So I didn't really need it (the cane). And it just happened." (Male, 83, prostate cancer) "I don't need nothing." (Female, 90, gynecological cancer) "I didn't want to use it. I felt I could walk okay. But I could walk okay. But when the leg gives out, it gives out. You can do nothing about that." (Male, 72, prostate cancer)
Opportunity for health-teaching regarding safety	Family: "Yesterday, if he had stayed straight with me……I had him by the arm walking across the road, and all of a sudden he veered right and stepped up on the sidewalk……..but, he…..he went a little bit off on his own, even though he knows I was standing right there to help them. So in other words he was…… he didn't follow instructions. I mean, in a situation where it was dangerous circumstances, and I'm standing right there ready to holding him up, and, he decided to do something different……." (Male, 70, prostate cancer) "And I think it was the chemo, because normally I'm fine. I wasn't feeling right that day and I really should have just stayed home, but my wife wanted to go out for a bike ride…….we go out all the time……and so I guess I just wanted to be a good husband and go out and spend time with her……" (Male, 73, prostate cancer) "….In my garden outside, and uh from step ladder I fall down……I slipped and I fall down." (Male, 70, prostate cancer) Family: "…..five weeks ago, he wanted to go feed the birds, he wanted to walk out, and I told him, "look, it's icy out there, but no he had to feed the birds. And that's what I'm talking about the fixation on things. And honest to God sometimes I feel like the house can be burning down if he's got to feed the bird he will still feed the birds. It's these fixations. And so he fell on the ice. He took two steps from the door fell on the ice." (Male, 71, pancreatic cancer)

[37]. Early recognition and management of cancer- and its treatment-related late effects as well as referral to relevant specialists/disciplines [39] to address amenable issues and to provide appropriate supportive care are needed. Patients receiving psychotropic medications should be asked about falls, and medication reviews should be performed for possible stopping of such medications. Referral to rehab/physiotherapist for assessment and strength-training may be beneficial. For those who fall at home, referral for occupational therapist for in-home safety evaluation could help reduce falls [40].

4.2. Research Implications

Further prospective studies to examine how older adults with cancer receiving cancer treatments estimate their risk of falls and evaluate the activities during falls are needed. Moreover, further research with a larger sample sizes and multi-site recruitment to capture patients of more diverse health state, education, race, and socioeconomic level is needed. Future studies should also incorporate information on multifocal/bifocal lenses and footwear in understanding circumstances of falls [41,42]. Prospective studies to more adequately capture circumstances of falls and physical sensations prior to falls are also warranted. Additionally, exploring risk factors unique to cancer, such as peripheral neuropathy and pain, are also needed. Future studies should also explore more in-depth different narratives and perspectives of single vs. multiple fallers as well as how such narratives/perspectives might affect older patients' responses/actions to adapt to or prevent further falls.

4.3. Limitations

This study recruited patients from a single urban comprehensive cancer centre; therefore, generalizability may be of issue. In particular, this cancer centre tends to attract patients who want cancer treatment and who are more highly educated, as evidenced in our participant characteristics. Second, referral bias in which less frail patients are referred to major cancer centres to some extent may explain our findings [43]. Patients who were more frail and who might have experienced more falls and more serious injuries might not have been captured. Nonetheless, our study sample included a high prevalence of recurrent fallers. Third, the retrospective recall of falls could have been subject to recall bias, which is not uncommon in studies utilizing retrospective approach [44], particularly more remote falls (i.e., up to a year ago). Moreover, the cross-sectional study design meant we could only assess their FOF at one time-point, as opposed to its evolution over time in the pre-fall and post-fall context. Nonetheless, the current FOF levels may

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still offer some insights into their attitude toward perceived fall risk. Lastly, the small sample size in this hypothesis-generating study also limits its representativeness of the population. Information regarding wearing multifocal/bifocal lenses and footwear was not collected. Additionally, the majority of the participants were Caucasian and other races were not well-represented; importantly, Spoelstra et al. found race to be a significant fall risk factor in the older cancer population [45].

5. Conclusion

Circumstances of falls do not seem to diverge from findings in the general geriatric population. Strategies for fall prevention and management used in the general geriatric population can potentially benefit this population as well. Attention may be warranted specifically regarding medication review, health-teaching on fall safety, home safety evaluation, and referral for balance-training.

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Conflict of interests

None.

Author Contributions

Study concepts

- SS, SA, SP, MP

Study design

- SS, SA, SP, MP

Data acquisition

- SS

Quality control of data and algorithms

- SS

Statistical analysis

- SS

Data analysis and interpretation

- SS, SA, SP, MP

Manuscript preparation

- SS, SA, SP, MP

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- SS, SA, SP, MP

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jgo.2018.08.005.

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