

Awareness of medication-related fall risk: a survey of community-dwelling older adults

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Abstract

Background: Falling is a serious health problem among older adults. The objective of this study was to assess older adults' awareness of medications associated with increased fall risk and to evaluate the impact of pharmacist counseling on the risk of medication-related falls.

Methods: Data were collected using an online questionnaire with four items to determine pharmacist counseling encounter, fall history, and number of medications taken; two items to collect demographic information; and 15 knowledge-based items to determine medication-related fall risk awareness. Participants were community-dwelling adults aged 60 years and older.

Results: Two hundred and six older adults (mean age = 69.07 years, SD = 5.59) participated in the study by completing all or part of the questionnaire. The number of older adults who reported having fallen within the last five years was 90 (43.7%). The knowledge-based portion of the questionnaire was completed by 162 participants. One hundred and nineteen (73.5%) questionnaire respondents scored <70% on the knowledge assessment (mean score 49.3%, SD = 26.8). The 12 respondents (7.6%) who reported having received pharmacist counseling regarding medication-related fall risk scored significantly higher on the knowledge assessment compared to the 145 respondents who did not (mean score 61.66% versus 48.09%, $p = 0.01$).

Conclusions: A majority of community-dwelling older adults lacked knowledge of medications associated with an increased risk of falling. Though most participants were never counseled by a pharmacist, those who had been counseled demonstrated greater awareness. Thus, pharmacist counseling of older adults regarding medications and fall risk should be promoted.

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Introduction

Falls are a common, serious, and complex problem among the elderly. Physical, behavioral, environmental, and medication-related factors may contribute to an older adult's risk of falling [1]. In order to address such risk factors and implement fall prevention strategies, older adults must first be aware of their personal fall risk.

Epidemiological studies have identified lack of physical activity, loss of muscle strength, impaired balance, lower limb arthritis, and use of certain medications as important contributing factors to falls [1,2]. Drugs associated with an increased risk of falling include anticholinergics, anticonvulsants, antipsychotics, analgesics, benzodiazepines, non-

benzodiazepine hypnotics, tricyclic antidepressants, selective serotonin reuptake inhibitors, and drugs that cause orthostasis [2].

Falls have devastating consequences for older adults and are considered a significant and costly health problem. The Centers for Disease Control and Prevention list falls as the number one cause of injury-related fatality in the elderly, accounting for 112,599 deaths from 2005 to 2010 [3]. Over 30% of community-dwelling adults 65 or older fall each year, causing disability and risk of early death [3]. Falls represent the most common cause of hospital admissions for nonfatal injuries and trauma. They also lead to increased length of hospital stay and use of healthcare resources [4]. Approximately 30% of older adults who fall suffer soft tissue injuries, hip fractures, lacerations, or head traumas that impair their ability to live independently. As a result, those injured in a fall are more likely to require nursing care in the ensuing year [5]. In addition to physical injury, the experience of a fall often precipitates a fear of falling in the elderly, which can restrict activity, limit mobility, increase the likelihood of subsequent falls, and negatively affect confidence and quality of life [6]. The economic impact of falls among older adults is not trivial. The direct medical costs of falls in 2010 were \$30 billion [7].

Despite decades of research on falls and fall prevention, there is a paucity of research in older adults' awareness of medications that can increase their fall risk. Most older adults demonstrate an awareness of physical, behavioral, and environmental fall risk factors and can take measures to modify them to prevent a fall [8]. However, there appears to be a lack of knowledge among older adults with regard to medication-related fall risk. A study by Wiens *et al.* showed that less than half of the older adults surveyed could identify high-risk medications [9]. Also, studies to date have assessed the knowledge of a limited number of drug classes and have not included over-the-counter (OTC) medications.

In order to identify gaps in knowledge, target educational efforts, and design comprehensive fall prevention initiatives, awareness of medication-related fall risk among community-dwelling older adults must be ascertained. The purpose of this study was to determine older adults' current state of knowledge of

which prescription and OTC medications can increase their risk of falling and to evaluate the impact of pharmacist counseling on knowledge of medication-related fall risk.

Methods

Design

This was a descriptive study that used data obtained through an online questionnaire. The study was approved by the University of Arizona Institutional Review Board Human Subjects Protection Program.

Subjects

Those invited to complete the questionnaire were eligible to participate if they were 60 years or older, community-dwelling, able to read and understand English, and had Internet access to complete the questionnaire online.

Measures

Data were collected using an online questionnaire consisting of 15 knowledge-based items to determine awareness of medication-related fall risk. Survey questions were adapted from *The Falls Risk Awareness Questionnaire* [9] and modified according to the specific aims of this study to incorporate OTC and other medications potentially inappropriate for older adults due to increased risk of falls. Participants were asked to select "True," "False" or "I don't know" in response to 15 statements (e.g. "Prescription medication to help me sleep can increase my chance of falling"). Awareness of medication-related fall risk was defined as correct responses to at least 11 out of 15 statements (i.e. a pre-determined "passing" score was 70% or greater). In addition, study participants were asked to report the number of prescription medications they use, the number of OTC medications they use regularly, fall history within the last five years, and whether they had ever been counseled by a pharmacist about medication-related fall risk. Demographic data were collected on age and gender.

Data collection

Study recruitment materials were distributed via listserv or hardcopy flyer by nine organizations that would reach a sizable number of older adults. The organizations included senior centers, senior resource organizations, professional organizations, senior living communities, community physician offices and a school alumni association. The online questionnaire was accessible from September 15th, 2013 to December 1st, 2013.

Data analysis

Continuous data were summarized using means and standard deviations, and categorical data were analyzed by calculating frequencies and percentages. The *t*-test was used to compare mean assessment scores of 1) male respondents versus female respondents, 2) those who had fallen within the past five years versus those who had not, and 3) those who had received counseling by a pharmacist versus those who had not. The *t*-test was also used to compare the mean number of prescription and OTC medications taken by those who had fallen versus those who had not. The number of counseled versus not-counseled respondents who had fallen or not fallen within the previous 5 years was compared using a Chi-square test. The *a priori* *p*-value was 0.05.

Results

The demographic characteristics of the study participants are shown in Table 1. The mean age of questionnaire respondents was 69.1 years (SD = 5.6). There were slightly more female participants than male participants. The mean number of prescription and OTC medications used by respondents was 3.2 (SD = 2.5) and 3.4 (SD = 2.9), respectively. Ninety (43.7%) respondents reported having fallen within the past 5 years, and the mean number of falls per respondent during that time period was 2.3 (SD = 1.8). Pharmacist counseling regarding medication-related fall risk was a rare occurrence. Only 17 out of 206

(8.9%) respondents reported ever being counseled on increased fall risk due to medications.

Table 1. Characteristics of study subjects

Characteristic	All Respondents ^a	Completed Knowledge Assessments Only ^b
Number	206	162
Age (mean, SD)	69.1 (5.6)	68.7 (5.1)
Gender		
Male (N, %)	92 (44.7%)	80 (49.4%)
Female (N, %)	102 (49.5%)	81 (50.0%)
Unspecified (N, %)	12 (5.8%)	1 (0.6%)
No. prescription meds taken by respondent (mean, SD)	3.2 (2.5)	3.2 (2.6)
No. OTC meds taken by respondent (mean, SD)	3.4 (2.9)	3.2 (2.9)
No. who have fallen within last 5 years (N, %)	90 (43.7%)	70 (43.2%)
No. falls within last 5 years (mean, SD; range)	2.3 (1.8); 1-12	2.1 (1.2); 1-8
No. who have received pharmacist counseling (N, %)	17 (8.9%)	12 (7.4%)

^a Includes data from fully-completed and partially-completed questionnaires

^b Only includes data from those respondents who completed the knowledge assessment portion of the questionnaire in its entirety

A detailed summary of the prescription medication knowledge assessment results is shown in Figure 1. The majority of survey participants (66%) were able to identify prescription hypnotics as a drug class associated with risk of falls, and approximately half (51%) recognized anti-hypertensives to be associated with increased fall risk. However, only slightly greater than one-third of respondents correctly identified anxiolytics (41.8%), sedatives (38.7%), and antidepressants (34.5%) as high fall-risk medications. Few respondents (9.2%) were aware that anticholinergic or orthostasis-causing medications to control bladder symptoms are associated with increased risk of falls. Less than 40% of respondents (39.7%) correctly identified the use of multiple medications as a fall risk factor. In addition, study participants demonstrated a lack of knowledge about prescription medications that are not associated with falls, such as lipid-lowering agents.

Prescription medication... ..can increase my chance of falling.

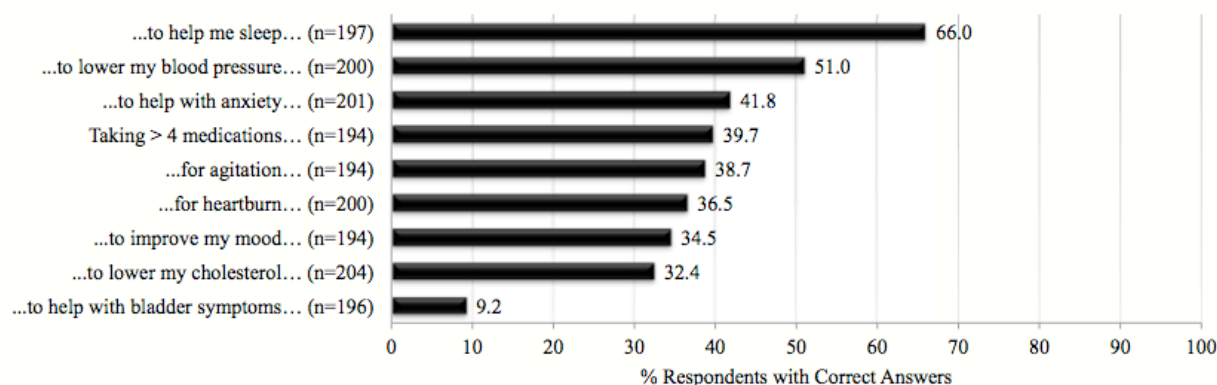


Figure 1. Prescription medication knowledge assessment results

Percent correct responses for individual questionnaire items. Survey questions were adapted from *The Falls Risk Awareness Questionnaire* [9] and modified to incorporate additional classes of medications potentially inappropriate for older adults due to increased fall risk

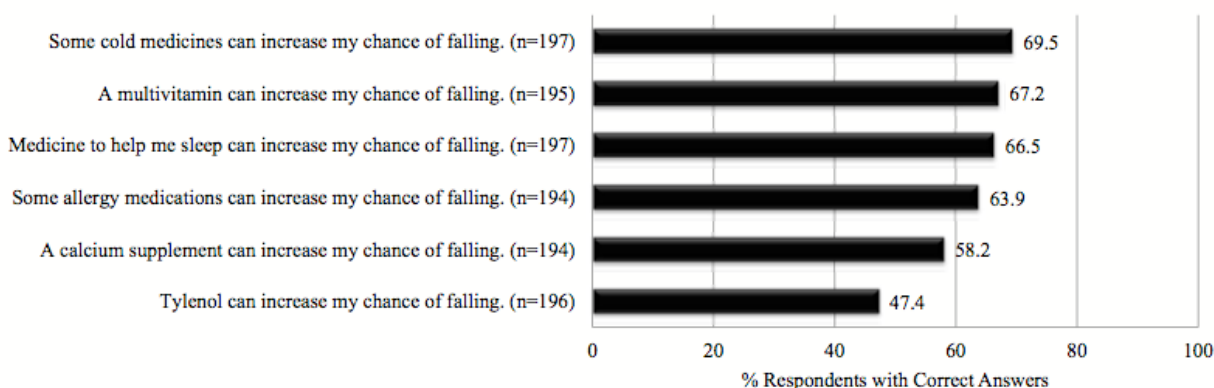


Figure 2. OTC medication knowledge assessment results

Percent correct responses for individual questionnaire items. Survey questions were adapted from *The Falls Risk Awareness Questionnaire* [9] and modified to incorporate OTC medications potentially inappropriate for older adults due to increased fall risk

A summary of the OTC medication knowledge assessment results is shown in Figure 2. Overall, survey participants demonstrated greater knowledge of OTC medications associated with increased fall risks than prescription medications associated with increased fall risks. Approximately two-thirds of respondents correctly identified the potential for cold medicine (69.5%), OTC hypnotics (66.5%) and some

allergy medications (63.9%) to increase their chance of falling. The majority of respondents were also able to identify those OTC agents unrelated to increased fall risk such as multivitamins (67.2%).

The results of the knowledge assessment are shown in Figure 3. One hundred and nineteen of the 162 respondents who completed the entire assessment scored below 70%, meaning they did not respond

correctly to at least 11 out of 15 questions. The mean knowledge assessment score was 49.3% (SD = 26.8). The score range with the greatest frequency was 60 – 69% with 34 respondents scoring within those percentages.

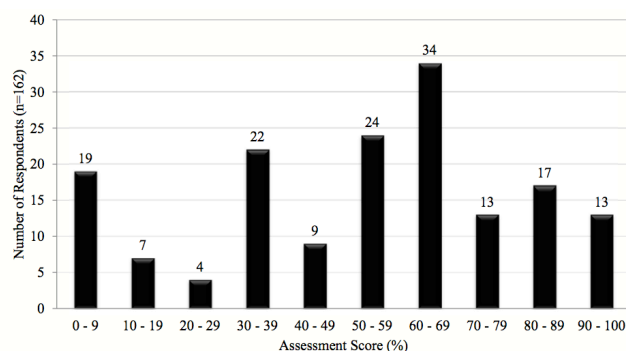


Figure 3. Medication and fall risk knowledge assessment score distribution

The knowledge assessment score group comparisons are shown in Table 2, which indicate that there were no significant differences in scores between male and female respondents (47.8% versus 51%, $p = 0.23$) or between those who had fallen within the previous 5 years and those who had not (46.4% versus 51.6%, $p = 0.11$). Furthermore, there were no significant differences in the mean number of prescription and OTC medications taken by those with a fall history and those without (3.3 versus 3.1, $p = 0.26$ and 3.4 versus 3.1, $p = 0.27$, respectively). The 12 respondents (7.6%) who reported having received counseling from a pharmacist regarding medication-related fall risk scored significantly higher on the knowledge assessment than the 145 respondents who did not (mean score 61.66% versus 48.09%, $p = 0.01$). Fewer respondents who had received pharmacist counseling had fallen within the last 5 years compared to those who had never received counseling (16.7% versus 44.8%); however, this difference approached, but did not reach, statistical significance ($p = 0.058$).

Discussion

The primary finding of the current study is that the majority of the community-dwelling older adults surveyed lacked knowledge of medication-related fall

risk (73.5% scored below 70% on the knowledge assessment), especially in regard to prescription medications. These results are consistent with the results of a previous study that assessed older adults' knowledge of a wide range of risk factors associated with falls including prescription medication classes [9].

Table 2. Knowledge assessment group comparisons

	Comparison Groups		p-value
	Males	Females	
Number (N, %)	80 (49.4%)	81 (50.0%)	
Assessment score % (mean, SD)	47.8 (26.7)	51.0 (27.1)	0.226
	Fall History^b	No Fall History	
Number (N, %)	70 (43.2%)	92 (56.8%)	
Assessment score % (mean, SD)	46.4 (26.6)	51.6 (26.8)	0.111
No. prescription meds (mean, SD)	3.3 (2.9)	3.1 (2.3)	0.264
No. OTC meds (mean, SD)	3.4 (3.1)	3.1 (2.8)	0.268
	Counseled^c	Not Counseled	
Number (N, %)	12 (7.6%)	145 (92.4%)	
Assessment score % (mean, SD)	61.7 (17.6)	48.1 (27.3)	0.013
No. with fall history (N, %)	2 (16.7%)	65 (44.8%)	0.058 ^d

^a All p-values are for a *t*-test unless otherwise specified

^b Fall history includes any falls within the previous 5 years

^c Counseled refers to having received counseling by a pharmacist regarding medications that can increase fall risk

^d p-value is for Chi-square test

Their findings showed that none of the medication classes listed in the survey instrument, which included antidepressants, antipsychotics, anxiolytics, hypnotics and use of multiple medications, were selected as a significant contributing factor for falls by more than 50% of the participants. In addition, only 14 older adults (9.2%) in that study and 12 (7.6%) in the current study reported having received any information about fall risks from a healthcare professional.

The current study explored older adults' knowledge of OTC medication-related fall risk in addition to fall risks associated with prescription medications. The

survey participants demonstrated higher knowledge of OTC medication-related fall risk, as almost 70% of respondents correctly identified the potential risk of cold medications and over 60% recognized the risks of OTC hypnotics and allergy medications. They were also able to identify some OTC agents not associated with fall risk. These findings may have been influenced by a previous student pharmacy project in which older adults were educated on safe use of OTC medications, including those with documented risk of falls [10]. Additionally, participants in the current study who received counseling by a pharmacist, though an infrequent occurrence, demonstrated significantly greater awareness of the topic, which illustrates the value of educating older adults about medication-related fall risk.

A recent case control study by Moller *et al.* has found that 10 out of the 20 most commonly prescribed medications taken by Swedish older adults were associated with falls [11]. This supports the notion that medication usage is an important consideration when assessing individual fall risk. In the current study, 90 participants (43.7%) reported falling within the past 5 years. Participants used 3.2 (SD = 2.5) prescriptions and 3.4 (SD = 2.9) OTC products with no significant differences in the mean number of prescription and OTC medications taken by those with or without a fall history (study participants were not asked to list their medications, only to report the number taken). Furthermore, the knowledge level of medication-related fall risk was not different between male and female participants or between those who reported history of falls and those who reported no falls in the past 5 years. In a prospective study by Campbell *et al.*, a similar percentage of study participants, 35.2%, fell during the one-year study period [1]. They did not report the mean number of medications taken by the subjects. However, in contrast to the current study, Campbell *et al.* showed a statistical difference between the female fall group and the female no-fall group with regard to number of drugs taken (40% of the female fall group used four or more medications versus 21% of the female no-fall group, $p < 0.001$). The study did not show a significant difference among men with regard to percentage of subjects taking four or more medications in the fall versus no-fall groups (29% versus 21%, respectively).

There were several limitations to the current study, including the study design using an online questionnaire. However, it is important to note that the data collection period was less than three months, yet more than 200 older adults answered the request to participate in an online survey study. The participants were recruited via professional and community organizations, thus it is likely that the study population included those with higher educational and/or socioeconomic backgrounds, and they may have participated in a previous education project by student pharmacists [10]. Survey respondents had social connections and the ability to use a computer or other technology to answer the online questionnaire. The study population, therefore, may not provide an accurate representation of all community-dwelling older adults. As with all survey studies, it was assumed that participants provided responses in an accurate and honest manner. Since this study predominantly reached those living in Southern Arizona, the results may not be generalizable to populations of older adults in other geographic locations.

Conclusions

Falls continue to be a serious concern of the aged population, and the findings of our study have several implications for fall prevention efforts. First, it was determined that a large percentage of community-dwelling older adults lack knowledge about an important contributing risk factor for falls: the use of certain medications. Second, the current study results have identified gaps in knowledge and specific medication-related, educational targets that should be addressed by fall prevention programs for older adults. Lastly, the increased awareness of medication-related fall risk exhibited by those who had been counseled by a pharmacist supports the role of the pharmacist in medication-focused fall prevention efforts.

References

1. Campbell AJ, Borrie MJ, Spears GF. Risk factors for falls in a community-based prospective study of people 70 years and older. *J Gerontol A Biol Sci Med Sci.* 1989;44:M112-7.

2. Fick DM, Semla TP. American Geriatrics Society 2012 Beers Criteria: new year, new criteria, new perspective. *J Am Geriatr Soc.* 2012;60:614-5.
3. Web-based Injury Statistics Query and Reporting System (WISQARS) [Internet]. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. [online]. [cited 2013 Feb 27]. Available from: <http://www.cdc.gov/injury/wisqars/>
4. Hornbrook MC, Stevens VJ, Wingfield DJ, Hollis JF, Greenlick MR, Ory, MG. Preventing falls among community-dwelling older persons: results from a randomized trial. *Gerontologist.* 1994;34:16-23.
5. Sterling DA, O'Connor JA, Bonadies J. Geriatric falls: injury severity is high and disproportionate to mechanism. *J Trauma.* 2001;50:116-9.
6. Boyd R, Stevens JA. Falls and fear of falling: burden, beliefs and behaviours. *Age Ageing.* 2009;38:423-8.
7. Stevens JA. Fatalities and injuries from falls among older adults – United States, 1993-2003 and 2001-2005. *MMWR* 2006a;55.
8. Braun BL. Knowledge and perception of fall-related risk factors and fall-reduction techniques among community-dwelling elderly individuals. *Phys Ther* 1998;78:1262-76.
9. Weins CA, Koleba T, Jones CA, Feeny DF. The falls risk awareness questionnaire: development and validation for use with older adults. *J Gerontol Nurs.* 2006;32:43-50.
10. Burgin LB, Gamboa AM, Tierney DM, Lee, JK. Interactive approach by pharmacy students to educate older adults on the safe use of over-the-counter medications. *Consult Pharm.* 2013;28:168-75.
11. Kuschel BM, Laflamme L, Moller J. The risk of fall injury in relation to commonly prescribed medications among older people—a Swedish case control study. *Eur J Public Health.* 2014:cku120v1-cku120.