

BRIEF REPORT

Initiative to deprescribe high-risk drugs for older adults presenting to the emergency department after falls

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Abstract

Background: Over 35 million falls occur in older adults annually and are associated with increased emergency department (ED) revisits and 1-year mortality. Despite associations between medications and falls, the prevalence of fall risk-increasing drugs remains high. Our objective was to implement an ED-based medication reconciliation for patients presenting after falls and determine whether an intervention targeting high-risk medications was related to decreased future falls.

Methods: This was an observational prospective cohort study at a single site in the United States. Adults 65 years and older presenting to the ED after falls had a pharmacist review their medicines. Pharmacists made recommendations to taper, stop, or discuss medications with the primary clinician. At 3, 6, and 12 months, we recorded the number of fall-related return ED visits and determined if recommended medication changes had been implemented. We compared the rate of return visits of patients who had followed the medication change recommendations and those who received recommendations but had no change in their medications using chi-square tests.

Results: A total of 577 patients (mean age 81 years, 63.6% female) were enrolled of 1509 potentially eligible patients. High-risk medications were identified in 310 patients (53.7%) who received medication recommendations. High-risk medications were associated with repeat fall-related visits at 12 months (risk difference 8.1% [95% confidence interval 0.97–15.0]). A total of 134 (43%) patients on high-risk medications had evidence of medication modification. At 12 months, there was no statistically significant difference in

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return fall visits between patients who had modifications to medications compared with those who had not implemented changes ($p = 0.551$).

Conclusions: Our findings identified opportunities for medication optimization in over half of emergency visits for falls and demonstrated that medication counseling in the ED is feasible. However, evaluation of the effect on future falls was limited.

KEYWORDS

deprescribing, fall prevention, geriatric emergency medicine, mobility, patient education

INTRODUCTION

Falls are associated with increased emergency department (ED) revisits and 1-year mortality in older adults.^{1,2} Medications are a known modifiable risk factor for falls, and polypharmacy increases fall risk when taking more than four medications, regardless of the properties of individual drugs.^{3,4} However, medications are not commonly addressed in the ED.⁵

Prior studies have focused on outpatient interventions or inpatient medication reconciliation and have yielded mixed results in fall reduction. There is sparse data on ED-based deprescribing programs, thus necessitating the need for additional research.^{6–8} Deprescribing challenges include conflicting messages from multiple prescribers and risk–benefit assessments of high-risk medications.⁹

The ED is an opportune setting to intervene on behalf of patients who have fallen.¹⁰ Addressing modifiable risk factors in the ED could mitigate subsequent fall risk with the long-term goal of preventing more serious fall-related injuries.^{5,10–12} Our aim was to implement an initiative for pharmacist-led medication reconciliation and modification of high-risk medications for older patients presenting to the ED after falls.

METHODS

This was a prospective, single-center study and quality improvement program at an academic tertiary care center in North Carolina. Patients aged 65 years and older who presented to the ED with the chief complaint of a fall between August 3, 2020 and December 5, 2021 were enrolled. Interpreters were utilized for non-English speaking patients, and care partners were interviewed if a patient's cognitive impairment precluded obtaining a medication history. Exclusion criteria included inability to communicate and hemodynamic instability. The study received approval from the hospital institutional review board (study number: 19-3290).

Key points

- Emergency departments regularly encounter patients who have fallen.
- Deprescribing did not significantly affect the repeat fall rate for patients.

Why does this paper matter?

A pharmacist-led protocol was a feasible method to implement; however, fall prevention measures from the emergency department face ongoing challenges.

Intervention

ED pharmacists reviewed the ED census for eligible patients during their hours of operation (7 a.m. to 12 a.m. 7 days a week). Pharmacists performed a medication reconciliation by reviewing a list of dispensed medications in the electronic health record (EHR) and interviewing patients and care partners about medication history including over-the-counter medication use. Medication administration records provided from skilled nursing or assisted living facilities were reviewed if available. Pharmacists identified high-risk medications using the STEADI-Rx initiative¹³ and the 2019 AGS Beers criteria¹⁴ (Table S1). In the first part of the intervention, pharmacists provided education to patients and care partners about identified high-risk medications. Recommendations were based on medication class: taper off medications with dependency or withdrawal risk (e.g., benzodiazepines), stop medications with no clinical benefit (e.g., diphenhydramine), and discuss with their primary care physician (PCP) for medications in which the benefits may outweigh risks (e.g., antihypertensives). Recommendations also included suggestions to adjust doses or administration times. For anticoagulants and antiplatelets, CHA₂DS₂-VAsC and HAS-BLED scores were

calculated to facilitate risk–benefit assessment.^{15–17} The second part of the intervention involved communicating recommendations with the ED clinician and summarizing high-risk medication(s) and recommendations in a note in the patient's EHR, which was routed electronically via EHR or by fax to the patient's PCP.

Data collection

Patient characteristics, medications, and recommendations were collected prospectively by the ED pharmacist. Pharmacists reviewed the EHR for enrolled patients at 3, 6, and 12 months after the initial fall encounter to record the number of fall-related return ED visits. Return encounters were identified on chart review based on chief complaint of fall. The primary objective was to determine whether medication counseling and modification would reduce subsequent ED fall visits at 12 months. For patients who received medication recommendations, the EHR was reviewed for evidence of modifications made to medications since the initial visit, including a review of PCP documentation and dispensing reports. Modification was defined as any cessation or dose reduction to at least one high-risk medication identified at the index visit. Timing of follow-up PCP visit was tracked. We compared the number of falls between patients who had received recommendations on high-risk medications and made modifications versus patients who had received recommendations but did not have evidence of modification.

Statistical analysis

We characterized the proportion of eligible individuals who were screened for medication recommendations, the types of recommendations made, and compared outcomes between individuals who followed medication recommendations and those who did not. Demographic data were summarized, using frequencies and proportions for categorical data and mean values and standard deviation for continuous data, and compared between patients who did and did not receive medication recommendations using chi-square and *t*-tests. We compared the rate of return visits of patients who had followed the medication change recommendations and those who received recommendations but had no change in their medications using chi-square tests. Risk differences and risk ratios were calculated for return visits.

RESULTS

During the study period, 1509 patients ≥ 65 years old presented to the ED with falls. A total of 577 patients were

enrolled, and home medications were reviewed by ED pharmacists. Out of 572 patients with complete charts, 309 patients (54.0%) had a high-risk medication identified and received medication recommendations (Table 1, Figure S1). The main reason that otherwise eligible patients were not enrolled was presentation outside of pharmacists' shifts or due to pharmacist workload. Of all patients, 64.2% were women and 85.5% were white, with a mean age of 81 years. There was no difference in demographics of patients taking high-risk medications versus those who were not, but there were significantly more patients with hypertension and heart failure in the group on high-risk medications. After initial ED evaluation, 313 patients (54.7%) were admitted (Table S3).

Patients were taking a median of 10 (interquartile range 7–14) total medications, with a mean of 1 (range of 1–10) flagged as high-risk. The most flagged medication classes were anticoagulants and anti-platelets, antidepressants, anticonvulsants, and opioids (Figure 1, Table S2). A total of 190 patients (33.2%) were taking anticoagulants or anti-platelets. The most common recommendation was to discuss the identified medication with the PCP (70.9% of recommendations). Of patients who received medication recommendations, 15 (4.9%) patients did not have a PCP and two PCPs were unable to be contacted. Within a year of initial presentation, 290 (50.7%) of all participants had evidence of a PCP visit. Of patients who received medication recommendations, 53.9% followed up within a year. Of 309 patients who received medication recommendations at initial visit, 134 (43.4%) had evidence of modification to at least one of the high-risk medications at 12 months.

A statistical analysis was performed for patients with complete charts ($n = 572$ at 3 months, $n = 552$ at 6 months, $n = 545$ at 12 months). A total of 117 (20.5%) patients died during the follow-up period. At 12 months, among patients who had a high-risk medication ($n = 309$), 84 (27.2%) had return visits by 1 year, compared with 45 (19.1%) of patients not on any high-risk medications ($n = 235$) [risk difference 8.1%, (95% confidence interval [CI] 0.97%–15.0%)]. Among individuals with high-risk medication use, there was no difference in the rate of return visits for falls at 3, 6, or 12 months when comparing patients with and without evidence of medication modifications (Table 2). Among patients who received recommendations and had evidence of modification, 25.4% ($n = 34/134$) had a fall-related visit at 12 months versus 28.0% ($n = 49/175$) of patients with no evidence of modification ($p = 0.551$). The relative risk of returning for falls at 12 months for patients with evidence of medication modification was 0.69 (95% CI 0.51–0.95) compared with patients who did not modify their medications.

TABLE 1 Demographics of older adults presenting with a chief complaint of fall.

Characteristics	All subjects, <i>n</i> = 572	Medication recommendation, <i>n</i> = 309	No medication recommendation, <i>n</i> = 263	<i>p</i> -Value
Sex, <i>n</i> (%)				0.41
Female	367 (64.2)	203 (65.7)	164 (62.4)	
Male	203 (35.5)	105 (34.0)	98 (37.3)	
Missing	2 (0.3)	1 (0.3)	1 (0.4)	
Race, <i>n</i> (%)				0.12
White	489 (85.5)	272 (88.0)	217 (82.5)	
Black	53 (9.3)	22 (7.1)	31 (11.8)	
American Indian/native Alaskan	1 (0.2)	0 (0)	1 (0.4)	
Asian	12 (2.1)	4 (1.3)	8 (3.0)	
Native Hawaiian/Pacific Islander	2 (0.3)	2 (0.6)	0 (0)	
Other	13 (2.3)	7 (2.3)	6 (2.3)	
Missing	2 (0.3)	2 (0.6)	0 (0.0)	
Ethnicity, <i>n</i> (%)				0.26
Hispanic/Latino	7 (1.2)	2 (0.6)	5 (1.9)	
Non-Hispanic/Latino	561 (98.1)	304 (98.4)	257 (97.7)	
Missing	4 (0.7)	3 (1.0)	1 (0.4)	
Age, mean (range), years	81 (65–100)	81.0 (65–100)	81.1 (65–99)	0.82
Disposition, <i>n</i> (%)				0.41
Admitted	313 (54.7)	174 (56.3)	139 (52.9)	
Discharged	255 (44.6)	133 (43.0)	122 (46.4)	
Missing	4 (0.7)	2 (0.6)	2 (0.8)	
Comorbidities, <i>n</i> (%)				
Hypertension ^a	306 (53.5)	178 (31.1)	128 (22.4)	0.01
Diabetes ^a	97 (17.0)	58 (10.1)	39 (6.8)	0.16
Dementia ^a	91 (15.9)	55 (9.6)	36 (6.3)	0.14
Heart Failure ^a	77 (13.5)	52 (9.1)	25 (4.4)	0.01
Missing	59 (10.3)	35 (6.1)	24 (4.2)	-

^aNot mutually exclusive.

DISCUSSION

We found that a fall prevention initiative conducted by ED pharmacists identified high-risk medication use among over half of patients. At 12 months, there was no difference in return fall-related visits between patients who had incorporated a medication change compared with those who had not. A power analysis calculation based on our 12-month data indicates a future study would need to recruit a sample size of 5402 participants on high-risk medications, with 2701 who implement modifications and 2701 who do not, to demonstrate a statistically significant effect.

Medication reconciliation in the ED has the potential to identify high-risk medications and provide direct education to patients. By engaging pharmacists to recommend changes to medication-related risk factors, our initiative suggests that an ED pharmacist-led model is one feasible intervention to address the use of high-risk medications in older patients who present after falls, providing an opportunity to educate patients and to apprise PCPs of patients' fall. This may be a beneficial intervention as part of a broader fall prevention program. One-year mortality in our study was 20.5%, consistent with prior data correlating falls with mortality.²

Fall literature has had mixed results regarding effective fall reduction interventions, with some studies

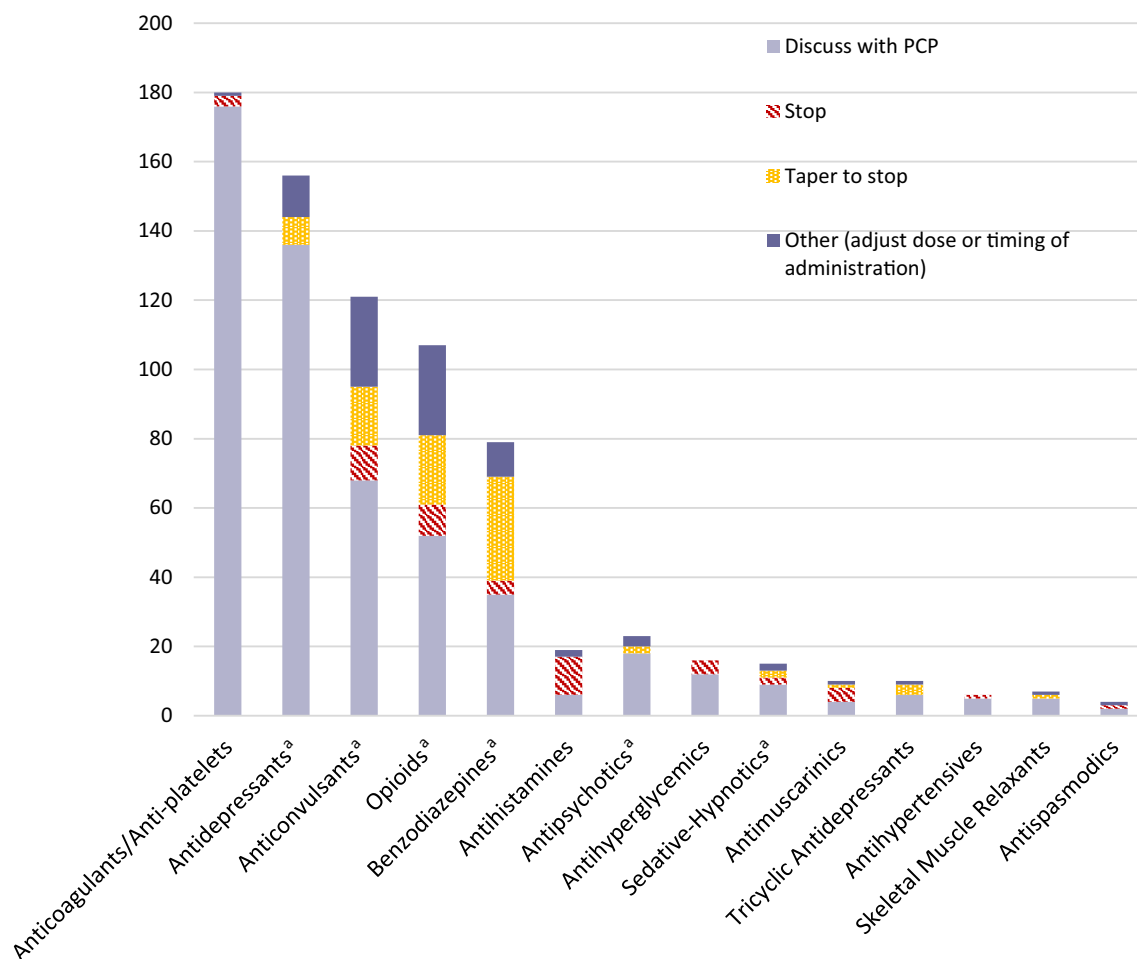


FIGURE 1 High-risk medication usage and pharmacist recommendations. ^aCentral nervous system acting medications. PCP, primary care physician.

TABLE 2 Comparison of cumulative repeat return visits for falls in patients who received medication recommendations at 3, 6, and 12 months.

	Evidence of medication modification, n (%)	No evidence of medication modification, n (%)	Risk ratio (95% CI)	p-Value
All subjects who received medication recommendations (n = 309)	134 (43.4)	175 (56.6)		
3-month return visit for fall	21 (15.7)	28 (15.9)	0.99 (0.59–1.66)	0.955
6-month return visit for fall	32 (23.9)	38 (21.6)	1.11 (0.73–1.17)	0.633
12-month return visit for fall	34 (25.4)	49 (28.0)	0.91 (0.62–1.32)	0.551

Abbreviation: CI, confidence interval.

finding absolute risk reduction for subsequent falls via medication deprescribing and others showing no difference, indicating the complexity in evaluating clinical outcomes of deprescribing programs.^{11,18–21} Long-term drug reduction can be difficult to maintain.²⁰ Patient engagement and discussion of the risks of benzodiazepines demonstrated higher rates of discontinuation or dose reduction, signifying the benefit of patient education.²² One ED-based study implemented a multimodal pharmacy and physical therapy

intervention for patients presenting with falls and showed a 50% reduction of subsequent ED visits.^{6,7}

Limitations

We only enrolled patients during ED pharmacist shifts leading to sampling bias and enrollment of 38.2% of potentially eligible patients. Eligible patients were identified by

a chief complaint of fall on the ED track board; a patient presenting with a complaint such as arm pain would not have been included, even if this was secondary to a fall. Similarly, we would not have captured falls listed under another complaint, such as syncope. Thus, we likely did not capture the full spectrum of falls and deprescribing goals likely differ based on the etiology of fall. The most common high-risk medication class identified was anticoagulants and anti-platelet agents. However, anticoagulants do not contribute to falls but put patients at higher risk of intracranial hemorrhage and death from bleeding injury following falls. Despite this, several studies have shown a net benefit of anticoagulation in patients at risk for stroke.^{23–26} We did not collect information regarding which medication classes most commonly had evidence of modification, whether certain medication class modification had an effect on return fall rate, and time between the initial recommendation and when modifications occurred. These confounding factors, as well as other variables we did not account for such as comorbidities or cognitive impairment, severely limit result interpretation. Patients who did not have any recorded medication modifications may have had barriers to deprescribing.

We only captured return fall-related ED visits if patients returned to our hospital system. After the initial visit, medication reviews and PCP visits were limited to chart review and medication dispensing reports to identify changes in prescribing and follow-up. Medications may have been modified independently by patients without being recorded in the EHR.

Treatment decisions were deferred ultimately to the prescribing clinician and approximately half of our patients remained on high-risk medications after initial presentations. Deprescribing is a complex decision with barriers including multiple prescribers, adverse effects from drug withdrawal, patient reluctance, and benefits of high-risk medications outweighing risks.⁹ Hospitalization or other major care transitions such as to a skilled nursing facility may result in medication changes outside of the patient's or primary prescriber's control. A 4.8% of our patients did not have a PCP and about half of our patients with a PCP did not follow-up, limiting the ability of the PCP to review recommendations.

Nearly one-third of our patients not taking high-risk medications had repeat visits for falls, suggesting opportunities to target other risk factors for falls. While the ED can provide immediate initiation of fall prevention care, more data is needed on implementation, which populations would benefit most, and whether targeting focused medication classes would have greater effect. Increased prevalence of fall-risk increasing drugs was observed in patients on 5–9 medications, ≥ 10 medications, and those with hypertension, depression, or epilepsy, suggesting

these populations may benefit most from medication review.²⁷ More focused populations would likely be more achievable for pharmacists to engage. Future actions for fall prevention programs in the ED include mobility assessments, focused patient education at discharge, and direct engagement with outpatient clinicians.

CONCLUSION

An ED-based pharmacist-led intervention to review high-risk medication is a scalable approach to intervene on one modifiable risk factor for older patients who have fallen; additional research is needed to determine the long-term efficacy of ED deprescribing programs.

AUTHOR CONTRIBUTIONS

Study conception and design: Kathleen Davenport, Katherine Selman, Joshua Niznik, Ellen Roberts, Jan Busby-Whitehead, and Kalynn Northam. *Data collection:* Greta Anton, Casey Kelley, Kalynn Northam, and Brittni B. Teresi. *Analysis and interpretation of results:* Casey Kelley, Brittni B. Teresi, Kathleen Davenport, Joshua Niznik, Greta Anton, Ellen Roberts, Martin F. Casey, and Katherine Selman. *Drafting and critical revision of the article:* Katherine Selman, Casey Kelley, Joshua Niznik, Greta Anton, Martin F. Casey, Ellen Roberts, and Kathleen Davenport. *Final approval of the version to be published:* All authors.

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CONFLICT OF INTEREST STATEMENT

All authors report no conflicts of interest relevant to the article.

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The sponsor had no role in design, methods, subject recruitment, data collection, or analysis. The sponsor reviewed the final version of the manuscript prior to publication.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Figure S1. Patient comparison groups.

Table S1. Pharmacist medication screening list.

Table S2. High-risk medication usage.

Table S3. High-risk medication usage in admitted versus discharged patients.

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