

JOURNAL OF GERIATRIC EMERGENCY MEDICINE

Fall 2022 | Volume 3 | Issue 3

Article 5 | Original Research

JGEM | The Journal of Geriatric
Emergency Medicine

 Advocate Aurora Health®

 **GEDC**

Effect of Pharmacist Intervention on Emergency Department Geriatric Patients with Polypharmacy

Rachael Sheehan, PharmD, Ashley Stajkowski, PharmD, Lee Hraby, PharmD, Melanie Mommaerts, PharmD, Tyler Nichols, PharmD, Marisa Nichols, PharmD, Alex Beuning, MD, Victor Warne, PharmD

ABSTRACT

Introduction	Polypharmacy is common within the geriatric population due to the commonality of multiple comorbidities and use of multiple providers. The emergency department (ED) is a prime location to capture these patients, especially when they present with chief complaints which may be medication related. Much of this population is prescribed potentially inappropriate medications which increases their risk for adverse drug reactions. Pharmacist review of patient home medication lists has been shown to decrease the number of potentially inappropriate medications, as well as medication-related problems, such as therapeutic duplications and drug interactions. These reductions can increase patient safety. The goal of this project was to evaluate the impact of a comprehensive home medication list review performed by a pharmacist for patients 65 years or older within the ED, in conjunction with ED provider education on potential interventions.
Methods	This retrospective study compared the average number of home medication modifications made per patient by ED providers at baseline compared to intervention implementation of provider education and pharmacist home medication list review. Additionally, the rate of return to the ED was also compared. Data were collected through manual chart review. Secondary outcomes include total number of pharmacist recommendations, average number of pharmacist recommendations per patient, total number of Medication Management Services (MMS) referrals, total number of MMS consults completed, and total number of MMS interventions.
Results	There was a statically significant increase in the average number of medications changes per patient on discharge between the two groups with an average of 0.1 changes (SD 0.3, 0.0-2.0) in the pre-intervention group and 0.7 changes (SD 1.5, 0.0-7.0; $p < 0.001$) in the post-intervention group. There also was a statistically significant increase in the percentage of patients with a home medication change on discharge, with 6.0% in the pre-intervention group and 25.7% in the post-intervention group ($p < 0.001$). There was a similar rate of return to the ED within 72 hours between the pre- and post-intervention groups, 6.7% and 8.1% ($p = 0.694$), respectively. A total of 48 pharmacist recommendations were made during the pilot with an average of 0.62 recommendations made per patient. Most of the recommendations made were most appropriate to be addressed by a primary care provider (PCP). A subgroup analysis was completed to compare the pre-implementation group to the post-implementation patients who discharged from the ED. The subgroup analysis showed similar data between both groups in regard to number of home medication changes and rate of return to ED within 72 hours.
Conclusion	Pharmacists are well positioned to evaluate home medication lists and make therapeutic recommendations based on a patient's medical history, current condition, and labs. However, the ED may not be the most appropriate place for this evaluation to occur. Additional studies are needed to evaluate sustainability of this evaluation in other areas of pharmacy practice, as well as to evaluate the implementation of pharmacist recommendations for PCPs

BACKGROUND

With the aging of the baby boomer generation, the proportion of the American population over 65 years of age is rapidly growing. As a result, there is an increased need for emergency medical care.¹ In order to appropriately address the medical needs of this population, geriatric-certified emergency departments (EDs) have been increasing since their development in 2008.² The accreditation process for a geriatric-certified ED requires processes to be in place to improve the quality of care provided to the geriatric population. Polypharmacy within the geriatric population increases the risks for medication-related adverse effects, falls, hospitalizations, therapeutic duplications, and even death.³⁻⁷ A pharmacist within the ED is well-positioned to intervene in patients with potentially inappropriate medications. In fact, prior studies have shown that pharmacist review of patient home medication lists decreases the number of potentially inappropriate medications, decreases the number of medication-related problems, and decreases the total number of medications for patients.⁸⁻¹¹

This project was intended to evaluate geriatric patients who present to the ED and identify patients who may be taking potentially inappropriate medications. Roughly 40% of the patients who presented between January and September 2021, to Mayo Clinic Health System-Eau Claire (MCHS-Eau Claire) ED, were over 65 years old. This patient population has the potential to benefit from an accurate home medication history and thorough pharmacist review to evaluate for potentially inappropriate medications, drug interactions, and appropriate medication dosing based on available lab values. At the time of this project, there were a total of four ED-specific pharmacists who provided 19 continuous hours of ED pharmacist coverage daily from 0700 to 0200 in two shifts. Pharmacist shift times were 0700-1700 and 1530-0200. None of the pharmacists were geriatric pharmacy board certified; however, three of the four were board certified in pharmacotherapy. During the work week, there were three medication history pharmacy technicians, with shifts from 0700-1730, 0800-1830, and 1130-2100 to provide 15 hours of coverage. On the weekend, there was one pharmacy technician who provided 8 or 10 hours of coverage dependent on scheduling factors. This project was utilized as a quality improvement project for the MCHS-Eau Claire ED as they applied for geriatric ED certification.

METHODS

This retrospective study compared home medication list changes for patients prior to this project's implementation to post-implementation patients who had a medication history obtained in the ED and a thorough pharmacist review of their home medication list. Patients were included if they were 65 years or older and received care at MCHS-Eau Claire ED. Patients were excluded if they were a geriatric trauma patient, if an accurate medication history was unable to be obtained, or if patients were on less than two medications, which included: prescription medications, over the counter medications, herbal medications, and supplements. Geriatric trauma patients were excluded as it was anticipated it may be challenging to obtain a medication history for these patients given the circumstances of their presentation. The ability to obtain an accurate medication history was determined by the pharmacy technician completing the medication history and the ED pharmacist. Guidance was provided to exclude patients who could not provide a home medication history and patients whose home medication list could not be confirmed with family or other outside sources. Emphasis was placed on trying to capture ED patients who were unlikely to be admitted to the hospital, as it is uncommon for a pharmacist to review these patients and their home medications.

In November 2021, education regarding geriatric polypharmacy and the purposes and workflow of the pilot was provided to the ED providers. Upon initiation of the pilot in January 2022, home medication histories were completed for geriatric patients in the ED who were unlikely to be admitted to the hospital. Patients were randomly selected by the ED pharmacist on duty following brief chart review to evaluate patient chief complaint and likelihood of the patient to be admitted. After medication reconciliation of the home medication list by the ED pharmacist, a thorough review of the patient's medications and recent labs was completed. During pharmacist review of the patient's home medication list, to ensure consistency, the patient's medication list was compared to the medications on the Beer's List and reviewed for interactions using the electronic medical record's embedded interaction checker.

Following this review, the ED pharmacist would document their review and any recommendations they had in a templated note (**Figure 1**) within the electronic health record.

Geriatric Polypharmacy Emergency Department Pharmacist Review

@OBJECTIVEBEGIN@

Chief complaint: @CC@

@OBJECTIVEEND@
@ASSESSMENTPLANBEGIN@

Renal/hepatic dosing: Medications [are appropriately dosed based on current renal and hepatic function / are appropriately dosed on current renal and hepatic function with the following exceptions ? / were unable to be reviewed for appropriate renal and hepatic dosing due to ? 41744].

Drug-drug interactions: (Drug-Drug interactions of potential clinical significance include ? / Did not identify drug-drug interactions of clinical significance.:41742).

Drug-disease interactions (including age): (Drug-Disease interactions of clinical significance include ? / Did not identify drug-disease interactions of clinical significance:41848).

Potentially inappropriate medications in older adults:

1. ***

Recommendations:

1. **Recommend:**

a. ***

2. **Consider:**

a. ***

3. **Follow-up with PCP:**

a. ***

4. **MMS referral placed to discuss ***:**

a. ***

Referral {WILL/WILL NOT:27377} be placed for Medication Management pharmacist in primary care for transitions of care visit and assessment of above medication concerns.

I spent *** minutes reviewing this patient's chart for potentially inappropriate medications, drug interactions, and indications of polypharmacy through the use of the Beers List criteria, available labs, patient/family provided information, and recent dispense history. {BLANK / Plan of care communication:88350}

This note is a part of a pharmacy-driven pilot to identify geriatric patients with potential polypharmacy.

@ME@
@ASSESSMENTPLANEND@

Figure 1. Note template utilized by ED pharmacists to document their review of the home medication list and their recommendations.

Terminology for recommendations was standardized to help with provider workflow and for consistency. “Recommend” was used for recommendations which were urgent or emergent which could impact the patient’s current status or care. These recommendations were intended for the ED provider to evaluate. Additionally, “consider” was utilized for recommendations which could be addressed by the ED provider but were lower priority. Lastly, “follow up with PCP” was used to document recommendations which were most appropriate for the patient’s primary care provider (PCP) to follow up on, but could be addressed by the ED provider, if deemed necessary. Following note documentation, if necessary, the note was routed to the ED provider, who was verbally notified of any recommendations which needed to be acted upon urgently or emergently during this ED visit. If the pharmacist had recommendations which would be most appropriately addressed by the patient’s PCP, the note was routed to their Mayo PCP. Notes could not be electronically routed to outside PCPs. Lastly, if the patient was deemed appropriate for an outpatient medication management services (MMS) pharmacist appointment then a consultation referral was placed by the ED pharmacist. Specific referral requirements can be seen in **Figure 2**.

Required MMS referral criteria:

- Resides at home - not a skilled nursing facility, assisted living facility, or other facility
- PCP within Mayo Clinic Health System-Northwest Wisconsin

Preferred MMS referral criteria:

- Non-adherence has been identified
- Medications identified without a clear indication
- Inappropriate medication(s) identified which will require tapering or coordination to be safely discontinued

A six-week period was selected to ensure the pilot was of adequate length. For the pre-implementation group, instead of using the same six-week period from the year prior, a six-week period closer to the intervention period was selected due to increased geriatric

Figure 2. MMS Consultation Criteria

presentation to the ED since April 2021. For patients in the pre-implementation group, it was assumed that no pharmacist recommendations regarding home medications were given and that a medication history was not completed for these patients as they were discharging from the ED.

Based on the preliminary data, the standard deviation of the number of changes to home medications was 1.5. Using a Wilcoxon rank sum test (with type I error=0.05) with this standard deviation gives 80% power to detect a difference of one medication with a sample size of 39 patients per period. Variables were summarized as appropriate for the variable type: mean, standard deviation, median, and interquartile range for continuous variables, and frequency and percentages for categorical variables. The percentage of patients who had a medication change and the percentage who returned to the ED within 72 hours were compared between periods using Pearson's chi-square test. In addition, the percentage of medications that were changed was computed for each patient and compared between periods using a Kruskal-Wallis test. A subgroup analysis was also done comparing the pre-implementation group to patients in the post-implementation group who were not admitted to the hospital. This subgroup analysis used the same previously described statistics to analyze the data between these two groups. Descriptive statistics were completed to evaluate the secondary outcomes which included total number of pharmacist recommendations, average number of pharmacist recommendations per patient, total number of MMS referrals, total number of MMS consults completed, and total number of MMS interventions. Lastly, pharmacists and pharmacy technicians involved with the project subjectively reported the amount of time spent on home medication list review and the medication history, respectively, for each patient in the pilot.

RESULTS

The pre-implementation group contained a randomized sample of patients from a six-week period between September 6, 2021, and October 17, 2021, which was compared to the post-implementation six-week period from January 10, 2022, to February 20, 2022. There were 150 randomly selected patients included in the pre-implementation data, while there were 74 patients in the post-implementation group. During the post-implementation period, there were a total of 1,169 geriatric patients who presented to the ED, thus approximately 6% of the geriatric population that presented to the ED was captured by the pilot. Baseline data between these two groups were comparable (**Table 1**).

Table 1: Baseline data for both pre-implementation and post-implementation groups		
	Pre-implementation (N=156)	Post-implementation (N=78)
Average Age	78 years old	77 years old (N=78, all patients) 76 years old (N=48, non-admitted patients)
Average Number of Home Medications	13.4 medications (SD 6.0)	11.6 medications (N=78, SD 6.2) Non-admitted: 11.2 medications (N=48, SD 5.8)
Admitted to the Hospital (%)	0%	35.1%

The average age for the pre-intervention group was 78 years old compared to 77 years old in the post-intervention group. The average number of home medications was also comparable, with 13.4 medications in the pre-intervention group compared to 11.6 medications in the post-intervention group. For the pilot group, an average of 12 minutes was spent on the medication history by the pharmacy technician and an average of 12 minutes was spent by the pharmacist to complete the home medication list review.

Following implementation there was a statically significant increase in the average number of medications changes per patient on discharge between the two groups with an average of 0.1 (SD 0.3, 0.0-2.0) in the pre-intervention group and 0.7 (SD 1.5, 0.0-7.0; $p<0.001$) in the post-intervention group. The percentage of patients with a home medication change on discharge was 6.0% in the pre-intervention group compared to 25.7% in the post-intervention group ($p<0.001$, **Figure 3**).

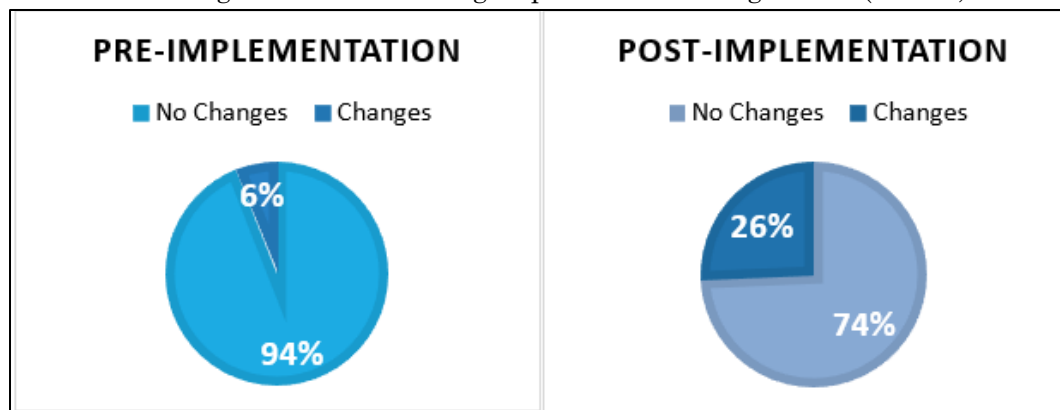


Figure 3. Comparison of the percentage of patients with home medication changes made on discharge between the pre-implementation (N=150) and post-implementation groups (N=74).

There was a similar rate of return to the ED within 72 hours between the pre- and post-intervention groups, 6.7% and 8.1% ($p=0.694$), respectively (**Figure 4**).

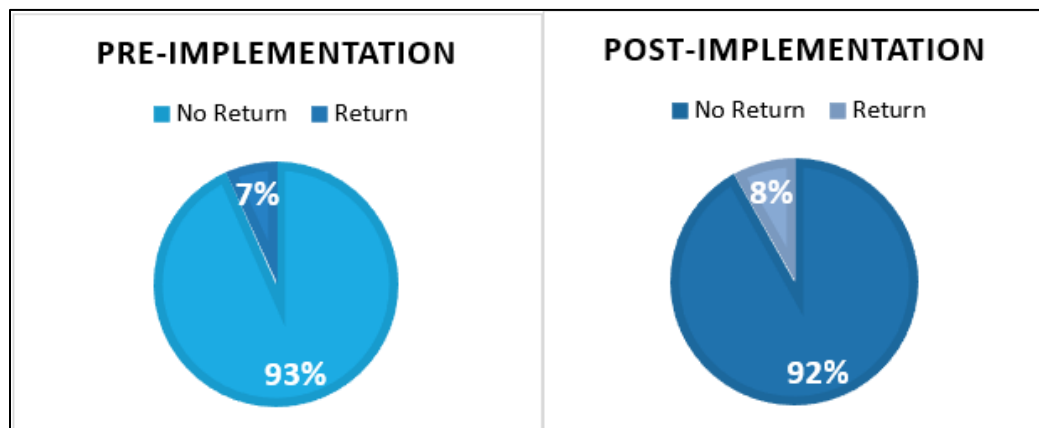


Figure 4. Comparison of rate of return to ED within 72 hours between the pre-implementation (N=150) and post-implementation groups (N=74).

A total of 48 pharmacist recommendations were made during the duration of the pilot with an average of 0.62 recommendations made per patient. Most of the recommendations made were determined to be most appropriately addressed by a PCP (**Figure 5**).

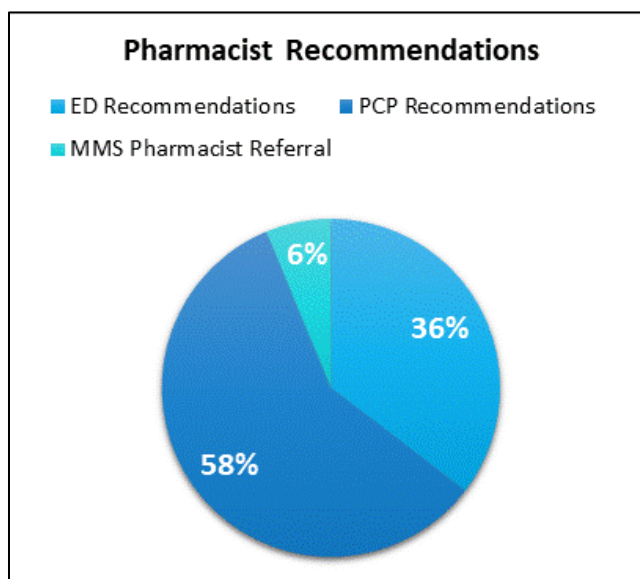


Figure 5. Types of pharmacist recommendations during the pilot (N=48).

The most common types of recommendations were for de-prescribing, patient education, and monitoring. (Table 2.)

Intervention Type	Number of Intervention Type During Pilot	Example Interventions
De-Prescribing	14	Diphenhydramine for sleep Benzodiazepines for sleep
Dose Reduction	6	Renal adjustment for gabapentin Renal adjustment for apixaban
Patient Education	10	Use of benzodiazepines with opioids Pseudoephedrine should be as needed, not twice daily
Medication Addition	1	Senna and polyethylene glycol scheduled for chronic constipation
Medication Change	7	Doxazosin being used for hypertension Ineffective mirtazapine to SSRI
Monitoring	8	Recheck TSH after recent levothyroxine change Sedation associated with pregabalin

Overall, there were three MMS referrals placed, of which, only one patient scheduled and attended the appointment. For that one patient, there were a total of six medication-related interventions made at the MMS appointment.

Since the pilot captured patients who were subsequently hospitalized, a brief evaluation of the hospitalized group was completed to evaluate intervention acceptance rate on hospital discharge. There were 28 patients captured who were subsequently admitted to the hospital. Of these patients, 11 patients had pharmacist recommendations. Recommendations were only accepted on hospital discharge for one patient. Additionally, analysis was later completed to determine rate of recommendation acceptance for those routed to a patient's PCP. Of 28 PCP recommendations, a total of 13 recommendations were accepted and followed, for an approximate acceptance rate of 46%. A subgroup analysis was also completed to compare the pre-implementation group to the post-implementation patients who discharged from the ED. There were 48 patients in the post-intervention group who discharged directly from the ED. The average number of home medication changes on ED discharge was similar between the two groups, 0.1 (SD 0.3) in the pre-intervention group compared to 0.1 (SD 0.2) in the post-intervention subgroup. The percentage of patients with a home medication change on ED discharge was also similar at 6.0% in the pre-intervention group compared to 6.2% in the post-intervention subgroup (Figure 6).

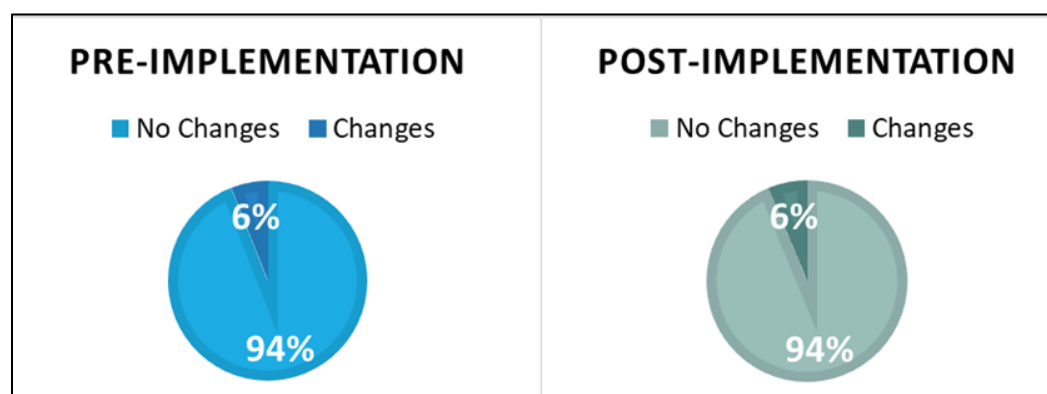


Figure 6. Comparison of home medication changes made on ED discharge for the pre-implementation group (N=150) compared to the subgroup of post-implementation patients who discharged from the ED).

Lastly, the rate of return to the ED within 72 hours was also similar between the groups at 6.7% and 10.4%, respectively. There were 32 total pharmacist recommendations for the patients in the post-intervention subgroup and most of the recommendations were for PCPs (Figure 7.)

DISCUSSION

Despite attempting to only capture ED patients, there were still several patients in the pilot who were subsequently hospitalized. Unfortunately, there is not a clear way to avoid this aside from completing retroactive chart review on patients who presented to the ED but then subsequently discharged from the ED.

At this site, it was found to be unsustainable long term for our pharmacists to proactively search out these patients. This is especially appreciated as only approximately 5% of the geriatric patients who presented to the ED were captured during this pilot. There were significant difficulties associated with incorporating these reviews into the current workflow of the ED pharmacists as they are frequently pulled away from the computer to participate in codes and procedural sedations, answer questions, provide patient education, etc. For programs considering implementing a similar pilot or practice, focusing on identification of specific, high yield interventions, rather than broadly reviewing patients for potential medication related issues, may be beneficial, especially if a high volume of geriatric patients is anticipated.

As the ED moves forward with geriatric certification, it is anticipated that our ED pharmacists will help with identification of these patients and then place referrals for our transitions of care pharmacist to review these patients retrospectively. The ED pharmacist group thought a transitions of care pharmacist may be best to facilitate these home medication evaluations as most of the recommendations were for PCPs and this pharmacist would be more knowledgeable about ambulatory practice guidelines. A transitions of care pharmacist is also well positioned to help with coordination for patients who have outside PCPs, as well assist with medication affordability and access. Of note, this is a position that is not yet implemented at this practice site, though the plan is to implement it in the near future.

LIMITATIONS

One of the main limitations of this project pertains to the inability to capture all qualified patients and specifically identify patients who would discharge directly from the ED. The ability of the pharmacists and pharmacy technicians to implement this additional work was severely limited by their current workload. It is expected that the true impact of the pharmacists' recommendations and the education of the providers may not have been sufficiently captured within the length of the pilot. An additional limitation of this study is that not all recommendations to PCPs were not followed to see they were evaluated or implemented. Due to timeline constraints associated with geriatric accreditation limited the ability to analyze the potential impact made by recommendations to PCPs. A future study that can allow the time necessary to track these changes would better quantify that potential impact. Unfortunately, recommendations were not sent to PCPs outside of the Mayo Clinic system, resulting in difficulty with transitions of care and implementation of medication changes. Lastly, we found that ED providers were hesitant to make changes to home medications, especially chronic home medications.

CONCLUSION

Pharmacists are well positioned to evaluate home medication lists and make therapeutic recommendations based on a patient's medical history, current condition, and labs. However, the ED may not be the most appropriate place for this evaluation to occur. In this pilot, ED pharmacists



Figure 7. Types of pharmacist recommendations from the subgroup of patients who were discharged directly from the ED (N=32).

recommended home medication list changes for most geriatric ED patients who were evaluated, but there was not a statistically significant difference in home medication changes on discharge, when considering the subgroup analysis of pilot patients who discharged from the ED. It would be interesting to evaluate the true impact of pharmacist review of home medication lists for geriatric patients who discharged from the ED. Additionally, it would be imperative for another study to follow the recommendations to the PCPs in order evaluate the value of a pharmacist's recommendations. Overall, this study found that pharmacist review of geriatric patient home medication lists results in a number of therapeutic recommendations for PCPs and several recommendations for ED providers. It is beneficial for pharmacists to evaluate geriatric patient home medication lists and this review has the potential to result in improved patient care.

KEYWORDS

Pharmacist, Polypharmacy, Geriatric, Recommendations, Medications

AUTHOR AFFILIATIONS

Mayo Clinic Health System-Eau Claire, Mayo Clinic

CORRESPONDING AUTHOR

Rachael Sheehan, PharmD

Mayo Clinic Health System-Eau Claire, Mayo Clinic

rachelshe@gmail.com

CONFLICTS OF INTEREST

The authors report no conflicts of interest.

ACKNOWLEDGMENTS

Ross Dierkhising, MS

Sponsor Role: None

Funding: None

REFERENCES

1. Pines JM, Mullins PM, Cooper JK, Feng LB, Roth KE. National trends in emergency department use, care patterns, and quality of care of older adults in the United States. *J Am Geriatr Soc*. 2013;61(1):12-17. doi:10.1111/jgs.12072
2. American Geriatrics Society. Geriatric EM Guidelines 2014. Am Geriatr Soc. Published online 2013. https://www.acep.org/globalassets/uploads/uploaded-files/acep/clinical-and-practice-management/resources/geriatrics/geri_ed_guidelines_final.pdf
3. Maher RL, Hanlon J, Hajjar ER. Clinical consequences of polypharmacy in elderly. *Expert Opin Drug Saf*. 2014;13(1):57-65. doi:10.1517/14740338.2013.827660
4. Greiver M, Dahrouge S, O'Brien P, et al. Improving care for elderly patients living with polypharmacy: Protocol for a pragmatic cluster randomized trial in community-based primary care practices in Canada. *Implement Sci*. 2019;14(1):1-15. doi:10.1186/s13012-019-0904-4
5. Banerjee A, Mbamalu D, Ebrahimi S, Khan AA, Chan TF. The prevalence of polypharmacy in elderly attenders to an emergency department - A problem with a need for an effective solution. *Int J Emerg Med*. 2011;4(1):22. doi:10.1186/1865-1380-4-22
6. Laatikainen O, Sneek S, Bloigu R, Lahtinen M, Lauri T, Turpeinen M. Hospitalizations due to adverse drug events in the elderly-a retrospective register study. *Front Pharmacol*. 2016;7(OCT):1-8. doi:10.3389/fphar.2016.00358
7. Chang TI, Park H, Kim DW, et al. Polypharmacy, hospitalization, and mortality risk: a nationwide cohort study. *Sci Rep*. 2020;10(1):1-9. doi:10.1038/s41598-020-75888-8

8. Kiel W, Phillips S. Impact of Pharmacist-Conducted Comprehensive Medication Reviews for Older Adult Patients to Reduce Medication Related Problems. *Pharmacy*. 2017;6(1):2. doi:10.3390/pharmacy6010002
9. Liu YL, Chu LL, Su HC, et al. Impact of Computer-Based and Pharmacist-Assisted Medication Review Initiated in the Emergency Department. *J Am Geriatr Soc*. 2019;67(11):2298-2304. doi:10.1111/jgs.16078
10. Houliand MB, Andersen AL, Trelldal C, et al. A collaborative medication review including deprescribing for older patients in an emergency department: A longitudinal feasibility study. *J Clin Med*. 2020;9(2):1-16. doi:10.3390/jcm9020348
11. Campins L, Serra-Prat M, Gózaló I, et al. Randomized controlled trial of an intervention to improve drug appropriateness in communitydwelling polymedicated elderly people. *Fam Pract*. 2017;34(1):36-42. doi:10.1093/fampra/cmz073