Journal of Medicines Development Sciences, 2026, Volume 11, Issue 3
https://bbwpublisher.com/journal/JMDS
Online ISSN: 2382-6371
Print ISSN: 2382-6363

Effect of Pharmaceutical Intervention on Potentially Inappropriate Medication in Elderly Hospitalized Patients with Polypharmacy

Debo Hu[1], Yongjie Zhang[2], Zhenni Yan[1], Dan Jin[1], Yalian Zheng[1], Chun Xie[1], Ye Chen[1]*

[1]Department of Pharmacy, Xuyong People's Hospital, Luzhou 646000, Sichuan, China
[2]Department of Respiratory and Critical Care Medicine, Xuyong People's Hospital, Luzhou 646000, Sichuan, China

Author to whom correspondence should be addressed.

Copyright: © 2026 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: *Objective:* To investigate the effect of systematic pharmaceutical intervention by clinical pharmacists on potentially inappropriate medication (PIM) in elderly hospitalized patients with polypharmacy, and to provide realworld evidence for establishing standardized medication management models and preventing medicationrelated risks in the elderly population. *Methods:* A total of 246 elderly inpatients with polypharmacy admitted to the Department of Respiratory and Critical Care Medicine of the hospital from January 2024 to June 2025 were enrolled. They were divided into a control group and an observation group according to the order of admission, with 123 cases in each group. The control group received routine diagnosis and treatment plus basic medication instructions; the observation group received integrated pharmaceutical interventions on the basis of routine care, including medication reconciliation upon admission, dynamic medication order review, individualized medication education, and discharge medication counseling. The incidence of PIM, the average number of PIM items per patient, and the incidence of moderatetosevere drugdrug interactions were compared between the two groups at admission and discharge. Adverse drug reactions during hospitalization and the acceptance rate of pharmacists' recommendations were also recorded. *Results:* There was no statistically significant difference in baseline characteristics between the two groups ($P > 0.05$). At discharge, the number of patients with PIM and the average number of PIM items per patient in the observation group were significantly lower than those in the control group (both $P < 0.001$). The incidence of drugdrug interactions at discharge and the incidence of adverse drug reactions during hospitalization in the observation group were also significantly lower than those in the control group (both $P < 0.01$). During the intervention period, clinical pharmacists proposed 216 medication optimization recommendations, of which 179 were accepted by physicians, yielding an acceptance rate of 82.87%. *Conclusion:* Comprehensive systematic pharmaceutical intervention can effectively reduce the number of PIM items in elderly inpatients with polypharmacy, lower the risk of adverse drug interactions and adverse drug reactions, and promote continuous optimization of multidrug regimens in elderly patients. This physicianpharmacist collaborative model is worthy of promotion in general internal medicine wards for the elderly.

Keywords: Elderly hospitalized patients; Polypharmacy; Potentially inappropriate medication; Clinical pharmacist; Medication reconciliation; Pharmaceutical intervention

Online publication: September 16, 2026

1. Introduction

Currently, the prevalence of chronic disease comorbidities among people aged 65 and above in China is as high as 60% [1]. Older adults with multiple chronic conditions often require longterm use of multiple medications to alleviate clinical symptoms, making polypharmacy increasingly common and serious. In clinical practice, the daily use of five or more medications is generally defined as polypharmacy, and this population faces a significantly higher risk of inappropriate prescribing. With declining hepatic drugmetabolizing enzyme activity, reduced renal filtration function, and decreased drug tolerance in the elderly, the likelihood of potentially inappropriate medication (PIM) is markedly increased under polypharmacy conditions [2]. Potentially Inappropriate Medication (PIM) specifically refers to prescribing situations where the benefits of a drug therapy are limited, the risks outweigh the potential benefits, or there are adverse drugdisease or drugdrug interactions. PIM not only induces acute adverse reactions such as dizziness, gastrointestinal injury, and orthostatic hypotension, but also increases the incidence of adverse clinical outcomes including falls, cognitive decline, and unplanned hospital readmissions, thereby consuming additional healthcare resources [3]. In the current clinical care system, physicians primarily focus on disease control and find it difficult to comprehensively address pharmaceutical issues such as drugcombination risks, ageappropriate dosing thresholds, and benefit assessment of longterm adjunctive therapies. Relying solely on conventional diagnosis and treatment models is insufficient to autonomously resolve the medication safety hazards posed by polypharmacy. Clinical pharmacists, equipped with professional medication therapy management skills, can utilize standardized geriatric medication assessment tools to conduct prescription screening, medication reconciliation, regimen optimization, and health education. In recent years, multiple domestic studies have confirmed that pharmaceutical care can improve the rationality of medication use in elderly patients; however, intervention protocols vary across institutions, and realworld quantitative evidence of its effects still needs to be supplemented. This study enrolled 246 elderly inpatients with polypharmacy, employed a controlled study design to implement comprehensive pharmaceutical interventions throughout the hospitalization, quantitatively analyzed changes in PIMrelated indicators before and after the intervention, and aimed to develop a feasible and standardized pharmaceutical care pathway for elderly inpatients, thereby providing practical references for hospitals to advance rational medication management in the elderly.

2. Materials and methods

2.1. Study Participants

A prospective controlled study was conducted on 246 elderly inpatients with polypharmacy admitted to the Department of Respiratory and Critical Care Medicine of our hospital from January 2024 to June 2025. Inclusion criteria: (1) age ≥ 65 years; (2) continuous use of ≥ 5 medications during hospitalization; (3) complete medical records, laboratory, and examination data; (4) informed consent provided by the patient or immediate family members to participate in the study. Exclusion criteria: (1) patients receiving palliative care for advanced malignant tumors; (2) severe cognitive impairment precluding effective communication; (3) admission to the intensive care unit or hospital stay < 48 hours; (4) voluntary discharge or transfer to another hospital before completing data collection; (5) patients with endstage organ failure requiring continuous hemodialysis. Group allocation: patients were consecutively numbered according to admission order; odd numbers were assigned to the observation group and even numbers to the control group, with 123 cases in each group. The study protocol was reviewed and approved by the Medical Ethics Committee of the hospital.

2.2. Intervention protocols

2.2.1. Control group

The control group received the hospital's conventional treatment and management approach: the attending physician formulated the medication plan based on the patient's condition; nursing staff executed the orders and provided basic medication instructions. There was no active involvement of clinical pharmacists in medication regimen review; only simple medication information was provided upon the physician's request, and no systematic medication reconciliation, continuous medication evaluation, or individualized education was conducted.

2.2.2. Observation group

On the basis of conventional care, a fullcourse pharmaceutical intervention from admission to discharge was delivered by dedicated clinical pharmacists. The specific measures were as follows: (1) Medication reconciliation completed within 24 hours of admission. A comprehensive list of longterm oral Western medicines, Chinese patent medicines, and dietary supplements used before admission was systematically collected. Combined with laboratory indicators such as liver and kidney function and electrolytes, PIMs and moderatetosevere drugdrug interactions were screened according to the 2024 China Criteria for Potentially Inappropriate Medication in Older Adults (PIMChina), and a personal medication risk profile was established [4]. (2) Dynamic daily review of medical orders. Pharmacists participated in daily ward rounds and case discussions, and performed realtime review of newly prescribed standing and asneeded orders. When inappropriate prescribing was identified, written optimization recommendations were formulated and communicated to the attending physician, proposing feasible options such as drug discontinuation, dose reduction, drug substitution, or adjustment of administration timing, based on the patient's clinical status. (3) Stratified, individualized medication education. Facetoface medication counseling was provided to patients and caregivers, with particular emphasis on highrisk drugs such as antihypertensives, sedativehypnotics, and nonsteroidal antiinflammatory drugs. Education covered proper medication administration, early recognition of adverse drug reactions, and correction of poor practices such as selfadjusting doses or duplicate medication intake. (4) Comprehensive discharge medication management. Before discharge, the discharge medication list was reviewed, distinguishing longterm maintenance therapy from shortcourse drugs, and a simple medication schedule was prepared. Clear instructions on medication contraindications and followup monitoring time points were given to reduce postdischarge medication execution errors. (5) Dynamic reassessment. When significant changes occurred in the patient's clinical condition or laboratory test results, the medication regimen was reevaluated to promptly identify newly emerged risks of inappropriate prescribing.

2.3. Observation indicators

(1) Baseline indicators: age, sex, number of chronic comorbidities, and total number of medications on admission; (2) Primary outcome indicators: incidence of PIM (potentially inappropriate medications) at admission and discharge, and mean number of PIM items per patient; (3) Secondary outcome indicators: incidence of moderatetosevere drugdrug interactions at admission and discharge, and incidence of adverse drug reactions during the hospitalization period; (4) Intervention effectiveness indicators: total number of pharmaceutical optimization recommendations, number of recommendations accepted by physicians, and overall recommendation acceptance rate.

2.4. Statistical analysis

Data were processed using SPSS 27.0 statistical software. Continuous data are presented as mean ± standard deviation (SD), and an independent samples ttest was used for comparisons both within and between groups. Categorical data were analyzed using the chisquare test. A *P*value <0.05 was considered statistically significant.

3. Results

3.1. Comparison of baseline characteristics between the two groups

Comparison of baseline characteristics between the two groups showed no statistically significant differences ($P > 0.05$), as shown in **Table 1**.

Table 1. Comparison of baseline characteristics between the two groups of elderly hospitalized patients

Group	Age (years)	Gender (Male/ Female, *n*)	Number of chronic diseases	Number of medications on admission
Control group (*n*=123)	76.35±6.42	67/56	4.72±1.36	7.86±2.15
Observation group (*n*=123)	75.81±6.75	63/60	4.65±1.41	7.73±2.24
t/x^2 value	0.643	0.261	0.398	0.501
P value	0.521	0.609	0.691	0.617

3.2. Comparison of PIMrelated indicators between the two groups at admission and discharge

At discharge, the observation group had significantly lower numbers of PIM cases and a lower mean number of PIM items per patient than the control group (both $P < 0.001$), as shown in **Table 2**.

Table 2. Comparison of PIM indicators between the two groups at admission and discharge

Group	Number of PIM cases (%)		Mean number of PIM items per person	
	Admission	Discharge	Admission	Discharge
Control group (*n*=123)	74 (60.16)	76 (61.79)	1.21±0.44	1.16±0.41
Observation group (*n*=123)	72 (58.54)	42 (34.15)	1.18±0.43	0.47±0.32
t/x^2	0.067	18.828	0.712	14.691
P	0.795	<0.001	0.477	<0.001

3.3. Comparison of moderate-to-severe drug–drug interactions and adverse drug reactions

The incidences of drug–drug interactions at discharge and adverse drug reactions during hospitalization in the observation group were significantly lower than those in the control group (all $P < 0.01$), as shown in **Table 3**.

Table 3. Comparison of drug–drug interactions and adverse drug reactions between the two groups [cases (%)]

Indicators	Moderate-to-severe drug-drug interactions at admission	Moderate-to-severe drug-drug interactions at discharge	Adverse drug reactions during hospitalization
Control group (n=123)	62 (50.41)	61 (49.59)	26 (21.14)
Observation group (n=123)	59 (47.97)	34 (27.64)	10 (8.13)

x^2	0.146	12.501	8.330
P	0.702	<0.001	0.004

3.4. Adoption rate of pharmaceutical intervention recommendations

During the wholecourse medication review process in the observation group, clinical pharmacists proposed a total of 216 medication optimization recommendations, of which 179 were accepted by physicians, yielding an overall adoption rate of 82.87%. The recommendations were categorized as follows: dose adjustment in 74 cases (34.26%), discontinuation of inappropriate medications without clear benefit in 61 cases (28.24%), substitution with suitable alternative agents in 45 cases (20.83%), adjustment of dosing frequency or administration time in 29 cases (13.43%), and addition of medication monitoring or symptomatic intervention in 7 cases (3.24%).

4. Discussion

Polypharmacy is a prevalent clinical phenomenon among hospitalized elderly patients in internal medicine departments [5]. Agerelated physiological decline alters the pharmacokinetic characteristics of drugs, and when combined with multiple medications, the risk of potentially inappropriate medications (PIMs) increases significantly. PIMs are not merely a single prescribing issue; they can increase acute adverse reactions, fall events, cognitive impairment, and readmission risk, while also imposing a heavier economic burden on patients, making them a key concern in geriatric medication safety [6]. Under conventional diagnosis and treatment models, physicians prioritize the management of various primary diseases and often cannot fully address the compatibility risks among multiple medications or the safety thresholds in elderly patients; relying on spontaneous prescription adjustments is insufficient to continuously control the incidence of inappropriate prescribing.

The baseline data from this study showed that among the 246 elderly patients with polypharmacy included at admission, the overall PIM prevalence reached 59.35%, which is consistent with findings from similar crosssectional surveys conducted in China, reflecting the prominent issue of inappropriate medication use in this population and the urgent need for specialized pharmaceutical intervention [7]. In the control group, which received conventional care, no significant improvement was observed in PIMrelated indicators from admission to discharge; some patients even developed new inappropriate medication regimens during hospitalization, confirming that without continuous pharmaceutical monitoring, polypharmacyrelated risks do not resolve spontaneously.

After the implementation of a fullcourse pharmaceutical intervention in the observation group, the PIM prevalence at discharge decreased from 58.54% to 34.15%, and the mean number of PIM items per patient was significantly reduced, accompanied by concurrent decreases in the incidences of moderatetosevere drug–drug interactions and adverse drug reactions. Analysis of the intervention mechanisms suggests that medication reconciliation at admission enables a comprehensive review of preexisting outpatient medication lists, facilitating early detection of longstanding inappropriate medications; routine order review allows for preemptive interception of irrational prescribing, preventing new drugrelated risks; and pharmacists, guided by unified geriatric medication standards, propose individualized optimization plans that balance medication safety with therapeutic needs. In this study, the acceptance rate of pharmacist intervention

recommendations reached 82.87%, indicating that clinicians acknowledge pharmaceutical expertise and that the physicianpharmacist collaborative model has a solid foundation for clinical implementation [8].

In terms of the composition of intervention recommendations, dose optimization and withdrawal of unnecessary medications accounted for the largest proportions. Common PIMs observed in clinical practice frequently involve longterm use of benzodiazepine sedatives, chronic highdose nonsteroidal antiinflammatory drugs, and concurrent use of multiple anticholinergic agents. Many elderly patients are prescribed various adjunctive medications for extended periods without periodic deprescribing assessments, resulting in a status quo of "continued medication without clear benefit." Deprescribing strategies are among the most direct and effective approaches to reducing PIMs. In addition, optimizing administration timing and avoiding conflicting drug combinations can reduce adverse drug interactions and lower the probability of adverse reactions [9].

Medication education also plays a vital role [10]. Many elderly patients exhibit behaviors such as missed doses, duplicate dosing, or unauthorized dose adjustments; even when discharge prescriptions are optimized, deviations in medication adherence can still pose safety risks. Oneonone pharmacist counseling combined with standardized medication lists can improve patient adherence and ensure the effective implementation of optimized therapeutic regimens.

This study is a singlecenter prospective controlled trial, with participants limited to patients with chronic diseases in the Department of Respiratory and Critical Care Medicine. The generalizability of the findings to elderly patients in surgical or rehabilitation settings still requires multicenter, largesample studies. Moreover, the observation endpoint was set at hospital discharge, and no longterm followup was conducted; therefore, the impact of pharmaceutical interventions on postdischarge falls, readmission, and longterm survival outcomes could not be assessed. Future studies should extend the followup period to further evaluate the longterm clinical benefits of pharmaceutical interventions.

In conclusion, establishing a wholecourse pharmaceutical intervention model led by clinical pharmacists for hospitalized elderly patients with polypharmacy can effectively screen for and reduce potentially inappropriate medication items, decrease the risks of moderatetosevere drug–drug interactions and adverse drug reactions, and continuously optimize polypharmacy regimens. It is recommended that medical institutions deploy specialized or wardbased clinical pharmacists on a routine basis, establish an integrated pharmaceutical care system encompassing admission medication reconciliation, dynamic order review, and discharge medication counseling, and leverage physicianpharmacist collaboration to manage medication risks in the elderly, thereby ensuring the safety of pharmacotherapy for hospitalized geriatric patients.

Funding

Project: Exploring Coping Strategies Based on the Current Status of Polypharmacy in Elderly Hospitalized Patients in the Southern Mountainous Area of Luzhou (Free Exploration) (Project No.: 2024JYJ095)

Disclosure statement

The authors declare no conflict of interest.

References

[1] Pan WY, Zhang CH, Zhang ZX, et al., 2022, Analysis and Commentary on Polypharmacy Management in Elderly Patients with Chronic Comorbidities. Chinese General Practice, 21(13): 1545–1550.

[2] Yu F, Zheng YL, Dong TY, et al., 2021, Research on Medication Guidance Methods for Elderly Patients in Family Physician Nursing Services. Chinese Journal of Social Medicine, 38(4): 451–454.

[3] Gao QY, Zeng YH, 2025, Research Progress on the Bidirectional Relationship between Frailty, Polypharmacy, and Potentially Inappropriate Medications in Elderly Patients. Chinese Journal of Convalescent Medicine, 34(4): 73–78.

[4] Yang WJ, Xin CW, Zhang ML, 2026, Interpretation of the 2024 update of the Chinese Criteria for Potentially Inappropriate Medications in Older Adults (PIM-China). Chinese General Practice, 29(24): 3409–3415.

[5] Chang YN, Wang N, Zhang Y, 2024, Assessment of Potentially Inappropriate Medications in Elderly Diabetic Patients with Polypharmacy Using the Beers Criteria Combined with STOPP Criteria. China Pharmacy, 35(24): 3076–3080.

[6] Gao QY, Zeng YH, 2025, Research Progress on the Bidirectional Relationship between Frailty, Polypharmacy, and Potentially Inappropriate Medications in Elderly Patients. Chinese Journal of Convalescent Medicine, 34(4): 73–78.

[7] Wang YL, Xu HY, Wang J, et al., 2025, Analysis of Potentially Inappropriate Medications and their Influencing Factors in Hospitalized Elderly Patients. Drug Evaluation, 22(9): 1063–1068.

[8] Bai Q, Cai WP, Zhu WY, et al., 2025, Effect of Clinical Pharmacist Intervention on Improving Medication Rationality in Hospitalized Elderly Patients. Journal of Pharmaceutical Sciences of the People's Liberation Army, 38(3): 281–283 + 288.

[9] Zhuang XS, Liu Y, Guo LL, 2024, Application and Effect Evaluation of Pharmaceutical-nursing Management in Elderly Patients with Multiple Medications. Northern Pharmacy, 21(9): 106–108.

[10] Cao L, Yang ZH, Xiao WZ, 2023, Exploration of Personalized Health Education Models for Patients with Multiple Comorbidities. Chinese Journal of General Practice, 21(6): 916–919 + 965.

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.