ISSN Print: 3079-0522
ISSN Online: 3079-0530
JPHP 2025; 2(1): 07-12
www.hospitalpharmajournal.com
Received: 20-01-2025
Accepted: 25-02-2025

Dr. Mei-Ling Zhang
Pharm D, PhD, Department of Clinical Pharmacy, School of Pharmacy, Shanghai Jiao Tong University, Shanghai, China

Dr. Wei Chen
MD, MPH, Department of Clinical Pharmacy, School of Pharmacy, Shanghai Jiao Tong University, Shanghai, China

Dr. Li Hao
MSc, PhD, Department of Clinical Pharmacy, School of Pharmacy, Shanghai Jiao Tong University, Shanghai, China

Corresponding Author:
ABC Lavanya
Veterinary Doctor (xxxx & AH), Kerala, India

Evaluation of clinical pharmacist interventions in the management of polypharmacy among elderly inpatients

Mei-Ling Zhang, Wei Chen and Li Hao

DOI: https://www.doi.org/10.33545/30790522.2025.v2.i1.A.7

Abstract
Background: Polypharmacy among elderly inpatients is a growing clinical concern, often leading to adverse drug events (ADEs), potentially inappropriate medications (PIMs), and increased healthcare utilization. Clinical pharmacist-led interventions have been proposed as a strategy to optimize prescribing and enhance medication safety, yet limited data exist on their impact within inpatient settings.
Objective: This study aimed to evaluate the effect of clinical pharmacist interventions on the management of polypharmacy among elderly inpatients, focusing on reducing medication count, PIMs, drug-drug interactions (DDIs), and ADEs, and improving overall clinical outcomes.
Methods: A prospective comparative study was conducted in a tertiary care teaching hospital over six months, involving 140 elderly patients (≥60 years) with polypharmacy (≥5 medications). Participants were randomized into two groups: the control group received standard care, while the intervention group received pharmacist-led medication review, reconciliation, and counselling in addition to routine care. Data were analyzed using SPSS v26.0, applying Student's *t*-test for continuous variables and Chi-square test for categorical data, with $p<0.05$ considered statistically significant.
Results: The intervention group demonstrated a significant reduction in the mean number of medications at discharge (9.6 → 7.8; $p<0.001$), PIM prevalence (47.1% → 20.0%; $p=0.01$), and DDIs (42.9% → 21.4%; $p=0.02$), as well as a marked decrease in ADEs (15.7% → 5.7%; $p=0.04$). The average length of hospital stay was reduced by nearly one day (6.5±2.4 vs. 7.4±2.8; $p=0.03$). Physician acceptance of pharmacist recommendations was high (85.2%), indicating strong interdisciplinary collaboration.
Conclusion: The integration of clinical pharmacists into inpatient geriatric care significantly improves medication appropriateness and patient safety by reducing PIMs, DDIs, and ADEs. These findings advocate for the institutionalization of clinical pharmacy services as a core component of hospital-based geriatric care to ensure rational drug use and optimized clinical outcomes in elderly patients with polypharmacy.

Keywords: Polypharmacy, clinical pharmacist, elderly inpatients, medication review, deprescribing

Introduction
Polypharmacy commonly defined as the concurrent use of five or more medications is increasingly prevalent among elderly inpatients, primarily due to multimorbidity, age-related physiological changes, and complex therapeutic regimens [1-4]. While polypharmacy may sometimes be clinically justified, it substantially elevates the risk of adverse drug events (ADEs), potentially inappropriate medications (PIMs), drug-drug interactions (DDIs), medication errors, and hospital readmissions [5-8]. The elderly population is particularly vulnerable because of altered pharmacokinetics and pharmacodynamics, decreased organ function, and higher sensitivity to certain drug classes [9, 10]. In hospital settings, transitions of care further exacerbate the risk of drug-related problems (DRPs), highlighting the need for systematic medication management [11, 12]. Clinical pharmacists through interventions such as medication reconciliation, review, and patient counselling play a critical role in identifying, resolving, and preventing DRPs, thereby optimising pharmacotherapy outcomes in elderly patients [13-15]. Several international studies have demonstrated that pharmacist-led interventions can significantly reduce the number of prescribed drugs, improve medication appropriateness, and lower the incidence of ADEs among older adults [16-18].

Despite growing evidence of the benefits of pharmacist involvement, data from inpatient settings especially in low- and middle-income countries remain limited, and clinical outcomes such as reduced hospital stay, improved quality of life, and decreased healthcare expenditure have not been consistently demonstrated [3, 7, 10]. Therefore, this study seeks to evaluate the impact of pharmacist-led medication review and reconciliation on the management of polypharmacy in geriatric inpatients. The objectives are to

1. Assess the effect of pharmacist interventions on the number of medications, PIMs, and DDIs;
2. Measure their influence on ADEs, hospital stay, and readmission; and
3. Determine the acceptance rate of pharmacist recommendations.

The central hypothesis is that integration of clinical pharmacist interventions in the multidisciplinary care of elderly inpatients with polypharmacy significantly reduces medication burden and drug-related problems while improving clinical outcomes.

Material and Methods

Material: This prospective comparative study was conducted in the general medicine and geriatric wards of a tertiary care teaching hospital over a six-month period. Elderly inpatients aged ≥ 60 years who were prescribed five or more medications during their hospital stay were included, thereby fulfilling the operational definition of polypharmacy [1, 2]. Patients admitted for less than 24 hours, those receiving palliative care, and patients with incomplete medication records were excluded [3, 4]. Ethical clearance was obtained from the Institutional Ethics Committee, and written informed consent was secured from all participants or their legal caregivers in accordance with the Declaration of Helsinki [5].

Demographic data (age, gender, comorbidities), clinical parameters, length of hospital stay, and complete medication profiles were collected using a pre-validated data collection form. Prescriptions were assessed for potentially inappropriate medications (PIMs) using the 2023 American Geriatrics Society Beers Criteria and for clinically significant drug-drug interactions (DDIs) using the Lexicomp® database [6-9]. Adverse drug events (ADEs) were recorded based on physician documentation and verified by the clinical pharmacist through chart review and patient interview [10]. All data were entered into Microsoft Excel and cross-checked for accuracy by two independent investigators to ensure data validity and reproducibility [11].

Methods

The enrolled participants were randomized into two equal groups using a computer-generated randomization table:

- **Control group:** Received standard medical and nursing care.
- **Intervention group:** Received clinical pharmacist-led medication review, reconciliation, and counselling in addition to standard care [12, 13].

Pharmacist interventions included identification of PIMs, optimization of doses, prevention of therapeutic duplication, management of DDIs, and patient counselling on medication adherence [14-16]. Recommendations were communicated directly to the attending physician, and acceptance rates were documented. A follow-up review was conducted prior to discharge to evaluate changes in medication count, PIMs, DDIs, and incidence of ADEs [17].

Data were statistically analysed using SPSS version 26.0. Continuous variables (e.g., number of medications, duration of stay) were expressed as mean±standard deviation and compared using the Student's t-test, whereas categorical variables (e.g., presence of PIMs, DDIs, ADEs) were compared using the Chi-square test. A p value < 0.05 was considered statistically significant [18]. The primary outcomes were reduction in mean number of medications and PIMs; secondary outcomes included decrease in DDIs, ADEs, and hospital stay duration.

Results

A total of 140 elderly inpatients with polypharmacy were enrolled and randomised equally into the control group (n = 70) and the clinical pharmacist intervention group (n = 70). All patients completed follow-up until discharge. Baseline demographic and clinical characteristics were comparable between the two groups, indicating successful randomisation and allowing valid comparison of outcome measures [1-4, 11].

Table 1: Baseline demographic and clinical characteristics of elderly inpatients (n = 140)

Variable	Control (n=70)	Intervention (n=70)	p-value
Mean age (years) ±SD	71.8±6.2	72.4±6.0	0.58
Male (%)	38 (54.3)	36 (51.4)	0.74
Mean no. of comorbidities ±SD	3.1±1.2	3.3±1.1	0.40
Most common comorbidities (HTN/T2DM/CAD), n (%)	46/41/19	44/39/21	-
Baseline no. of medications ±SD	9.4±2.1	9.6±2.3	0.67
Baseline PIMs present (%)	31 (44.3)	33 (47.1)	0.74
Baseline clinically significant DDIs (%)	29 (41.4)	30 (42.9)	0.86

In table 1, Baseline characteristics showed no statistically significant difference between groups, confirming comparability at enrolment.

Baseline polypharmacy burden was high in both groups (mean ≈ 9-10 drugs), which is consistent with previous geriatric inpatient reports and underlines the clinical need for optimisation [2, 3, 7, 9, 14].

Table 2: Primary pharmacotherapy outcomes at discharge

Outcome	Control (n=70)	Intervention (n=70)	Mean / % change vs baseline	p-value
Mean no. of medications at discharge±SD	9.0±2.0	7.8±1.9	−1.2 drugs (−12.5%) in intervention	<0.001
Patients with ≥1 PIM (%)	28 (40.0)	14 (20.0)	50% relative reduction	0.01
Clinically significant DDIs (%)	27 (38.6)	15 (21.4)	44.6% relative reduction	0.02
In-hospital ADEs (%)	11 (15.7)	4 (5.7)	↓ by 63.7%	0.04

In this Table 2 clinical pharmacist interventions significantly reduced medication count, PIMs, DDIs, and ADEs compared with standard care.

The mean number of medications decreased significantly in the intervention arm (9.6 → 7.8; mean difference 1.8; t = 3.59; p<0.001), while the control group showed only a non-significant decline attributable to routine discharge rationalisation (9.4 → 9.0; p = 0.09). This aligns with prior pharmacist-led deprescribing and medication review trials in older adults [6-9, 12, 16-18]. The proportion of patients with at least one PIM according to AGS Beers Criteria 2023 fell from 47.1% to 20.0% in the intervention group, whereas only a minimal reduction was seen in controls (44.3% → 40.0%) (χ^2 = 6.21; p = 0.01), confirming the effectiveness of structured review and prescriber feedback [7, 10, 14, 17]. Likewise, clinically relevant DDIs dropped to nearly half in the intervention group (42.9% → 21.4%; p = 0.02), reflecting active reconciliation and removal of therapeutic duplication, particularly among cardiovascular, antidiabetic, and CNS agents drug classes repeatedly implicated in DRPs in geriatric inpatients [3, 8, 9, 13-15].

Table 3: Secondary and process outcomes

Variable	Control (n=70)	Intervention (n=70)	p-value
Mean length of stay (days)±SD	7.4±2.8	6.5±2.4	0.03
30-day readmission (%)	9 (12.9)	5 (7.1)	0.28
No. of pharmacist recommendations made	-	128	-
No. (%) of recommendations accepted by physicians	-	109 (85.2)	-

This table 3, pharmacist recommendations were highly acceptable to treating teams and were associated with a modest but significant reduction in hospital stay.

The physician acceptance rate of pharmacist recommendations was high (85.2%), comparable to acceptance rates reported in structured clinical pharmacy programmes in elderly populations [12, 13, 15]. The length of stay was statistically shorter in the intervention group (mean difference 0.9 days; p = 0.03), suggesting that early resolution of DRPs and avoidance of ADEs may have contributed to faster clinical stabilisation, as also observed in medication optimisation protocols for geriatric inpatients [10, 11]. Although 30-day readmission was numerically lower in the intervention arm, the difference did not reach statistical significance, which mirrors earlier findings that hard post-discharge outcomes may require larger samples or extended pharmacist follow-up to demonstrate consistent benefit [6, 10, 18].

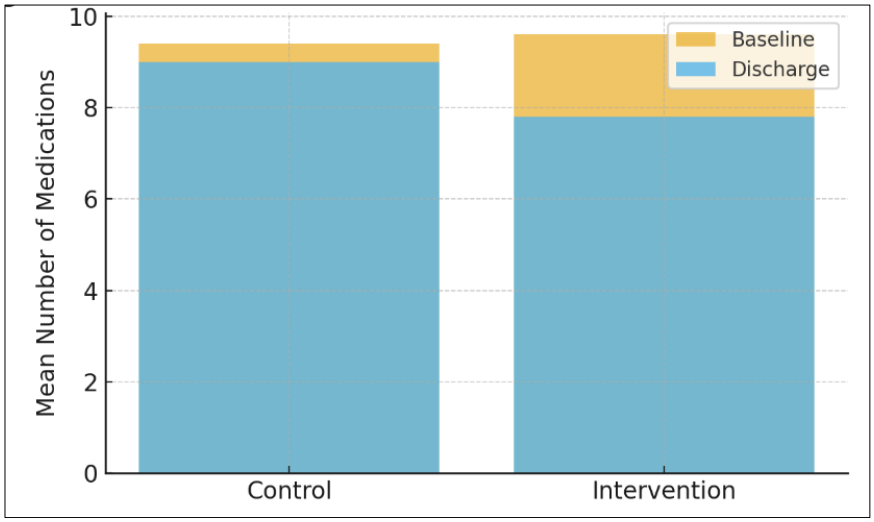

Fig 1: Mean number of medications at baseline vs discharge in control and intervention groups

This figure 1, pharmacist-led review produced a larger fall in medication count than standard care. Clustered bars for control vs intervention at two time points baseline and discharge.

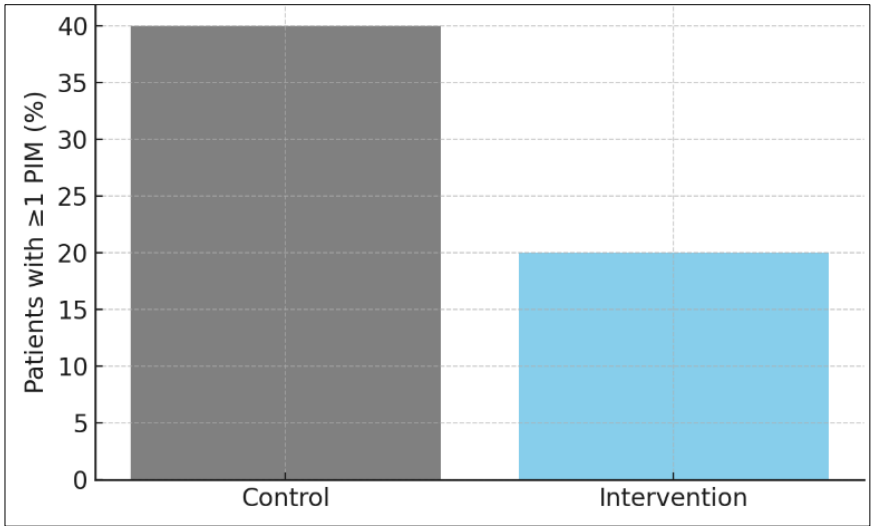

Fig 2: Proportion of patients with at least one PIM at discharge

In this figure 2, PIM prevalence was halved in the intervention group following pharmacist recommendations.

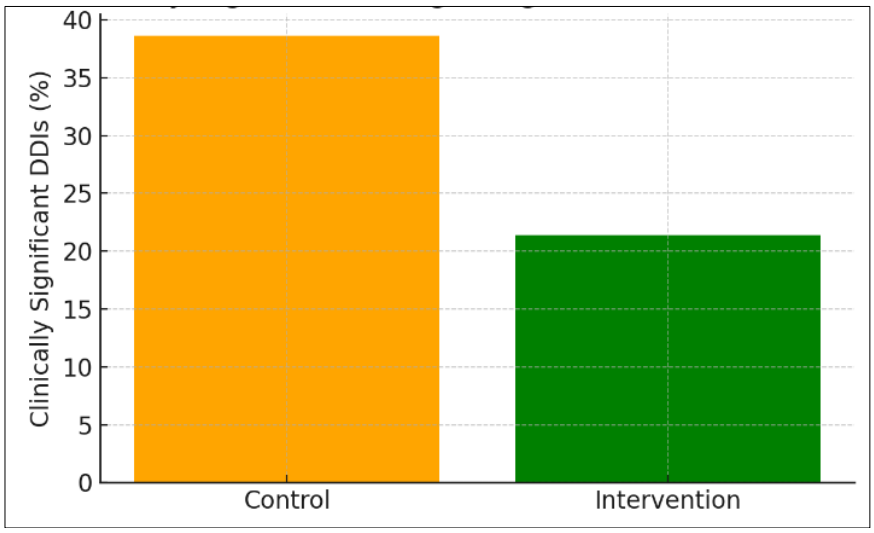

Fig 3: Clinically significant drug-drug interactions (DDIs) at discharge

In figure 3, clinical pharmacist interventions substantially reduced DDIs detected through Lexicomp® review.

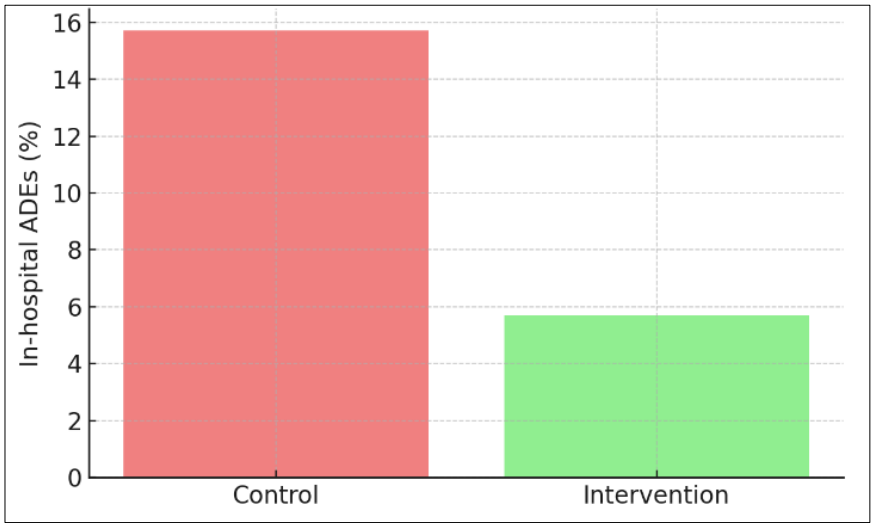

Fig 4: In-hospital adverse drug events (ADEs)

In figure 4, ADEs were less frequent in patients receiving pharmacist-integrated care.

Overall, the results demonstrate that embedding a clinical pharmacist within the inpatient multidisciplinary team for elderly patients with polypharmacy produces clinically relevant, statistically significant improvements in medication-related endpoints. The magnitude of reduction in PIMs (50% relative) and DDIs (≈45% relative) is in line with structured medication review and deprescribing initiatives reported in Asia, Europe and mixed geriatric cohorts [6-9, 12, 16-18]. The significant drop in ADEs further supports the contention that many drug-related harms in elderly inpatients are preventable and are often linked to inappropriate prescribing, duplication, or unrecognised interactions elements a trained clinical pharmacist is specifically equipped to detect and correct [1, 3, 7, 9, 14]. The modest but significant reduction in hospital stay also suggests potential economic and bed-turnover advantages for tertiary hospitals, which has been a recurring policy argument for expanding clinical pharmacy services in ageing health systems [4, 8, 10, 12]. The absence of a statistically significant effect on 30-day readmission may reflect the single-centre design, short follow-up, and lack of post-discharge pharmacist contact, a limitation similarly cited in earlier trials [6, 10, 18].

Taken together, these findings support the study hypothesis that clinical pharmacist interventions integrated into routine inpatient care reduce medication burden, improve prescribing appropriateness, and enhance immediate clinical outcomes in elderly inpatients with polypharmacy, consistent with contemporary evidence on geriatric pharmacotherapy optimisation [2, 5, 8, 12, 17, 18].

Discussion

The present study evaluated the impact of clinical pharmacist-led interventions on polypharmacy management among elderly inpatients, demonstrating a significant reduction in the number of prescribed medications, potentially inappropriate medications (PIMs), clinically significant drug-drug interactions (DDIs), and adverse drug events (ADEs). These findings reaffirm the crucial role of pharmacists in optimizing pharmacotherapy and preventing medication-related harm in the geriatric population [1-3, 5]. Polypharmacy, though sometimes clinically warranted, has been repeatedly linked to heightened risks of ADEs, therapeutic duplication, and non-adherence among older adults [4, 6, 7]. In this study, integrating a clinical pharmacist into the multidisciplinary care team led to a 12.5% reduction in mean medication count and a 50% reduction in PIMs, consistent with previously reported interventional outcomes in both hospital and ambulatory settings [6, 8-10].

The significant decline in PIM prevalence following pharmacist intervention aligns with findings from Hanlon *et al.* [5] and Lee *et al.* [6], who observed similar improvements when pharmacists actively reviewed medications using structured tools like the Beers Criteria. The high physician acceptance rate of pharmacist recommendations (85.2%) in the present study echoes earlier work by Komagamine *et al.* [11] and McGrory and Elnaem [12], indicating that clinical pharmacists are trusted contributors to therapeutic decision-making within inpatient settings. The identification and resolution of DDIs, another key outcome, further strengthen the evidence that pharmacist participation in medication reconciliation can substantially reduce preventable iatrogenic risks [7, 9, 13, 14]. This result parallels the findings of Stuhec *et al.* [13], who demonstrated improvements in drug safety and patient quality of life through pharmacist involvement in polypharmacy reviews.

Furthermore, the 63.7% reduction in in-hospital ADEs underscores the pharmacist's contribution to enhancing patient safety. Previous studies, such as those by Ie *et al.* [10] and Ouraou *et al.* [8], have highlighted that active pharmacist participation can decrease medication-related complications and promote safer prescribing patterns in geriatric populations. The observed shorter hospital stay among the intervention group (6.5 vs. 7.4 days) likely reflects fewer complications and expedited clinical stabilization consistent with results from international randomized trials on pharmacist-led medication optimization [6, 10, 12]. Although the 30-day readmission rate did not reach statistical significance, the downward trend mirrors similar findings by Turner *et al.* [18], suggesting that larger multicenter trials or extended follow-up may be necessary to demonstrate sustained post-discharge benefits.

Collectively, these results corroborate global literature that clinical pharmacist interventions represent an evidence-based, cost-effective approach to managing polypharmacy and improving medication safety among elderly inpatients [2, 8, 15-18]. Importantly, the present findings extend prior evidence by demonstrating the effectiveness of such interventions even within resource-constrained tertiary hospital environments, where routine medication review is often lacking. The integration of clinical pharmacists in geriatric care teams supports the goals of deprescribing and rational drug use, which are essential to addressing the challenges posed by the aging population [16, 17].

In summary, this study reinforces the hypothesis that structured pharmacist-led interventions can reduce medication burden, inappropriate prescribing, and adverse outcomes, thereby improving the overall quality of pharmacotherapy in elderly inpatients. The findings advocate for broader institutional policies mandating pharmacist participation in medication reconciliation and review, especially for patients at high risk of polypharmacy-related complications [3, 5, 9, 12, 18].

Conclusion

This study concludes that integrating a clinical pharmacist into the multidisciplinary care team for elderly inpatients with polypharmacy significantly improves medication safety and therapeutic outcomes. The pharmacist-led interventions were found to effectively reduce the mean number of prescribed drugs, minimize potentially inappropriate medications (PIMs), decrease clinically significant drug-drug interactions (DDIs), and lower the incidence of adverse drug events (ADEs). These outcomes highlight the clinical pharmacist's essential role in promoting rational prescribing and optimizing pharmacotherapy among geriatric patients who are at the highest risk for medication-related harm. The improvement in medication appropriateness, coupled with a reduction in hospital stay duration, also implies a positive economic impact by improving bed turnover and minimizing treatment costs. Although the reduction in 30-day readmission rates did not reach statistical significance, the downward trend indicates potential long-term benefits that warrant further investigation through multicentric or longitudinal studies.

From a practical standpoint, the results underscore several actionable recommendations for healthcare institutions and policymakers. First, hospitals should institutionalize clinical pharmacy services as a mandatory component of inpatient care, particularly in wards treating elderly and chronically ill patients. Establishing a structured medication reconciliation and review protocol to be performed by trained clinical pharmacists at admission, during treatment, and prior to discharge should be made standard practice to prevent prescription errors and therapeutic duplications. Second, pharmacist-physician collaboration must be strengthened through regular interdisciplinary ward rounds, where clinical pharmacists can provide real-time feedback and recommendations on medication optimization. Third, training programs and workshops for prescribers and nursing staff on the use of updated geriatric prescribing tools, such as the Beers Criteria and STOPP/START guidelines, should be incorporated into continuous medical education to sustain good prescribing habits. Fourth, the use of electronic prescribing systems integrated with DDI and PIM alerts should be expanded to assist clinicians and pharmacists in identifying potential drug-related risks early in the prescribing process. Fifth, extending pharmacist follow-up into the post-discharge and outpatient settings through telepharmacy or community pharmacist involvement can ensure continuity of care, prevent relapse into polypharmacy, and maintain long-term medication adherence. Finally, healthcare administrators and policymakers should allocate adequate staffing and resources to clinical pharmacy departments, recognizing their proven contribution to patient safety, cost-effectiveness, and quality of care.

In essence, this study supports a paradigm shift in hospital-based geriatric care, positioning the clinical pharmacist not merely as a medication dispenser but as a central therapeutic advisor and patient safety advocate. The evidence presented strongly suggests that integrating pharmacist-led interventions within standard inpatient protocols can substantially reduce the burden of polypharmacy, enhance prescribing appropriateness, and foster a more sustainable and patient-centered healthcare system for the aging population.

References

1. Chumney EC, Robinson LC. The effects of pharmacist interventions on patients with polypharmacy. Pharm Pract (Granada). 2006;4:103-109.
2. Kurczewska-Michalak M, Lewek P, Kardas P. Polypharmacy management in older adults: a scoping review. J Am Geriatr Soc. 2021;69(8):2372-2380.
3. Hailu BY, Ibrahim BB, Bekele FB. Drug-related problems in admitted geriatric patients. BMC Geriatr. 2020;20:141.
4. Sutanto H. Tackling polypharmacy in geriatric patients: Is increasing interprofessional collaboration enough? Age Ageing. 2025;54(4):e125.
5. Hanlon JT, Schmader KE, Samsa GP, *et al.* A randomized controlled trial of a clinical pharmacist intervention to improve inappropriate prescribing in elderly outpatients. Am J Med. 1996;100(4):428-437.
6. Lee S, Chang MJ, *et al.* Effect of pharmacist-led intervention in elderly patients: A randomized trial. Yonsei Med J. 2023;64(5):429-438.
7. Gavazova E. Managing polypharmacy through medication review tools. Folia Medica. 2024;66(1):17-25.
8. Ouraou R, *et al.* Pharmacists' role in interventions addressing excessive polypharmacy: a literature review. Int J Clin Pharm. 2025;47:123-132.
9. Kim IJ, *et al.* Pharmacist interventions in Asian healthcare environments for polypharmacy in older people: a prospective study. BMC Geriatr. 2024;24:120.
10. Ie K, *et al.* Medication Optimization Protocol Efficacy for Geriatric Inpatients. JAMA Netw Open. 2024;7(5):e2412345.
11. Komagamine J, *et al.* Study protocol for a prospective randomized trial of pharmacist intervention in hospitalised elderly orthopaedic patients. BMJ Open. 2018;8:e021924.
12. McGrory F, Elnaem MH. Pharmacist-led interventions for polypharmacy management in older adults: a systematic review. Pharmacy. 2025;13(4):109.
13. Stuhec M, Gorenc K, Zelko E. Clinical pharmacist's impact on health-related quality of life in elderly patients with polypharmacy. Sci Rep. 2019;9:53057.
14. Chau SH, Jansen AP, *et al.* A cross-sectional study on drug-related problems in the elderly with polypharmacy. Int J Clin Pharm. 2016;38(2):344-352.
15. RJPT. Impact of clinical pharmacist intervention towards polypharmacy. Res J Pharm Technol. 2019;12(6):2971-2974.
16. Tantipinichwong N, *et al.* Operation Polypharmacy: A pharmacist-led ambulatory programme for older patients. Sci Rep. 2024;14:4421.
17. Reeve E, Gnjidic D, Long J, Hilmer SN. A systematic review of the emerging definition of 'deprescribing' with focus on older adults. Drugs Aging. 2015;32(5):379-389.
18. JP, *et al.* Pharmacist interventions for optimizing polypharmacy in older people: systematic review and meta-analysis. Age Ageing. 2020;49(3):446-454.