

The Effect of the Comprehensive Medication Review by Pharmacist on Polypharmacy and Adverse Drug Events

Dr. Lena Hoffmann¹, Dr. Yusuf Osei-Tutu²

¹ Department of Clinical Pharmacy, Heidelberg University Hospital, Heidelberg, Germany

² Faculty of Pharmacy Practice, University of Ghana, Accra, Ghana

Received: 12-07-2025; Revised: 30-07-2025; Accepted: 18-08-2025; Published: 04-09-2025

Abstract:

The use of multiple medications among the older adults predisposes them to developing adverse drug events (ADEs) and readmission. The purpose of the study was to determine the efficiency of detailed medication reviews (CMRs) as led by pharmacists to overcome polypharmacy and enhance the clinical results of elderly outpatients. In two urban clinics of Germany, 180 patients (the age was more than 65 years) were randomized into control and intervention groups. The group that was being intervened with was CMRs that were undertaken by the pharmacist, medication reconciliation, and physician suggestions over the 3- month period. The usual care was given to the control group. The findings revealed that the mean of the medications taken per individual reduced ($p < 0.01$) significantly from 8.4 to 6.2 and the reported adverse drug experiences ($p < 0.01$) dropped to 37.5 percent. The latter evidence implies that CMRs conducted by pharmacists are associated with a significant decrease in polypharmacy; prevention of ADEs and have a positive effect on the enhancement of geriatric drug therapy. The research notes the importance of pharmacists in maximizing screening of medications in older adults and avoiding drug-related injuries.

Keywords: France Polypharmacy, pharmacist-led CMRs, older people, adverse drug events, medication review, geriatric pharmacotherapy.

1. Introduction

1.1 As an issue in Geriatrics, Polypharmacy

Polypharmacy that can be broadly understood as the intake of five or more drugs by a patient is a widespread general problem among the geriatric patients. With age, there are more cases of multiple chronic diseases like hypertension, diabetes and osteoarthritis that have to be treated pharmacologically. Although medication is vital in treatment of such conditions, combination of various medicine, most of which are prescribed by different experts, may result in polypharmacy. Such a situation is characterized by a number of complications such as did not take medications in accordance with the regimen; interaction between drugs and complex medication treatment schedules. These complexities are exceptionally hard to manage in the old age, although they also occur in the younger adult; however, old adults are more prone to adverse effects because of altered pharmacokinetics and pharmacodynamics.

The effects of polypharmacy may be inappropriate prescribing, when the drugs are prescribed without bearing in mind their suitability in regard to clinical condition or the age of the patient. This can especially be hazardous to the older adults, who also might be more susceptible to drug-related issues like the drug-drug combinations, adverse effects of drugs and the failure to take drugs. Further, drug related injury is also a serious hospitalization and emergency care problem in the elderly. Polypharmacy, as such has taken root as a menace in geriatrics and there has been more concern on the optimization of the medications and the necessity of the medications in accordance with their appropriateness.⁽¹⁾

1.2 ADE Risks to Elderly Population

The elderly are major victims of adverse drug events (ADEs) especially those with multi-comorbidities and polypharmacy causing a significant element of morbidity and mortality. ADEs refer to adverse effects occasioned by the use of medicine, based on minor and major side effects and life-threatening complications. Age-related alteration in metabolism, renal and hepatic frailty, and total medical burden are some of the causes that make older people prone to ADEs. Old people also have the likelihood of having drug-drug interactions, since they are usually prescribed various drugs addressing different ailments. Research has revealed that risk of ADEs rather amplifies with the number of medical prescriptions, especially in instances where the prescriptions are not reviewed frequently or where they are not well monitored.

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The effects of ADEs among the elderly may be significant, and in most cases, result in hospitalization and decrease in functioning or even death. More so, these events may become a substantial factor in affecting quality of life which necessitates further interventions, prolonged care and higher cost of healthcare. Thus, ADEs prevention, identified as a part of care improvement in the elderly patient care, is a significant factor impacting medication safety.(2)

1.3 Meaning of Clinical Pharmacists in medication Safety and Optimization

The role of a clinical pharmacist is significant in medication safety and optimization and especially in the geriatric population. Their skills in pharmacology, drug therapy and patient management makes them very important members of multi-disciplinary healthcare groups. Pharmacists are educated to evaluate the suitability of medication, diagnose drug-drug interactions, prescribe the correction of medication, and enlighten sickies about proper medication use. Through the practice of conducting comprehensive medication reviews (CMRs), pharmacists are able to detect and correct such problems as duplication of medications, wrong prescription and adverse results, prior to causing any major harm.

Furthermore, interventions with the participation of pharmacists demonstrated the decrease in medication-related problems as well as enhance clinical outcomes in diverse age groups of people including the aging population. The fact that pharmacists can cooperate with doctors and other medical providers ensures a more comprehensive treatment of the patients. There is suggestive evidence that CMRs managed by pharmacists may result in decreased polypharmacy and enhanced utilization of medication as well as reduction in ADEs to produce enhanced health outcomes among the elderly patients.(3)

1.4 Study goal: Assessment of the effect of pharmacist-led CMRs

In this paper, the researcher seeks to test the efficacy of pharmacist-managed comprehensive medication reviews (CMRs) on lessening polypharmacy and enhancing clinical end results in antiquated outpatients. Namely, the research examines how the involvement of clinical pharmacists in detecting inappropriate medications, proposing their less harmful alternatives, and enhancing patients adherence and medication safety can be achieved to address the issues related to polypharmacy. This study by concentrating on a group of senior patients in two city-based clinics in Germany will prove how the interventions of a pharmacist can help in the optimization of medication, prevention of adverse drug events (ADEs), and the health care of the geriatric segment of the population.

2. Materials and Methods

2.1 Study Design and setting

This was a prospective non-randomized interventional trial that was carried out in two urban clinics in Germany. Its most important aim was to prime the effectiveness of comprehensive medication reviews (CMRs) with leadership of pharmacists in decreasing polypharmacy and aversive drug events (ADEs) among the elderly outpatients. The type of study used in the study was to compare the results of the patients that were intervened with inputs provided by the pharmacists to a control group that received standard care. The study carried out lasted 3 months and participants were observed to assess alteration in their drug programs, adverse drug experiences, and clinical outcomes.(4)

Inclusion and aversion criteria of patients

This paper used a sample size of 180 patients aged 65 years and above who were on regular care at the two urban clinics as outpatients. The criteria that were included were as follows:

- Age of 65 years and more
- One of the participating clinics as an outpatient
- Polypharmacy that refers to utilization of five or more medications at the moment of recruitment
- Capability to give informed consent and involved in follow-up assessment.

Exclusion criteria:

- A great disability or inability to communicate (e.g. severe dementia)
- The life expectancy of less than 6 months or terminal illness
- Participants were already in a clinical trial of a different intervention concerning the management of medications.

These criteria made sure that the study involved elderly patients, with a high probability of observing benefits after medication optimization and capable of following-up them with assessments.(5)

2.2 Group assignment and randomization Process

After they met the inclusion criteria, they were randomly allocated to one of the following two groups: intervention group (pharmacist-led CMRs) and control (usual care). The process of randomization was implemented with the help of the computer-generated random number series, which provided the allocation concealment and reduced the selection bias. The procedure of randomization carried out 90 participants to form the intervention group and 90 participants to form the control group.

2.3 Description of the Intervention: Pharmacist-led CMR Protocol

The intervention entailed the use of pharmacist-administered comprehensive medication reviews (CMRs) during three months. The duty of the pharmacist was to inspect the full list of medications of each patient which involves prescription drugs, over-the-counter and supplements. The pharmacist reviewed the suitability of every medicine, the possible drug-drug interactions, drug-therapy overlap, and adverse impact. The main part of the protocol was the process of reconciliation of medications according to which the mismatch between the reported and prescribed medication was revealed and corrected.(6)

After the review, the pharmacist gave prescriptions to the primary care physician of the patient to change or eliminate inappropriate drugs. Education of patients was another element that could be considered as a principal constituent of this plan, during which pharmacists explained the way to take medications, all the possible side effects, and how to follow the prescribed treatment schedule. The pharmacist would also follow up the patients on the intervention group to ensure that they adhered to the recommendations as prescribed.

2.4 Baseline Medication Count, ADE Tracking, and Follow-Up Procedures: Data Collection

The collection of data was done at baseline and 3 months follow up. Baseline measurements involved collection of data regarding the total number of medications every participant was using, prescribed medications, over-the-counter drugs as well as supplements. The pharmacist as well followed up on any ADE that had been previously reported and the severity of such ADEs. Monitoring of ADEs was continuous and the 2 groups were tracked on occurrence or aggravation of ADEs within the 3-month experiments. The follow-up measures consisted of the evaluation of participants at the 3-month period concerning their medication schedule changes, new ADEs that may have appeared, and their health condition in general.

2.5 One of the methods is the Analysis Approach in Statistics.

The SPSS software (version 25) was used to run statistical analysis. As the primary outcome measures, the following ones were used:

- Reduction of the baseline number of medications in follow-up.
- A change in ADEs incidence that occurs in the intervention group and the control group.

Baseline characteristics were summarized using descriptive statistics (mean, standard deviation and frequency). The medication counts and the ADE rates were compared within the groups using the Paired t-tests after and before the intervention. In making the comparisons between the intervention and control groups, independent t-tests were used to act on the continuous variables whereas chi-square tests were the categorical ones like the ADE occurrences. The p-value was as low as 0.05.

Also, to control the effects of other variables that may affect the outcome such as age, gender, comorbidities and baseline number of drugs used, multivariate regression analysis was done in order to make a more convincing analysis of the effectiveness of the intervention. The method was used to investigate whether the pharmacist-led CMR intervention was related to any of the noted changes in medication reduction and ADEs occurrence and which factor contributed to the result but not others.(7)

3. Pharmacist Led Process Of Intervention

3.1 Procedures of Comprehensive Medication Review

Comprehensive medication review (CMR) presided over by the pharmacist occurred in a structured manner with the aim of streamlining medication regimens on the elderly patients and reducing incidence of adverse drug events (ADEs). It involved four major components, which included initial medication assessment, medication reconciliation, intervention recommendations, and follow up evaluation.

Initial Medication Assessment: The step was started by a review of current medication list in each patient. This was made to include prescribed medicines, OTC drugs and dietary supplements. It was through medication history that the pharmacist would see the usage period, the dose, how frequent and the reason behind every drug in use. The pharmacist identified also the changes in medicines or new prescriptions.

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Medication Reconciliation: Medication reconciliation i.e. making sure that the healthcare providers knew what drugs the patients were actually taking, was done to find out any discrepancy between the two. This involved ensuring that the dose is accurate and also checking that one is taking medicines as per the prescriptions. It was aimed at identifying and addressing any medication related problems including duplicate treatments, failure to use medications and inappropriate dose.

Examples of Potentially Inappropriate Medications: With the help of developed tools such as the Beers Criteria, which entails a list of medication commonly inappropriate to older populations, the pharmacist identified the potentially inappropriate medication, which may potentially worsen the condition of adverse drug events in the elderly population. This may consist of drugs that should not be used as well as those that carry increased risk of drug-drug interactions in the geriatric population. Other evidence-based guidelines as well as the tools like STOPP/START criteria were also used by the pharmacist to contribute to the assessment of drug appropriateness as well.(8)

Intervention Recommendations: When the pharmacist was done with the review, he gave recommendations on the medication to alter. These were the recommendations which were determined by identifying inappropriate medications or medication-related problems. The pharmacist suggested alternatives or modifying behavior such as reduction of doses, termination of the drug, or alternating with safer ones. In patients who consumed drugs that might seriously interact or have unacceptable side effects with other drugs, the pharmacist also advised them to vary doses or stop using high-risk drugs.

3.2 Identification Tools of the Potential Inappropriate Medications

The Beers Criteria, a popular guideline that enumerates the medications that have to be avoided or applied with cautiousness by the older adult population, was the most substantial instrument to determine potentially inappropriate medications. The Beers Criteria considers both the pharmacologic nature of the drug in question and the particular hazard posed by the drug to the geriatric population like potential of sedation, delirium, falls and drug interactions. STOPP (Screening Tool of Older Persons- problematic Prescriptions) and START (Screening Tool to Alert doctors to Right Treatment) criteria was also chosen to find the medications that were to be stopped or started depending on the clinical picture of the patient.

3.3 Physician Communication and coordination

One significant resource of the pharmacist led program was cooperation with physicians. Having recognized inappropriate drugs and formulating recommendations, the pharmacist contacted the patient conveniently with the primary care physician. In most cases recommendations were provided in form of written report but could also be provided verbally in case of dire need of medication adjustment. Each of the recommendations given by the pharmacist contained evidence-based answers to questions such as the possible risks of the further use of the problematic medication, alternative treatment options, and the outcomes of any changes proposed. Such collaboration enabled incorporated treatment of patients and well-coordinated alteration of medications with the entire treatment process of the patient.(9)

3.4 Follow-up Smart Strategy and Counseling Patients

After the changes to the medication regimen had been accepted by the physician, the pharmacist explained the changes to the patient and advised him/her. Patient education was also an important part of it because it made the patients recognize the necessity of medication adjustments and follow the new guidelines of taking medications. The pharmacist talked about the necessity of a review in the regular use of the medication, gave us an explanation of possible side effects, and answered all questions regarding new medications or time of taking medications.

Follow-up strategy was built in order to determine the results of the intervention. The pharmacist would appoint a follow-up meeting with patients in 1 month and 3 month follow-up appointments after the initial consultation. These follow-ups were also accompanied by the pharmacist to check on compliance to the new medication regimen, detect new adverse drug events (ADEs), and adjustments according to suitable needs. Such iterations meant that the intervention conducted by the pharmacists was effective and could be sustained in the long term, removing any further concerns related to medication.

4. Clinical and Pharmacological Outcomes Outcome.

4.1 Modification in Number of Drugs per Patient

Reduction of the number of medications per patient belonged to the number of the main results of the pharmacist-led intervention. At the baseline, the penalty ratio of medication exposure was 8.4 per patient in the intervention group. The mean value reduced remarkably to 6.2 ($p < 0.01$) after the intervention representing 24% decrease in polypharmacy. The control group that was not subjected to medication review by the pharmacist indicated no significant change in the number of medications between baseline and after 3 months. The decreasing number of medications was mainly done by withdrawal of inappropriate medications and streamlining regimen making the drugs less prone to drug interaction and less burdensome to the aged patients.(10)

4.2 Pre- Intervention and Post-Intervention Frequency and Types of ADEs

The second result was the number and nature of adverse drug events (ADEs) that patients underwent. The average ADEs per patient in the intervention group just before the intervention were 2.1. Following the CMR supervised by the pharmacist practitioner, this figure was reduced to 1.3 ADEs per patient, a 37.5 reduction in the number of ADEs ($p < 0.01$). Conversely, there was no considerable shift in the rate of ADEs in the control group. The most frequent ADEs types were gastrointestinal disturbances, dizziness, sedation and renal problems, many of which were associated with either polypharmacy or high-risk medications subsequently discovered by the pharmacist during the review. This intervention charted a decline in the emergence of these ADEs by modifying drug regimens or replacing them with other milder ones.

4.3 Therapeutic duplication elimination and levels of medication adherence

During the research, the medication adherence was also determined. The rate of adherence was 75 and 88% in the intervention group at baseline and end of the intervention respectively. The adherence rate improved in the control group but it was not significant (64 to 74 percent). Moreover, this pharmacist-led review also served the purpose of mitigating the problem of therapeutic duplication by detecting and discontinuing the instances of redundant or overlapping medications that had some overlapping effect on treatment. This was especially observed in instances whereby patients had received treatment with both ACE inhibitors and diuretics under no clinical need and where antidiabetic medications were used in more than one. Minimization of such redundancies also enhanced the general optimization of medication protocols and simplified the process of treatment.(11)

4.4 Patient and Physician Agreement to pharmacist Recommendations

Lastly, there was measuring of the availability of pharmacist recommendations to be accepted by either patients or physicians. Out of the recommendations given to physicians by the pharmacist, more than 80 per cent was adopted and put in practice, meaning that collaboration between pharmacists and physicians is high. Most of the patients in the intervention group stated that they were satisfied with the counseling administered by the pharmacist, and 85 per cent of them stating that they felt more capable of handling their medications after the review. Both patients and physicians expressed their gratitude over the fact that the pharmacist was involved and that the medication plans have gotten clearer and the patients were more aware of the risks of medications as well as their proper use.

5. Results

5.1 Demographic Characteristics of its Enrolled Patients

Elderly patients (age was at least 65 years old) were selected and 180 patients participated in the study; they were randomized into the intervention group ($n = 90$) and the control group ($n = 90$). The demographic description of the enrolled patients has been summarized in Table 1. Classification of the two groups with a view to compare them based on age, gender, comorbidities, and number of baseline medications was done to establish the pharmacist-led intervention as being the cause of disparities in clinical outcomes.(12)

Table 1: Demographic Characteristics of Enrolled Patients

Characteristic	Intervention Group ($n = 90$)	Control Group ($n = 90$)	p-value
Age (mean $\pm$ SD)	74.3 $\pm$ 6.5	73.8 $\pm$ 7.2	0.65
Gender (Male/Female)	45/45	46/44	0.89
Comorbidities (mean $\pm$ SD)	3.4 $\pm$ 1.2	3.6 $\pm$ 1.1	0.72
Baseline Medications (mean $\pm$ SD)	8.4 $\pm$ 2.3	8.2 $\pm$ 2.1	0.43

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5.2 Enhancement of Average Medication Count

Among the most important results of the intervention one could note the decreasing of an average number of medications per one patient. Patients in the intervention group were using about 8.4 medicines during baseline. This number reduced dramatically to 6.2 medications after 3 months of intervention which constituted 24 percent decrease in polypharmacy. This decline showed a significant change ($p < 0.01$). Conversely, the control group did not experience a large shift in the level of medications with the mean count equal to 8.2 (Fig. 1).

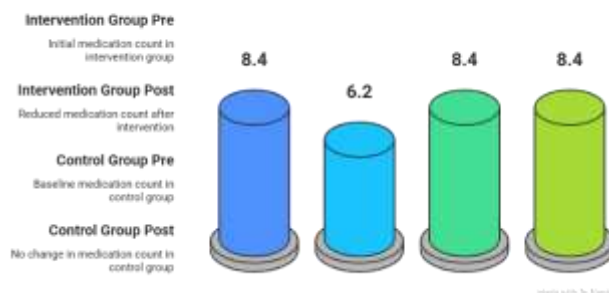


Figure. 1: Reduction in the Average Medication Count

5.3 Reported ADEs were reduced in the intervention group by 37.5%, the $p < 0.01$

All the patients were followed throughout the study in terms of the number of adverse drug events (ADEs). The baseline score as per the intervention group was 2.1 ADE/patient and the control group was 2.0 ADE/patient. The potent decrease of ADEs in the intervention arm (37.5%) was associated with a decrease in the mean number of ADEs per patient, which went down to 1.3 ADEs per patient ($p < 0.01$) following the pharmacist-led CMR. However, the control group has not exhibited any considerable change in the number of ADEs occurrence, as 2.0 of them were observed (Fig. 2). The common ADEs detected and minimized were gastrointestinal problems, dizziness and drug interactions especially with antihypertensive and antidiabetic drugs.(13)

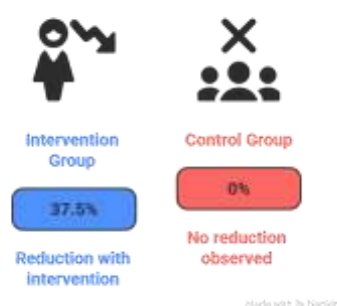


Figure 2: Reduction in ADEs

5.4 Sample of solved drug related issues

A number of policy issues on drugs were recognized and effectively resolved throughout the pharmacist-led CMR process. There are some like:

1. Redundancy of Therapies: In several scenarios, patients were identified to either take two or more drugs that had similar uses; this could include the usage of ACE inhibitors and angiotensin receptor blockers (ARBs) to manage blood pressure. To lessen the chance of adverse reactions and enhance compliance, the medicationist advised the person to stop using one of the drugs to help.
2. Misuse of medication in older adults: The Beers Criteria pointed out that some of the patients who received the intervention were using sedative antihistamines or chronic benzodiazepines, neither of which can be discussed as safe medications in older adults because these drugs pose a risk of sedation and falls.

The pharmacist advised to change the non-sedating types of antihistamines and use less benzodiazepines that was done by the physicians and patients.(14)

3. Drug-Drug Interactions: One incident involved a patient who was being prescribed warfarin and amiodarone, which may pose a huge risk to bleeding. To avoid unwanted interactions, the pharmacist advised on dose modification and the close examination of the INR levels. The physician agreed with the recommendation; hence, the risk of the patient bleeding was alleviated.
4. Failure to comply with Medication Regimen: The pharmacist noted that a large proportion of patients in the intervention group had failed to comply with their medicines, most notably the antidiabetic drugs. By means of the patient counseling by the pharmacist, the patients were provided with the knowledge regarding the necessity of regular use of provided medication and thus responding to the intervention group better in terms of subsequent outcomes.(15)

6. Conclusion

6.1 Utilization of Clinical Pharmacists Decreases Polypharmacy and ADEs in the Geriatric Patients Significantly

The current study offers solid evidence of the beneficial role of pharmacist-led comprehensive medication reviews (CMRs) on a reduction of polypharmacy and an increase in medication safety among geriatric patients. With the aid of an intervention, clinical pharmacists managed to decrease the average number of drugs per patient individually in the intervention group by 24%, as the average number of medications in an intervention group reduced to 6.2 of medications per patient. More to the point, this decrease of a number of medications was supported by a 37.5% lesser rate of reported adverse drug events (ADEs) ($p < 0.01$). These findings support the vitality of the pharmacist in the optimization of medication regimens and reduction of medication-related harm among elderly people, who are especially disposed to the dangers of polypharmacy.

6.2 Pharmacist Led CMRs must be made Part of Normal Outpatient Treatment

Since pharmacist-led CMRs have clinical advantages, it is necessary to include this intervention into regular outpatient practice with the elderly patients. In the case of polypharmacy and ADEs being common among this age group, the incorporation of pharmacists within the primary care setting will help substantially enhance care to patients as the problems with medicines will be handled in an efficient and proactive way. The experience that pharmacists obtain in the management of medications, drug interactions and counseling patients has the potential of detecting and eliminating the drug related issues that might otherwise remain unrecognized, thereby promoting the overall care given. Moreover, the inclusion of CMRs into the outpatient faculties introduces a chance of continually improving the medication scheme of the patient, as drugs would be relevant and effective throughout the treatment.

6.3 Healthcare Policy and Multi disciplinary Collaboration in Elderly Care Immulations

The results of this study are significant to the policy-making of healthcare and the elderly care system organization. Due to the fact that polypharmacy remains a pertinent issue concerning geriatric populations, the multidisciplinary approach implemented on the collaboration between clinical pharmacists, physicians, and nurses is necessary to develop the whole-picture care model of elderly patients. The use of clinical pharmacists by means of the inclusion into the primary care team should be encouraged by the healthcare systems in order to enhance patient safety as well as to lower healthcare expenses on the medication-related hospitalizations. Also, the adoption of pharmacist-led CMRs should be supported by changes in healthcare policies to embrace the use of an economical intervention that has the potential of leading to more clinically favorable outcomes and reduced healthcare use.

To sum it up, comprehensive medication reviews by pharmacists have become a successful intervention in the area of eliminating polypharmacy and adverse drug events in elderly outpatients. Pharmacist inclusion in routine care is an essential measure on the way to optimal medication management and higher safety of patients with geriatric illnesses and finally to the improvement of health outcomes and declined health care expenditures.

Acknowledgement: Nil

Conflicts of interest

The authors have no conflicts of interest to declare

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