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Review Article

A complete narrative review on polypharmacy: role of clinical pharmacist in managing interventions in polypharmacy and improving patient outcomes

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ABSTRACT

Polypharmacy, commonly defined as the concurrent use of multiple medications, has emerged as a significant global health concern, especially among elderly patients with multimorbidity. It is associated with an increased risk of adverse drug reactions, drug–drug interactions, prolonged hospital stays, and poor medication adherence, ultimately leading to unfavorable clinical outcomes. This review critically evaluates existing literature on polypharmacy, focusing on its etiology, associated risks, and clinical consequences. It examines patient-, physician-, and healthcare system-related factors contributing to inappropriate prescribing. Additionally, the role of clinical pharmacists and the application of assessment tools such as Beers criteria, STOPP/START criteria, and the medication appropriateness index are analyzed. The findings highlight that inappropriate polypharmacy is driven by multiple factors, including fragmented healthcare delivery, lack of medication review, and limited awareness among healthcare providers. Clinical pharmacists play a pivotal role in mitigating these risks by identifying potentially inappropriate medications, conducting medication reviews, and implementing deprescribing strategies. The use of standardized tools and multidisciplinary collaboration has been shown to improve medication appropriateness and patient safety. Polypharmacy remains a complex challenge requiring a coordinated and systematic approach. Integration of clinical pharmacy services into routine healthcare practice significantly enhances medication safety and clinical outcomes. Clinical pharmacists are essential in promoting rational pharmacotherapy and reducing medication-related harm through targeted interventions and patient-centred care.

Keywords: Polypharmacy, Clinical pharmacist, Interventions, Medical management, Adverse drug reactions

INTRODUCTION

Polypharmacy is a serious problem on a global scale. It describes the administration of multiple medications at the same time. 'Poly' comes from a Greek word that means 'quantity more than one'. At the same time, 'pharmacy' refers to the Greek word for drugs.¹ According to the World Health Organisation (WHO), polypharmacy is the

practice of administering an excessive number of medications at once. Concurrent usage of five or more drugs is a frequent definition.² Polypharmacy is typically associated with excessive pharmaceutical use.³ Many medications for an increasing number of elderly patients with multiple medical conditions are still unknown. This lack of evidence has, regrettably, frequently resulted in incorrect pharmacological treatment and, as a result,

several unfavourable clinical consequences. The WHO also acknowledged this widespread problem, which resulted in the initiation of a global challenge medication without harm, an ongoing patient safety campaign aimed at reducing serious preventable drug-related harm globally by 50% by 2002.⁴ The study by Das et al found that recent hospitalisation and three or more comorbidities were common related variables.⁵ The increased accessibility of efficient medications in developed nations and many recommendations made in support of the use of several medications for the treatment of prevalent diseases are two more factors that are linked to an increase in drug use among older adults.⁴ Physiological changes that occur with ageing include changed pharmacokinetics and pharmacodynamics, decreased liver and renal function, decreased muscle mass, weakened immune system, poor nutritional status, and decreased hydration levels.⁶ While prescribing numerous medications is frequently clinically necessary (appropriate polypharmacy), exposure to multiple medications may cause harm or result in continued use of medication that is no longer

recommended (inappropriate polypharmacy). According to certain studies, up to one-third of the population may be impacted by inappropriate polypharmacy.² Depending on the demographic and environment under study, the prevalence of polypharmacy might vary greatly, ranging from about 10% to about 90%.⁷ Among those aged 60 and over, approximately 49% had polypharmacy (5–9 medications) and 31% had hyperpolypharmacy (>10 medications); 28% of people took potentially inappropriate drugs.⁸ Polypharmacy is associated with poor health outcomes, including a higher risk of falls, severe drug reactions, disability, hospitalisation, and death, particularly in older people.⁹ Effective management involves interdisciplinary cooperation, the use of tools like BEERS or STOPP/START criteria, and medication reviews and prescriptions.¹⁰

ETIOLOGY OF POLYPHARMACY

Etiology of polypharmacy is represented in Table 1.

Table 1: Representing the etiology of polypharmacy.¹¹⁻²⁴

Category and key contributing factors	Clinical consequences
Biological and illness-related factors	
Aging	Age-related physiological and pathological changes increase vulnerability to multimorbidity and polypharmacy.
Multimorbidity (≥2 chronic diseases)	Strongly associated with multiple medication use and reduced physiological resilience.
Chronic diseases	Cardiovascular, metabolic, musculoskeletal, mental health disorders, chronic pain, sensory impairment, and substance misuse increase medication burden.
Decline in homeostasis and frailty	Reduced ability to recover from stressors increases medication dependence and adverse outcomes.
Adverse drug reactions	Increased hospital admissions and mortality; major burden on healthcare systems.
High-risk medication classes	Benzodiazepines, diuretics, antibiotics, anticonvulsants, cardiovascular drugs, NSAIDs, anticoagulants, hypoglycemics commonly linked to ADEs.
Patient-related factors	
Medication non-adherence	Leads to hospitalization, treatment failure, disease progression, and ADEs.
Poor medication literacy	Limited understanding of prescriptions reduces safe medication management
Cognitive impairment	Polypharmacy increases risk of delirium and dementia; number of medications is a risk factor.
Limited self-management ability	Challenges in balancing lifestyle changes, emotional management, and medication therapy.
Resistance to deprescribing	Fear of symptom worsening and satisfaction with current therapy hinder medication reduction.
Unhealthy lifestyle behaviors	Smoking, poor diet, inactivity, alcohol misuse, sedentary behavior, and poor sleep increase chronic disease burden and medication use.
Physician-related factors	
Misinterpretation of symptoms	Drug side effects (e.g., fatigue, confusion, falls) mistaken for aging, leading to prescribing cascades.
Prescribing cascades	Additional drugs prescribed to treat adverse drug effects misidentified as new illnesses.
Fear of patient dissatisfaction	Reluctance to deprescribe high-dependence medications (e.g., benzodiazepines).
Low shared decision-making	Poor communication and low patient health literacy limit informed deprescribing.
Potentially inappropriate medications (PIMs)	Misprescription and overprescription, especially in institutionalized patients; increased fall-risk medications.

Continued.

Category and key contributing factors	Clinical consequences
Systemic and healthcare-related factors	
Fragmented care	Multiple providers and poor coordination increase medication numbers and healthcare costs.
Disease-centered approach	Specialization without integrated care promotes multiple prescriptions.
Inadequate communication	Poor interprofessional collaboration leads to duplication and drug-related problems.
Limited consultation time	Insufficient medication review and optimization.
Lack of electronic information systems	Reduced ability to coordinate care and track medication use
	Need for collaborative, person-centered, and palliative-focused deprescribing strategies.

RISK AND CONSEQUENCES OF POLYPHARMACY

Evidence of adverse drug social outcomes of polypharmacy was few in number between polypharmacy and physical active social consequences such as loneliness were reported and other risk like anxiety, circulatory disorders, depression, dry mouth, gastrointestinal disorders, and weight loss were reported.²⁵ The polypharmacy is significantly associated with potentially inappropriate medication and hospitalization due to adverse drug reaction the studies have found that polypharmacy expose significance increase adverse drug reaction like nausea, vomiting, diarrhea, hallucinations, and other symptoms may include nervous system illnesses, renal problems, and mental disorders. Polypharmacy exposure has been shown to have a beneficial effect on medication usage in adults with mild to moderate dementia; however, no significant correlation was observed with drug overuse in various dementia patients.²⁶ Polypharmacy was associated with many adverse care utilization outcomes, hospitalization, unplanned number of prescriptions supplementary materials.²⁵

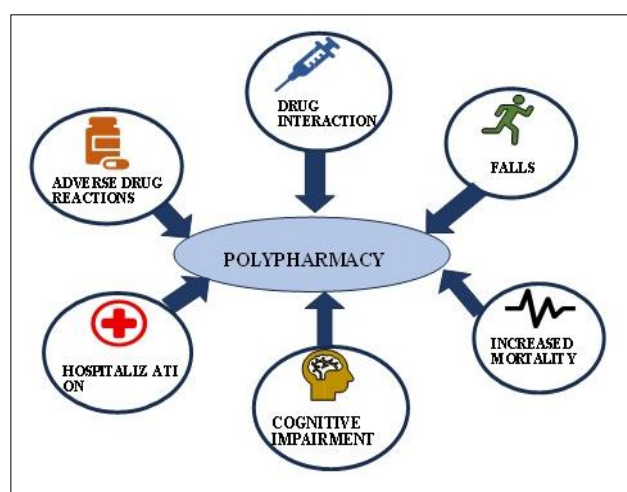


Figure 1: Representing the risks and consequences of polypharmacy.

In 2005, it was anticipated that approximately 4.3 million health-care visits were caused by an adverse medication

response, with the majority of elderly patients being hospitalized. In population-based studies, outpatients who take 5 or more medications are at risk of adverse drug events. Older adults with polypharmacy are predisposed to drug interactions. In prospective and cohort studies of old hospitals, patients who take 5 to 9 medications have a 60% probability of non-adherence; in comparison, the risk increases to 100% for patients who take more than 20 medications as presented in (Figure 1).²⁷

ROLE OF CLINICAL PHARMACIST

Clinical pharmacists enhance medication therapy and thus help improve health outcomes.²⁸ Clinical pharmacist interventions successfully eliminated various types of errors, including incorrect electronic selections, inappropriate dosage forms, duplicate medications allergy-associated mistakes.²⁸ The pharmacists who were involved in managing interventions were either highly experienced or had undergone specialised University training in managing polypharmacy.²⁹ Pharmacist helped patients by providing follow-ups to ensure that patients had received their treatments, addressed any questions, offered guidance on medication use assessed whether further deprescribing was appropriate or not.²⁹ Recently, pharmacists have also demonstrated their importance as a part of the healthcare team by performing medication-related interventions, shortening hospital stays, enhancing treatment adherence among pediatric patients hospitalised in various countries, including Canada, China, Egypt, and Spain.³⁰ A study published in 2012 reported pharmacist actions in an 87-bed pediatric hospital over nearly 2 months, noting a total of 1,315 actions (about 21 actions daily).²⁷ Of all recorded actions, drug-related errors represented 24.5% and medication reconciliation mistakes accounted for 2.2%.³⁰ A study has indicated that both healthcare professionals and patients recognize and support the pharmacist's role as a collaborative prescriber in mental health care. Pharmacists are also valued for their contribution to medication management following a physician's diagnosis and for their active participation as integral members of multidisciplinary teams.³¹ A notable example of such collaboration is collaborative drug therapy management (CDTM), which involves a formal arrangement between pharmacists and physicians. So, that pharmacist can take on the responsibility of performing

patient evaluations, selecting and adjusting medication plans, and tracking patient outcomes from drug therapy, among other duties.³¹ Pharmacists hold an essential role in enhancing medication usage and management among elderly patients and decreasing associated risks.³²

A systematic review indicated that pharmacist interventions can boost patient outcomes by simplifying medication routines, increasing compliance avoiding negative drug reactions.³² In a particular study, pharmacists provided 113 deprescribing recommendations, in which 99 involved stopping medications and 14 involved reducing the dosage. Out of these 81 suggestions (71.7%) were accepted and carried out by physicians looking at the individual patients; 30 out of 48 (62.5%) had every deprescribing suggestion fully implemented.³³ A clinical pharmacist can play a role in tackling challenges linked to polypharmacy by identifying potential hazards and assisting in their control, especially in resource-constrained environments.³⁴ The pharmacist can deliver guidance to elderly patients on multiple aspects, such as basic details about their illness and medications, how the prescribed drugs function or affect the body, possible adverse effects and drug interactions length of the treatment course.³⁴ The responsibility of the clinical pharmacist includes recognising and recommending the use of safe and effective medicines to manage drug-related problems (DRPs) through assessing the treatment plan to ensure it is economical, safe suitable.³⁵ The most common intervention made by pharmacists was drug discontinuation and initiation, comprising 67 interventions (31.4%). Specifically, drug initiation occurred in 62 cases (29.1%), while drug discontinuation was carried out in 29 cases (13.6%).³⁵ To detect and address the risks of polypharmacy, the clinical pharmacist can use tools such as the Beers criteria, STOP/START guidelines medication therapy management (MTM).³⁶

ASSESSMENT AND IDENTIFICATION

In order to detect and treat polypharmacy and perhaps inappropriate drug usage among older persons with cancer, the study found that pharmacist-led medication evaluations are essential. By optimizing treatment regimens, these evaluations may lower adverse drug events and enhance patient outcomes.³⁷

Scope of assessment

The study focused on evaluating the instruments' suitability for clinical practice by conducting a systematic review of those intended to identify PIPs in children. It highlighted the variations in identification techniques by including both explicit (criteria-based) and implicit (judgment-based) tools.³⁸ The paper examines the use of medication review tools to find possibly inappropriate drugs and polypharmacy in a range of patient demographics. Instead of focusing on ad hoc evaluation, the assessment stresses methodical identification.⁴⁰

Finding instruments to evaluate prescription appropriateness, such as potentially inappropriate medicines (PIMs), underprescribing, and overprescribing, is the main goal of the project. The identification methods and their relationship to patient-related outcomes are both assessed in the review.⁴¹ Creating and verifying a polypharmacy assessment score (PAS) to identify individuals at increased risk of negative outcomes from polypharmacy is the main goal of the project. Rather than just counting medications, the evaluation places more emphasis on risk stratification.⁴²

Methods of identification

The explicit techniques are based on predetermined standards for possibly unsuitable drugs, such as drug selection, dose, frequency, and pediatric patient contraindications. Clinician judgment is used with implicit tools, taking into account the child's entire treatment and clinical state.³⁸ The material focuses on both quantitative and qualitative techniques. Quantitative strategies include using particular criteria such as STOPP/START, Beer's criteria, and the medication appropriateness index (MAI), as well as counting medicines (e.g., five or more concurrent prescriptions). Qualitative approaches take into consideration clinical judgment as well as patient-specific characteristics such as frailty, comorbidities, and adherence challenges.³⁹ The number of medications taken overall, the presence of high-risk medications, patient comorbidities, and possible drug-drug interactions are some of the characteristics that are combined in the PAS. The evaluation systematically identifies individuals at various risk levels using data from electronic health records.⁴²

Evaluation metrics

Accuracy, clinical practice viability, and possible influence on patient safety are used to evaluate how successful identification is. The ability of several tools to identify therapeutic duplications, drug-drug interactions, improper doses, and unneeded drugs is compared.³⁸ The sensitivity, specificity, and predictive utility of PAS for adverse medication events and hospitalizations are assessed in this study. Patients can be categorized as low, medium, or high risk using the score's numerical result.⁴²

STRATEGIES FOR MANAGEMENT

Encourage patients to bring their real pills or this list to visits; maintain a current, accurate record of all prescriptions, over-the-counter medications, and supplements.⁴³ Conduct organized evaluations to find and discontinue superfluous, redundant, or inappropriate drugs on a regular basis (or if care changes).⁴⁴ To detect undertreatment and PIMs, particularly in older persons, use proven screening criteria and algorithms.⁴⁵ To increase adherence and lower the chance of mistakes, use the fewest drugs required and use the most straightforward dose regimens.⁴⁴ Use of STOPP/START tools as a

structured/checklist or prompt to guide medication review rather than ad-hoc judgement alone. The article describes the tools as: prompts, checklists, structured approaches.⁴⁵

Reinforces that while process measures improve (medication counts, appropriateness), translating into hard outcomes is still difficult.⁵⁰ Involve pharmacists, nurses, doctors, and maybe social workers in the management of prescription lists and choices.⁴⁶ Determine whether medications are no longer helpful or possibly hazardous, and work with the patient to safely reduce or terminate their use.⁴⁷ Include electronic assistance (interaction, dosage, and PIM alerts) to help with drug evaluation and safe prescribing.⁴⁸

Concentrate on patients who are most at risk of polypharmacy issues, such as those who are elderly, have several comorbidities, take a lot of pills, or have multiple prescribers.⁴³ Involve patients in decision-making (shared decision-making), offer thorough counselling regarding drugs, dangers, and benefits, and encourage them to voice concerns.⁴⁴ Monitor for withdrawal symptoms, lingering issues, adherence, and changes in health status following modifications (such as eliminating prescriptions or simplifying the regimen).⁴⁹

CHALLENGES IN MANAGING POLYPHARMACY

There are many clinical, patient-related, and system-level difficulties in managing polypharmacy as presented in (Figure 2). Clinically, individuals who take several medications are more likely to experience ADRs, interactions between drugs and diseases, therapeutic duplication, and decreased efficacy of medications, particularly in older adults with altered pharmacokinetics and pharmacodynamics.^{50,54} Fear of disease recurrence or patient injury, as well as uncertainty about which medications are still necessary, make deprescribing frequently challenging.⁵³ Medication errors and treatment failure are caused by patient-related barriers such as low health literacy, cognitive decline, and poor adherence brought on by complicated medication regimens. Furthermore, many patients take herbal or over-the-counter medications without telling their doctors, which raises the possibility of interactions.⁵² Fragmented care across several specialists and healthcare settings usually results in inconsistent prescribing and insufficient medication reconciliation, according to the provider and system perspective.⁵³

The integration of therapies in multimorbid patients is rarely covered by clinical practice guidelines, which are usually disease-specific, leaving clinicians without clear evidence-based guidance.⁵¹ Effective medication review is further hampered by time restraints, restricted access to electronic prescribing tools, and a lack of interprofessional collaboration.⁵³ Inappropriate polypharmacy is sustained organisationally by a lack of organised deprescribing procedures, pharmacist involvement, and adequate training and resources.⁵² Psychosocial factors also

contribute, as patients and families often resist medication discontinuation due to fear or misunderstanding of its purpose.⁵³ The main aim of polypharmacy is to reduce medication-related harm while controlling disease through coordinated, multidisciplinary interventions.⁵¹

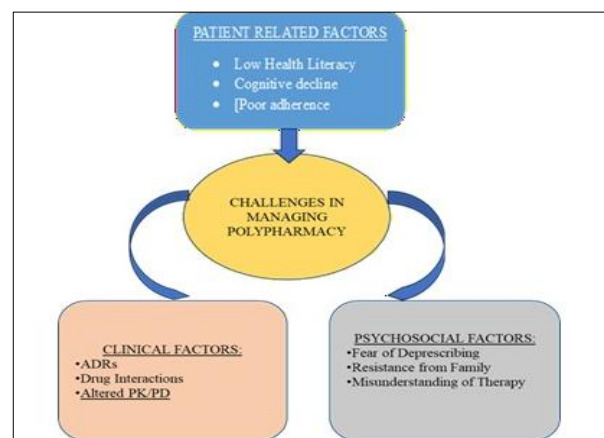


Figure 2: Representing the challenges in managing polypharmacy.

CONCLUSION

The clinical pharmacist plays a pivotal role in determining and applying optimal interventions to support appropriate polypharmacy. This involvement ensures the effective management of polypharmacy-related challenges and contributes to better therapeutic outcomes for patients. This review provides strong support for previous research highlighting the positive influence of pharmacists' interventions on the health outcomes of older adults. Consequently, pharmacists should be actively engaged, either independently or collaboratively, in optimizing medication therapy for elderly patients. The implementation of clinical pharmacy services, with a focus on medication safety, plays a crucial role in the early identification and prevention of serious consequences associated with prescribing errors. Pharmacists play a crucial role in addressing excessive polypharmacy across various healthcare settings. Prescribers and pharmacists need to be mindful of possible drug interactions in pediatric patients who are receiving multiple medications.

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