

## IMPROVING MEDICATION SAFETY IN OLDER ADULTS: A COMPREHENSIVE REVIEW OF POLYPHARMACY

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### ABSTRACT

Geriatric polypharmacy, commonly defined as the concurrent use of five or more medications, has emerged as a major healthcare challenge due to the increasing prevalence of multiple chronic diseases among older adults. The growing complexity of medication regimens places elderly patients at a higher risk of adverse drug reactions (ADRs), drug-drug interactions, medication errors, non-adherence, functional decline, falls, and frequent hospitalizations. Age-related physiological changes affecting drug absorption, distribution, metabolism, and excretion further increase the likelihood of medication-related complications. This review provides a comprehensive overview of the prevalence, causes, risk factors, and clinical consequences of polypharmacy in the geriatric population. It also discusses the importance of identifying potentially inappropriate medications using validated screening tools such as the Beers Criteria and STOP/START criteria. In addition, the review highlights evidence-based strategies including regular medication review, deprescribing, individualized treatment planning, patient education, and multidisciplinary collaboration to optimize medication therapy. The role of clinical pharmacists in medication reconciliation, identifying drug-related problems, and promoting rational prescribing is also emphasized. Implementing patient-centered medication management strategies can significantly improve medication safety, reduce healthcare costs, and enhance the overall quality of life of older adults.

**Keywords:** Polypharmacy, Older Adults, Geriatric Patients, Medication Safety, Adverse Drug Reactions, Drug-Drug Interactions.

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### INTRODUCTION

The global population is aging rapidly, resulting in a significant increase in the number of older adults requiring long-term healthcare. According to the World Health Organization (WHO), individuals aged 65 years and above are generally considered part of the geriatric population. Advancing age is frequently accompanied by multiple chronic conditions such as hypertension, diabetes mellitus, cardiovascular diseases, arthritis, and chronic kidney disease, often necessitating the use of several medications simultaneously [1]. Age-related physiological changes can alter drug response and increase susceptibility to medication-related complications, making medication safety a major concern in geriatric practice. In addition to clinical challenges, complex medication regimens may affect treatment adherence, functional independence, and overall quality of life. Therefore, optimizing medication use through careful assessment, regular medication review, and patient-centered care has become an essential component of geriatric healthcare [2]. This review focuses on current evidence regarding medication safety in older adults and highlights strategies to improve therapeutic outcomes through rational prescribing and multidisciplinary collaboration, with particular emphasis on the role of clinical pharmacists [3].

### DEFINITION

Polypharmacy is commonly defined as the regular use of five or more medications simultaneously by an individual. It is highly prevalent among older adults due to the presence of multiple chronic diseases requiring long-term treatment [4].

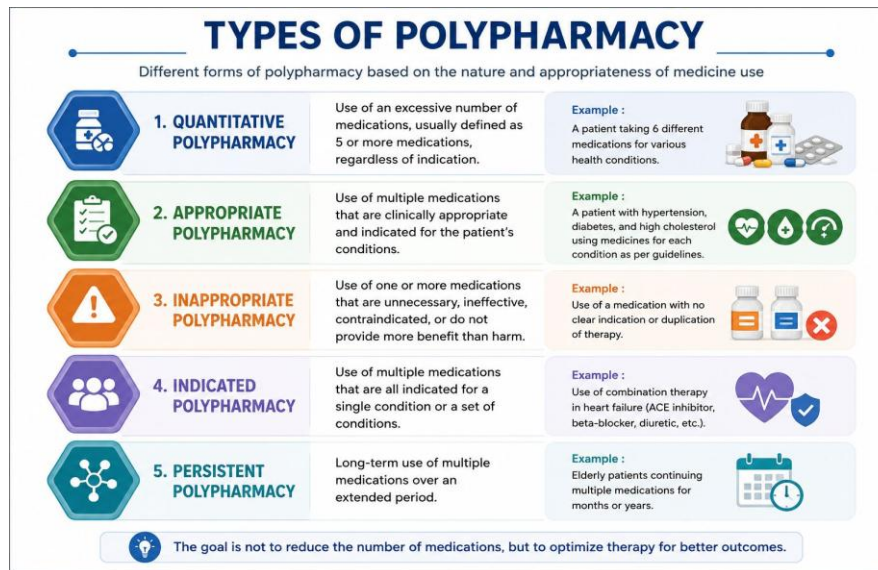


Figure 01: Types of Polypharmacy

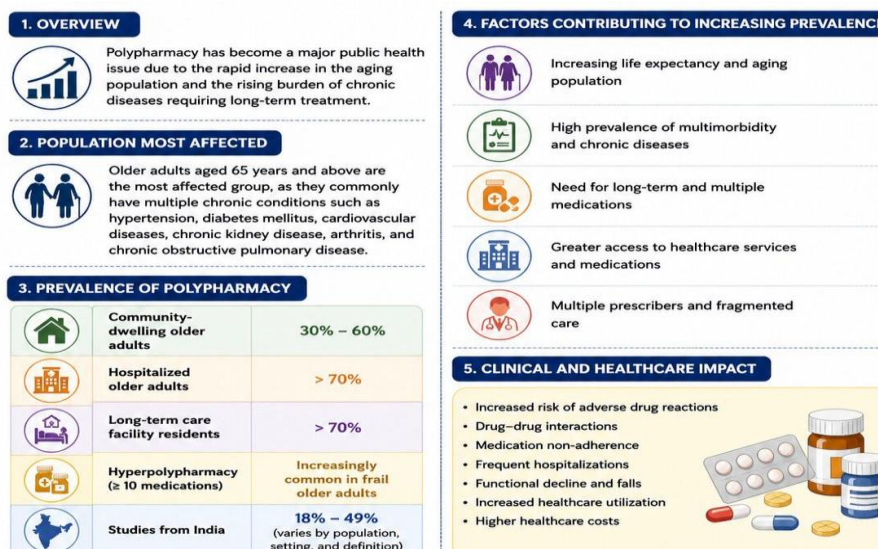


Figure 02: Epidemiology of poly pharmacy

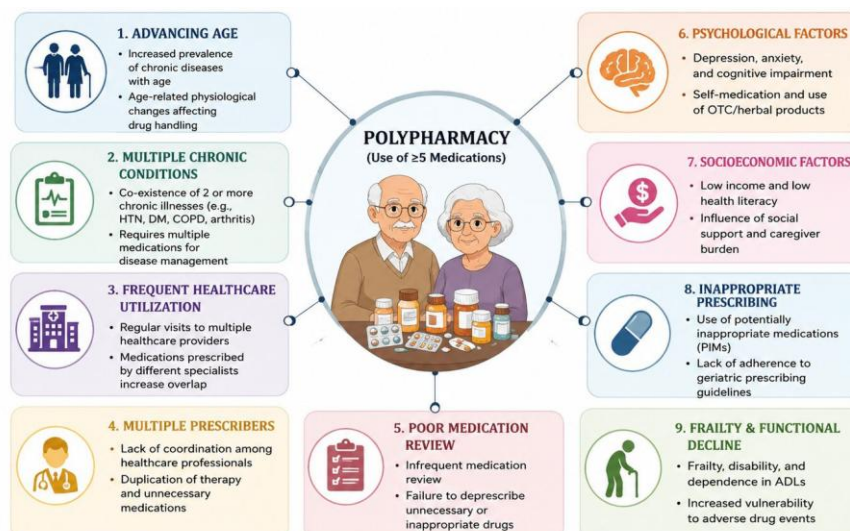


Figure 03: Risk Factors of Polypharmacy

## CLINICAL CONSEQUENCES OF POLYPHARMACY

### Adverse Effects:

Polypharmacy increases the risk of medication-related complications in older adults due to age-related physiological changes and the use of multiple medications. It is associated with a higher incidence of adverse drug reactions (ADRs), adverse drug events (ADEs), drug–drug interactions, medication non-adherence, falls, hospitalization, and increased healthcare costs [5].

An ADE is any harm caused by medication use, whereas an ADR is an unintended and harmful response to a drug taken at normal therapeutic doses. ADRs are classified into Type A (dose-dependent and predictable) and Type B (unpredictable and often allergic or hypersensitivity reactions). Older adults are particularly susceptible because of reduced renal and hepatic function and altered drug metabolism [6]. Medications such as anticoagulants, cardiovascular drugs, antidiabetic agents, diuretics, NSAIDs, and psychotropic drugs are commonly associated with adverse effects. Regular medication review and appropriate prescribing are essential to reduce medication-related harm and improve patient safety in the geriatric population [7].

### Drug-Drug and Drug-Disease Interactions:

#### Drug–Drug Interactions (DDIs)

Drug–drug interactions occur when the effect of one medication is altered by the presence of another medication. Older adults are particularly susceptible because they often receive multiple drugs for several chronic conditions. These interactions may increase drug toxicity, reduce therapeutic effectiveness, or produce unexpected adverse effects [8].

Drug–drug interactions can be classified into three types:

#### 1. Pharmacokinetic Interactions

These interactions occur when one drug affects the absorption, distribution, metabolism, or excretion (ADME) of another drug, resulting in altered drug concentrations [9].

#### Examples:

- Warfarin + NSAIDs → Increased risk of gastrointestinal bleeding.
- Digoxin + Verapamil → Increased digoxin levels leading to toxicity.
- Clarithromycin + Simvastatin → Increased statin concentration causing myopathy or rhabdomyolysis [10].

#### 2. Pharmacodynamic Interactions

These occur when two drugs produce additive, synergistic, or antagonistic effects without changing each other's concentration [11].

#### Examples:

- ACE inhibitors + Potassium-sparing diuretics → Hyperkalemia.
- Benzodiazepines + Opioids → Excessive sedation and respiratory depression.
- Beta-blockers + Verapamil → Bradycardia and heart block [12].

#### 3. Pharmaceutical Interactions

These occur before drug administration due to physical or chemical incompatibility, mainly with intravenous medications [13].

#### Example:

- Mixing ceftriaxone and calcium-containing solutions intravenously may result in precipitation [14].

#### Drug–Disease Interactions (DDIs)

Drug–disease interactions occur when a medication worsens an existing disease or interferes with its management. Older adults with multiple comorbidities are at greater risk because medications prescribed for one condition may aggravate another [15].

#### Medication Non-Adherence:

Medication non-adherence is a common and clinically significant consequence of polypharmacy among older adults. As the number of prescribed medications increases, treatment regimens become more complex, making it difficult for patients to take their medications correctly. Older adults are particularly vulnerable because age-related factors such as cognitive decline, visual and hearing impairment, reduced manual dexterity, and memory problems can interfere with proper medication use [16].

Multiple daily dosing schedules, frequent changes in prescriptions, medication costs, fear of adverse effects, and inadequate understanding of treatment instructions further contribute to poor adherence. Medication non-adherence may result in uncontrolled chronic diseases, therapeutic failure, increased adverse drug reactions, preventable hospitalizations, and higher healthcare costs. It can also reduce functional status and negatively affect the overall quality of life of older adults [17].

Improving medication adherence requires a patient-centered approach that includes simplifying medication regimens, providing clear counseling, using medication organizers or reminder systems, conducting regular medication reviews, and actively involving caregivers and clinical pharmacists. These strategies help enhance treatment adherence, optimize therapeutic outcomes, and improve medication safety in the geriatric population [18].

## Falls and Hospitalization

Polypharmacy increases the risk of falls and hospitalization in older adults due to the use of multiple medications and age-related physiological changes. Drugs such as sedatives, antihypertensives, antidepressants, opioids, and hypoglycemic agents may cause dizziness, orthostatic hypotension, confusion, impaired balance, and reduced alertness, increasing the likelihood of falls and fractures [19]. In addition, adverse drug reactions, drug-drug interactions, and medication non-adherence contribute to frequent emergency department visits and hospital admissions. Regular medication review, deprescribing of unnecessary medications, dose optimization, and patient education are essential strategies to reduce fall-related injuries, prevent avoidable hospitalizations, and improve medication safety in older adults [20].

## POTENTIALLY INAPPROPRIATE MEDICATIONS

### Beers Criteria:

The Beers Criteria, developed by the American Geriatrics Society (AGS), is one of the most widely used evidence-based tools for identifying potentially inappropriate medications (PIMs) in adults aged 65 years and older. It helps healthcare professionals recognize medications whose risks may outweigh their benefits in older adults because of age-related physiological changes, multimorbidity, and increased susceptibility to adverse drug reactions [21]. The criteria categorize medications into those that should generally be avoided, those that should be used with caution, drugs that require dose adjustment in renal impairment, and medications with significant drug-drug interactions. The Beers Criteria support individualized prescribing, improve medication safety, reduce adverse drug events, and assist clinicians in optimizing pharmacotherapy for geriatric patients. However, clinical judgment and individual patient characteristics should always be considered before making therapeutic decisions [22].

### STOPP/START Criteria

The STOPP (Screening Tool of Older Persons' Prescriptions) and START (Screening Tool to Alert to Right Treatment) criteria are validated prescribing tools developed to improve medication appropriateness in older adults. STOPP identifies medications that may be inappropriate because they increase the risk of adverse effects, drug interactions, or therapeutic duplication, whereas START identifies beneficial medications that have been omitted despite clear clinical indications [23]. Unlike the Beers Criteria, which mainly focuses on inappropriate medications, the STOPP/START criteria evaluate both overprescribing and underprescribing, providing a more comprehensive assessment of medication therapy. These tools help clinicians optimize prescribing, reduce medication-related harm, improve treatment effectiveness, and promote rational medication use through regular medication review and individualized patient care [24].

## STRATEGIES TO IMPROVE MEDICATION SAFETY:

### Medication Review

Medication review is a structured and systematic evaluation of a patient's complete medication regimen to ensure that each medicine is appropriate, effective, safe, and consistent with the patient's current clinical condition. In older adults with polypharmacy, regular medication review helps identify unnecessary medications, therapeutic duplication, inappropriate prescribing, drug-drug interactions, drug-disease interactions, and adverse drug reactions [25]. It also provides an opportunity to optimize doses, simplify treatment regimens, and improve medication adherence. Regular medication reviews performed by a multidisciplinary team, including clinical pharmacists, play an essential role in improving medication safety and reducing medication-related harm in geriatric patients [26].

### Deprescribing

Deprescribing is a systematic and patient-centered process of reducing the dose or discontinuing medications that are no longer necessary, ineffective, or potentially harmful. It is an important strategy for managing polypharmacy in older adults and aims to minimize adverse drug reactions, drug interactions, medication burden, and healthcare costs while maintaining essential therapy [27].

Deprescribing should be based on a comprehensive medication review, the patient's clinical condition, life expectancy, treatment goals, and preferences. Medications that commonly require reassessment in older adults include anticholinergic drugs, which may contribute to cognitive impairment and falls; NSAIDs, which increase the risk of gastrointestinal bleeding and kidney injury; hypoglycemic agents such as sulfonylureas and insulin, which may cause hypoglycemia; and antihypertensive medications, which may lead to orthostatic hypotension and falls. Depending on the patient's condition, other medications such as benzodiazepines, proton pump inhibitors, statins, and antipsychotics may also be considered for deprescribing when the risks outweigh the benefits [28].

A structured deprescribing approach involving physicians, clinical pharmacists, patients, and caregivers can improve medication safety, enhance treatment outcomes, reduce hospitalizations, and improve the quality of life of older adults [29].

### Medication Reconciliation

Medication reconciliation is the process of creating and verifying an accurate and complete list of all medications a patient is taking and comparing it with newly prescribed medications at every transition of care, such as hospital admission, transfer, or discharge [30]. This process helps identify medication discrepancies, omissions, duplications,

incorrect doses, and potential drug interactions. Effective medication reconciliation reduces medication errors, prevents adverse drug events, and ensures continuity of care[31]. Active involvement of healthcare professionals, patients, and caregivers is essential for maintaining accurate medication records and improving patient safety[32].

### Patient Education

Patient education is a key component of safe medication management in older adults. It involves providing patients and caregivers with clear information about the purpose of each medication, correct dosage, administration schedule, expected benefits, possible adverse effects, and the importance of adherence[33]. Education should also include guidance on avoiding self-medication, recognizing early signs of adverse drug reactions, maintaining an updated medication list, and attending regular follow-up appointments[34]. Improved patient understanding enhances medication adherence, reduces preventable medication errors, and supports better clinical outcomes and quality of life in geriatric patients [35].

## ROLE OF PHARMACISTS



Figure 04: Role of Pharmacist in management of poly pharmacy improving medication safety in older adults

## CONCLUSION

Polypharmacy is a major concern in older adults because it increases the risk of adverse drug reactions, drug–drug and drug–disease interactions, medication non-adherence, falls, hospitalization, and reduced quality of life. Age-related physiological changes further increase the risk of medication-related complications. Improving medication safety requires regular medication review, medication reconciliation, patient education, appropriate deprescribing, and the use of validated tools such as the Beers Criteria and STOPP/START Criteria. Clinical pharmacists play a vital role in optimizing medication therapy, identifying drug-related problems, and promoting rational prescribing. A multidisciplinary, patient-centered approach is essential to reduce medication-related harm and improve health outcomes in the geriatric population.

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