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A SYSTEMATIC REVIEW ON THE PREVALENCE, CHARACTERISTICS, AND CLINICAL OUTCOMES OF DRUG RELATED PROBLEMS IN GERIATRIC PATIENTS AND EVALUATION OF CLINICAL PHARMACIST INTERVENTIONS

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ABSTRACT

Background: Geriatric patients are highly vulnerable to drug-related problems (DRPs) due to age-related changes in pharmacokinetics and pharmacodynamics and the increasing prevalence of chronic diseases requiring complex therapy. DRPs are associated with increased mortality, hospital admissions, healthcare costs, and reduced quality of life. **Objectives:** To assess the effectiveness of clinical pharmacist-led interventions and conduct a systematic evaluation of the prevalence, characteristics, risk factors, and clinical outcomes of DRPs in geriatric patients. **Methods:** A systematic review on the prevalence, types, risk factors, clinical outcomes, and/or pharmacist interventions in patients aged 60 and older was carried out. **Results:** DRPs were highly prevalent, particularly among hospitalized and chronically ill patients, ranging from 4% to 30%, with approximately 82% experiencing at least one DRP. Most issues were related to adverse drug reactions, and 50–97% of DRPs were potentially preventable. **Conclusion:** DRPs are common among geriatric patients, especially those with comorbidities and polypharmacy. Clinical pharmacist interventions, including medication review, patient education, and clinical involvement, play a key role in reducing DRPs and improving medication safety.

KEYWORDS: Geriatric patients, Drug-related problems (DRPs), Polypharmacy, Adverse drug reactions (ADRs), Clinical pharmacist interventions, Medication review, Risk factors, Medication safety.

INTRODUTION

Drugs are essential for disease prevention and treatment; however, the increasing number of medications and complexity of regimens have led to a rise in drug-related problems (DRPs), including adverse drug reactions, drug interactions, and medication errors, contributing to significant morbidity, mortality, and healthcare costs. DRPs may occur at any stage of medication use—prescribing, dispensing, administration, or adherence—and are commonly caused by inappropriate prescribing, lack of indication, therapeutic duplication, contraindications, inadequate monitoring, and poor patient awareness. If not properly managed, they can result in hospital admissions, prolonged stays, increased healthcare utilization, and economic burden. Geriatric patients are particularly vulnerable due to age-related physiological changes, altered pharmacokinetics and pharmacodynamics, multiple comorbidities, and polypharmacy.[1] With the global elderly population increasing, most older adults require multiple medications for chronic conditions, further elevating DRP risk.[2] Additionally, geriatric syndromes such as falls, frailty, delirium, and cognitive impairment complicate medication management. Therefore, optimizing pharmacotherapy and ensuring safe medication use through effective identification and management of DRPs is crucial in improving outcomes in elderly patients.[3]

Physiological considerations in geriatric patients

Age-related changes to biological systems occur within the central nervous (CNS), cardiovascular, pulmonary, renal, immune, and musculoskeletal systems.

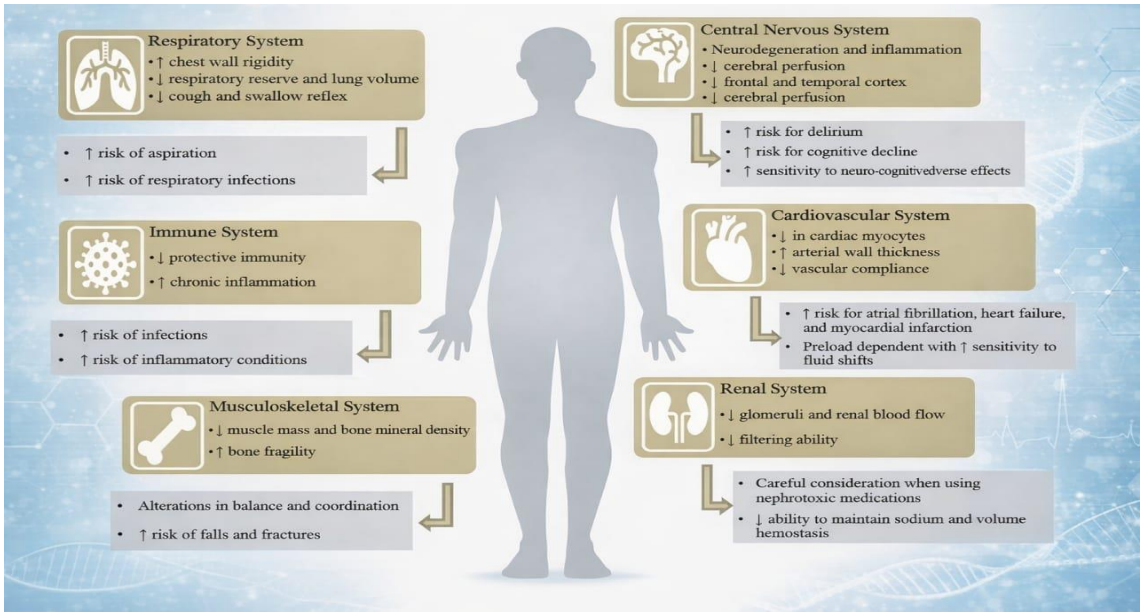
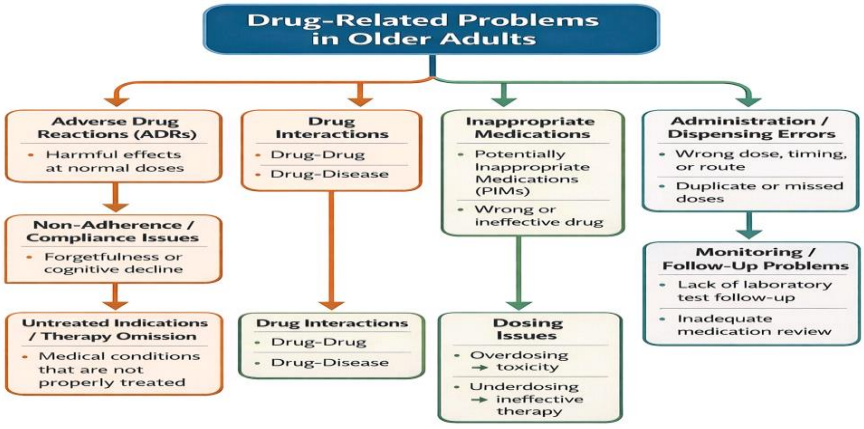


Figure 1.1: (3) Physiological considerations in geriatric patients.

In addition to biologic changes, geriatric patients also experience physiological changes which directly affect pharmacokinetic variables including absorption, distribution, metabolism, and excretion.

Pharmacokinetic Parameter	Alterations in the Elderly	Considerations	Examples
Absorption	• ↓ Intestinal blood flow • ↓ Gastric acid production • ↓ Gut motility • Delayed gastric emptying	• ↓ First-pass metabolism • ↓ Impaired drug dissolution	• Iron • Calcium
Distribution	• ↓ Total body water • ↓ Lean body mass • ↑ Body fat	• Alterations in volume of distribution	• ↑ Serum concentrations of gentamicin, digozin • ↓ Serum concentrations of diazepam, lidocaine
Metabolism	• ↓ Liver volume • ↓ Serum albumin	• ↓ Phase I metabolism pathways • Accumulation of drugs with high extraction ratios (E > 0.7)	• Propranolol • Morphine • Verapamil • Phenytoin
Excretion	• ↓ Renal function	• ↓ *and prolonged drug clearance*	• Digoxin

Fig:1.2[3]



Types of DRPs in geriatric patients: Figure 1.2.[4]

CAUSES

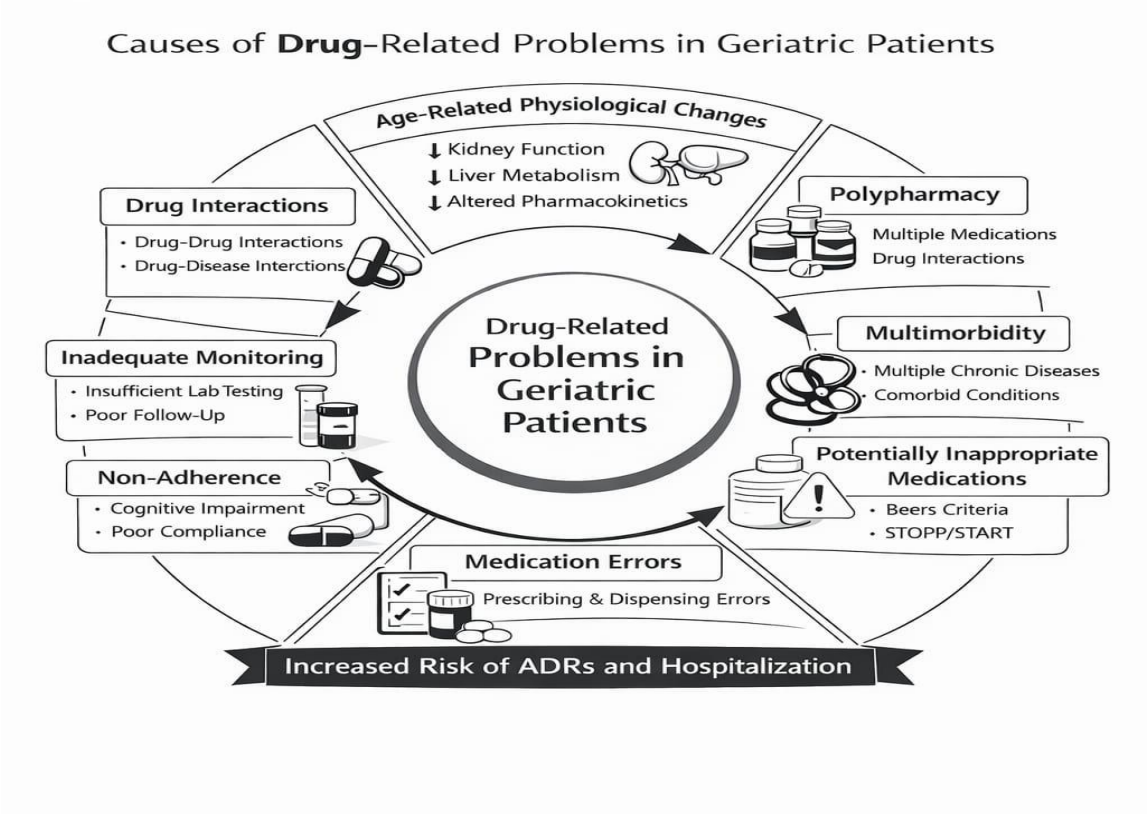


Figure 1.4[5] Causes of DRP.

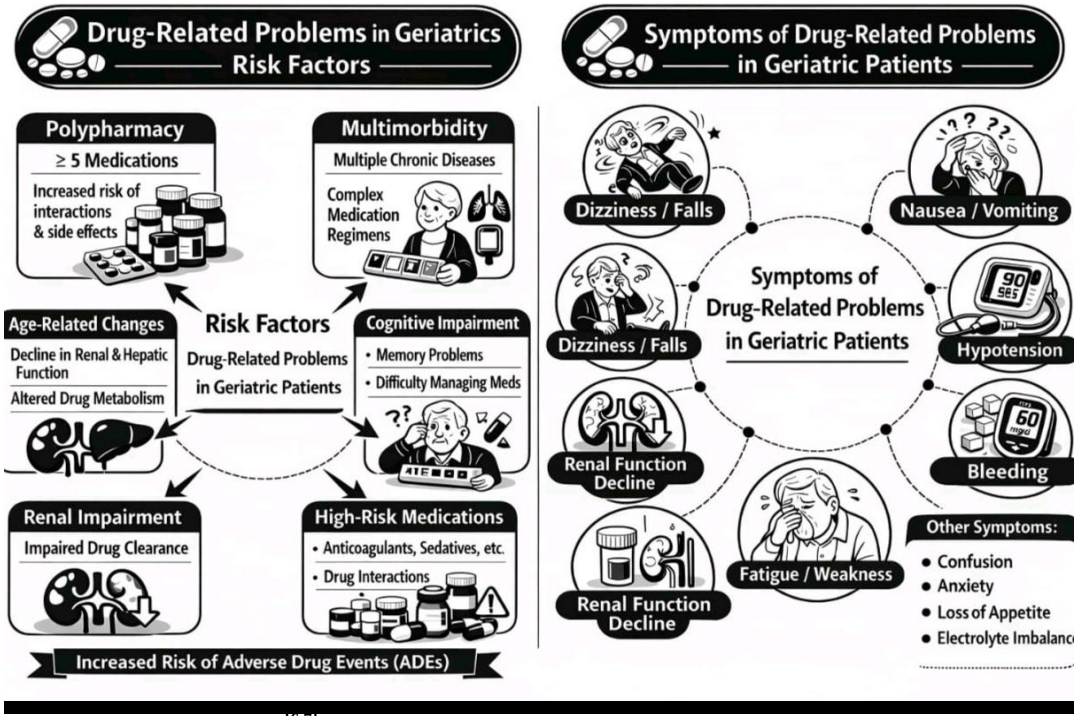


Figure 1.5,1.6[6,7] risk factors and symptoms of DRP in geriatric patients.

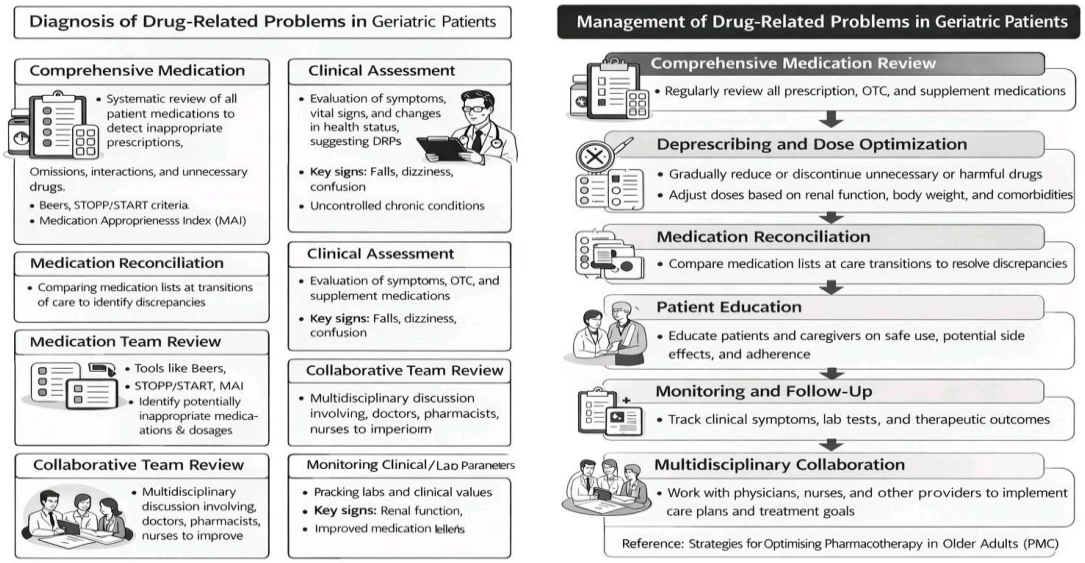


Figure 1.7,1.8[8,9] Diagnosis and management of DRP in geriatric patients.

PREVALENCE

Age-related physiological changes, altered pharmacokinetics and pharmacodynamics, multimorbidity, and polypharmacy significantly increase the risk of drug-related problems (DRPs) among geriatric patients (≥60 years).[10] Studies report a high prevalence of DRPs ranging from 63.3% to 95.9%, particularly in hospitalized patients due to frequent medication changes and poor continuity of care.[11] DRPs are also a major cause of hospital admissions in older adults, accounting for approximately 4–30% of cases.[12] Although data in outpatient settings are limited, it is estimated that one in ten prescriptions contains a DRP.[13] Higher prevalence rates are observed in ten. prescriptions contains a DRP.[13] Higher prevalence rates are observed in developing countries, likely due to limited pharmaceutical care services and inadequate medication review systems.[14]

DRPs are more common in elderly patients with multiple comorbidities and polypharmacy. Common associated conditions include endocrine (27%) and cardiovascular diseases (22%), while frequently implicated drug classes include antihypertensives (31%), non-steroidal anti-inflammatory drugs (27%), and antibiotics (20%). The most common types of DRPs are untreated indications (36%) and unnecessary drug therapy (29%). The leading causes include absence of appropriate therapy despite valid indications (38%) and drug use without proper indication (24%). These findings highlight the importance of regular medication review and clinical pharmacist interventions to optimize treatment outcomes and improve patient safety.[15]

Role of Clinical Pharmacist Interventions in Reducing Drug-Related Problems Among Geriatric Patients

Age-related changes in pharmacokinetics and pharmacodynamics increase the risk of drug-related problems (DRPs) in geriatric patients, making careful medication management essential. Evidence shows that the involvement of clinical pharmacists significantly reduces the occurrence of DRPs in elderly populations.[16] Clinical pharmacists play a vital role in ensuring safe and effective pharmacotherapy by optimizing medication regimens, preventing adverse drug reactions, and minimizing drug–drug interactions. Their responsibilities include conducting comprehensive medication reviews, identifying inappropriate prescribing, monitoring therapeutic outcomes, and improving medication adherence.[1] Medication adherence in elderly patients is often affected by complex regimens, cognitive decline, and financial limitations. Pharmacists address these challenges by simplifying treatment plans, recommending cost-effective alternatives, and using adherence aids such as pill organizers and reminder systems. They also enhance patient care through effective communication with patients and caregivers and by assessing cognitive and functional status using tools like MMSE and MoCA.

Additionally, clinical pharmacists contribute to multidisciplinary care by educating healthcare professionals about polypharmacy risks and supporting deprescribing practices. Overall, their interventions are essential in reducing DRPs, improving therapeutic outcomes, and enhancing patient safety in geriatric care.[3]

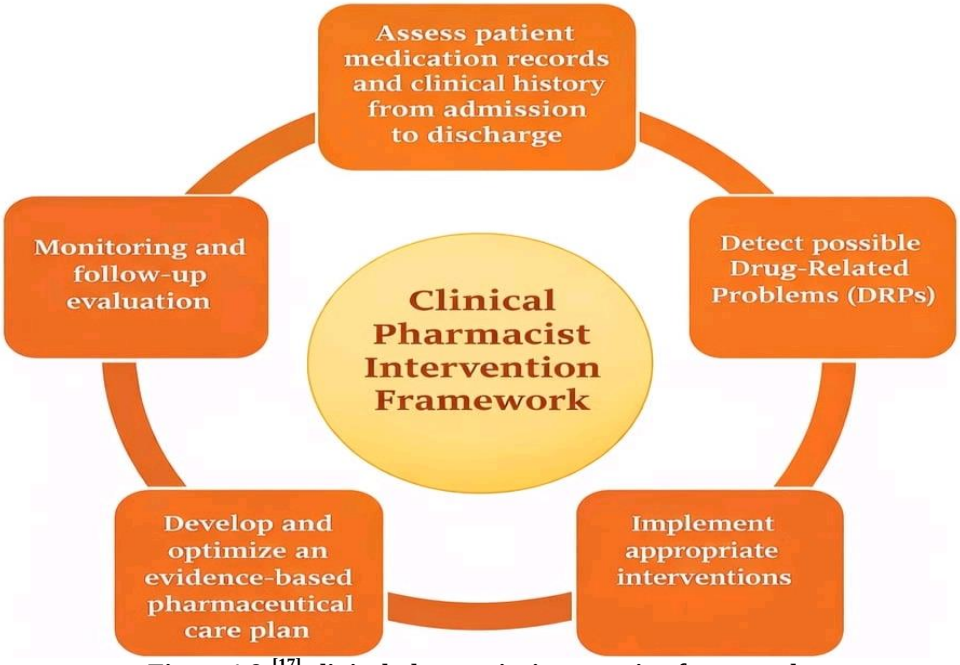


Figure 1.9:[17] clinical pharmacist intervention framework.

DISUSSION

Medication-Related Issues in the Elderly

Older adults commonly experience medication-related complications such as reduced therapeutic effectiveness, adverse drug reactions (ADRs), inappropriate dosing, and drug–drug interactions. These issues may arise due to cautious under-prescribing, poor adherence influenced by economic or cognitive factors, and incorrect drug administration practices. Common ADRs in elderly patients include sedation, confusion, falls, hallucinations, and bleeding.[17]

Susceptibility to Drug-Related Problems

Geriatric patients are highly susceptible to drug-related problems (DRPs) due to age-related physiological changes affecting pharmacokinetics and pharmacodynamics. The presence of multiple chronic conditions and polypharmacy further increases the risk. DRPs, as defined by the Pharmaceutical Care Network Europe, can negatively impact therapeutic outcomes and are associated with increased hospitalizations, healthcare costs, and mortality. Effective management requires rational prescribing, monitoring for adverse effects, prevention of drug interactions, and ensuring patient adherence.[16]

Prevention and Management of DRPs

Prevention of DRPs should occur at all stages of therapy. Before initiating treatment, clinicians should ensure appropriate indications, consider non-pharmacological options, evaluate potential interactions, and select safe and effective medications. After initiation, continuous monitoring, dose adjustments, and regular reassessment of therapy are necessary. Discontinuation of unnecessary medications and use of strategies such as medication reconciliation and electronic prescribing systems can further minimize DRPs.[1]

Prevalence and Patterns of DRPs

DRPs are highly prevalent among geriatric patients, with reported rates ranging from 63.3% to 95.9%, particularly in hospital settings. They account for approximately 4–30% of hospital admissions. In outpatient settings, about one in ten prescriptions may involve a DRP, with higher prevalence observed in developing countries due to limited pharmaceutical care services.[10-14]

Associated Factors, Drug Classes, and Causes of DRPs

Older adults above 60 years are more affected by drug-related problems (DRPs) due to multiple comorbidities and polypharmacy. The most common associated conditions include endocrine (27%) and cardiovascular diseases (22%). Frequently implicated drug classes are antihypertensives (31%), non-steroidal anti-inflammatory drugs (NSAIDs) (27%), and antibiotics (20%). Common DRPs include untreated indications and unnecessary drug therapy, with major causes being absence of appropriate treatment despite valid indications (38%) and prescribing without proper indication (24%). Other contributing factors include suboptimal dosing and therapeutic duplication, highlighting the need for regular medication review and clinical pharmacist interventions to optimize patient outcomes.[15]

CONCLUSION

Drug-related problems (DRPs) are a major concern in geriatric care due to age-related changes, multimorbidity, and polypharmacy, which increase the risk of adverse drug reactions and poor treatment outcomes. However, many DRPs are preventable with proper medication management and monitoring.Clinical pharmacists play a key role in reducing DRPs through medication review, patient education, and promotion of rational prescribing.

Strengthening clinical pharmacy services and multidisciplinary collaboration is essential to improve medication safety and ensure better therapeutic outcomes in elderly patients.

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