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MULTIMORBIDITY AND POLYPHARMACY IN OLDER ADULTS: CHALLENGES FOR HEALTHCARE SYSTEMS AND STRATEGIES FOR MEDICATION OPTIMIZATION — A NARRATIVE REVIEW

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ABSTRACT

Background: Population aging has contributed to a substantial increase in multimorbidity and polypharmacy among older adults worldwide. The coexistence of multiple chronic diseases frequently requires complex pharmacotherapy, increasing the risk of medication-related harm and adverse clinical outcomes. Beyond clinical consequences, polypharmacy represents an important public health and healthcare system challenge associated with increased hospitalization rates, healthcare expenditure, and growing demand for interdisciplinary care.
Aim: The aim of this narrative review was to summarize current evidence regarding multimorbidity and polypharmacy in older adults and to discuss contemporary strategies for medication optimization and deprescribing from both clinical and public health perspectives. Methods: A structured literature review was conducted using the PubMed, Scopus, and Google Scholar database. Contemporary peer-reviewed studies published between 2015 and 2026 focusing on epidemiology, adverse outcomes, inappropriate prescribing, medication review, deprescribing interventions, and healthcare system implications in older adults were included.
Results: Current evidence demonstrates that polypharmacy is strongly associated with adverse drug reactions, falls, frailty, hospitalization, cognitive decline, and increased mortality risk. Recent studies additionally indicate that medication review, multidisciplinary interventions, pharmacist-led care, and deprescribing strategies may improve medication appropriateness, reduce inappropriate prescribing, and decrease treatment burden among older adults.
Conclusions: Effective management of polypharmacy requires patient-centered care, interdisciplinary collaboration, and healthcare system-level interventions aimed at improving medication safety and optimizing clinical outcomes in aging populations.

KEYWORDS

Polypharmacy, Multimorbidity, Older Adults, Public Health, Healthcare Systems, Deprescribing

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Introduction

Population aging represents one of the most significant healthcare and public health challenges worldwide (World Health Organization, 2015). Increased life expectancy has resulted in a growing prevalence of chronic diseases and multimorbidity among older adults (Nicholson et al., 2024; Khezrian et al., 2020).

Multimorbidity, commonly defined as the coexistence of two or more chronic conditions, currently affects the majority of adults aged 65 years and older and is associated with disability, reduced quality of life, increased healthcare utilization, and mortality (Nicholson et al., 2024; Delara et al., 2022). Older adults frequently present with multiple chronic diseases simultaneously, including hypertension, diabetes mellitus, cardiovascular diseases, chronic kidney disease, osteoarthritis, and chronic obstructive pulmonary disease.

Polypharmacy, most commonly defined as the regular use of five or more medications, has become increasingly prevalent due to aging populations and expanding disease-specific treatment recommendations (Masnoon et al., 2017; Pazan & Wehling, 2021). Contemporary epidemiological studies indicate that approximately 40–50% of older adults are exposed to polypharmacy, while excessive polypharmacy may affect up to 20% of this population (Delara et al., 2022; Midão et al., 2018).

Polypharmacy is associated with numerous adverse clinical outcomes, including adverse drug reactions, falls, hospitalization, cognitive impairment, frailty, and mortality (Wastesson et al., 2018; Leelakanok et al., 2017; Seppala et al., 2018). In addition, inappropriate prescribing contributes substantially to healthcare burden, healthcare expenditure, and avoidable hospital admissions among older adults.

The increasing prevalence of multimorbidity and polypharmacy represents not only a clinical challenge but also a major healthcare system concern. Aging societies require effective interdisciplinary strategies aimed at improving medication safety, reducing treatment burden, and optimizing pharmacotherapy in older adults.

Aim of the Study

The aim of this narrative review was to summarize current evidence regarding multimorbidity and polypharmacy in older adults and to discuss evidence-based strategies for medication optimization and deprescribing from clinical and public health perspectives.

Materials and Methods

A structured literature review was conducted using the PubMed, Scopus, and Google Scholar database. The search included peer-reviewed publications published between January 2015 and February 2026. The search strategy included combinations of the following keywords: "multimorbidity," "polypharmacy," "older adults," "geriatric pharmacotherapy," "deprescribing," "potentially inappropriate medications," "medication review," "healthcare systems," and "public health."

Eligible studies included narrative reviews, systematic reviews, meta-analyses, randomized controlled trials, cohort studies, and clinical guidelines focusing on epidemiology, clinical outcomes, prescribing appropriateness, deprescribing interventions, and healthcare implications of polypharmacy in older adults.

Peer-reviewed studies involving adults aged 65 years and older were included, with emphasis on contemporary evidence published between 2015 and 2026. Due to the narrative nature of the review, no quantitative synthesis or formal meta-analysis was performed.

Epidemiology of Multimorbidity and Polypharmacy

Multimorbidity is currently considered the dominant pattern of disease burden in aging populations (Nicholson et al., 2024). Its prevalence increases significantly with age and is associated with functional decline, disability, hospitalization, and mortality.

Polypharmacy has become increasingly common worldwide due to population aging and the growing complexity of chronic disease management (Khezrian et al., 2020; Delara et al., 2022). Recent studies demonstrate that polypharmacy prevalence continues to rise globally, particularly among older adults with cardiovascular disease, diabetes mellitus, chronic kidney disease, and neurodegenerative disorders.

A recent systematic review by Midão et al. (2018) additionally emphasized substantial international variability in polypharmacy prevalence depending on healthcare systems, prescribing patterns, and definitions used across studies.

Polypharmacy is also strongly associated with frailty and reduced physiological reserve in older adults (Herr et al., 2015). Frail individuals appear particularly vulnerable to adverse drug reactions and medication-related complications.

Furthermore, inappropriate polypharmacy substantially contributes to healthcare expenditure, increased healthcare utilization, and avoidable hospital admissions (Rankin et al., 2018).

The prevalence of common chronic diseases among older adults is presented in Table 1.

Table 1. Prevalence of chronic diseases in adults aged 65 years and older

Condition	Estimated prevalence (%)
Hypertension	60–75
Diabetes mellitus	20–30
Cardiovascular diseases	20–25
Chronic kidney disease	15–25
Chronic obstructive pulmonary disease	10–20

Sources: Nicholson et al. (2024); Khezrian et al. (2020); Delara et al. (2022)

Clinical Consequences of Polypharmacy

Polypharmacy has consistently been associated with multiple adverse clinical outcomes in older adults (Wastesson et al., 2018). Studies indicate that increased medication burden significantly increases the risk of adverse drug reactions and hospitalization.

The use of multiple central nervous system-active medications has additionally been linked to falls, fractures, cognitive decline, reduced independence, and mortality (Seppala et al., 2018). Frailty risk also appears to increase progressively with the number of prescribed medications (Herr et al., 2015). Importantly, adverse outcomes are influenced not only by the number of medications but also by prescribing appropriateness, frailty, and clinical complexity (Pazan & Wehling, 2021).

Polypharmacy additionally contributes to psychological burden, treatment fatigue, reduced medication adherence, and decreased quality of life among older adults (Bloomfield et al., 2020). Recent evidence also suggests that medication-related harm significantly contributes to emergency department visits and preventable hospital admissions in aging populations (Aspinall et al., 2020).

Major adverse clinical outcomes associated with polypharmacy are presented in Table 2.

Table 2. Major adverse clinical outcomes associated with polypharmacy in older adults

Outcome	Reported clinical impact	Healthcare impact
Adverse drug reactions	Increased emergency visits and hospitalization	Increased healthcare costs
Falls and fractures	Functional decline and disability	Increased long-term care demand
Cognitive impairment	Reduced independence	Increased caregiver burden
Frailty	Reduced physiological reserve	Increased healthcare utilization
Hospitalization	Longer hospital stays	Increased hospital expenditure
Mortality	Increased all-cause mortality risk	Increased healthcare burden

Sources: Wastesson et al. (2018); Leelakanok et al. (2017); Herr et al. (2015); Seppala et al. (2018)

Drug–Drug Interactions

Older adults are particularly susceptible to drug–drug interactions due to multimorbidity, polypharmacy, and age-related physiological changes (Guthrie et al., 2015).

Clinically significant drug–drug interactions may lead to bleeding, arrhythmias, electrolyte disturbances, sedation, respiratory depression, hospitalization, and mortality. The risk of interactions increases proportionally with the number of prescribed medications.

Common clinically relevant drug–drug interactions in older adults are presented in Table 3.

Table 3. Clinically significant drug–drug interactions commonly observed in older adults

Drug combination	Potential complication	Clinical consequence
Nonsteroidal anti-inflammatory drugs + anticoagulants	Gastrointestinal bleeding	Increased hospitalization risk
Angiotensin-converting enzyme inhibitors + potassium-sparing diuretics	Hyperkalemia	Cardiac arrhythmias
Benzodiazepines + opioids	Respiratory depression	Increased mortality risk
Selective serotonin reuptake inhibitors + nonsteroidal anti-inflammatory drugs	Increased bleeding tendency	Gastrointestinal complications
Anticholinergics + psychotropics	Cognitive impairment	Delirium and falls
Multiple antihypertensives	Orthostatic hypotension	Syncope and fractures

Sources: Guthrie et al. (2015)

Potentially Inappropriate Prescribing and Assessment Tools

Potentially inappropriate prescribing remains a major challenge in geriatric pharmacotherapy (O'Mahony et al., 2015; American Geriatrics Society Beers Criteria® Update Expert Panel, 2023). Several validated tools have been developed to support medication review and improve prescribing appropriateness in older adults. The STOPP/START criteria and the Beers Criteria are among the most widely used instruments for identifying potentially inappropriate medications and prescribing omissions.

Recent evidence suggests that structured medication review using validated assessment tools may significantly improve medication appropriateness and reduce inappropriate prescribing in older adults (Rankin et al., 2018; Kurczewska-Michalak et al., 2021). Pharmacist-led medication review has additionally been associated with improved medication safety and reduced medication-related harm in primary care settings (Aubert et al., 2021).

Commonly used tools for assessing prescribing appropriateness are presented in Table 4.

Table 4. Commonly used tools for assessing prescribing appropriateness in older adults

Tool	Main purpose	Clinical application
Beers criteria	Identification of inappropriate medications	Widely used in geriatric medication review
STOPP criteria	Detection of medications with unfavorable risk–benefit profile	Prevention of inappropriate prescribing
START criteria	Identification of potential prescribing omissions	Optimization of evidence-based therapy
Medication Appropriateness Index (MAI)	Individualized assessment of medication suitability	Structured medication review
Deprescribing algorithms	Identification of medications suitable for discontinuation	Support for medication reduction strategies

Sources: O'Mahony et al. (2015); American Geriatrics Society Beers Criteria® Update Expert Panel (2023); Scott et al. (2015); Reeve et al. (2015); Page et al. (2016); Rankin et al. (2018)

Optimization of Pharmacotherapy and Deprescribing

Optimizing pharmacotherapy in older adults requires individualized and patient-centered care. Regular medication review, shared decision-making, and interdisciplinary collaboration are essential components of safe pharmacotherapy in aging populations (Scott et al., 2015). Deprescribing has emerged as an important strategy aimed at reducing inappropriate polypharmacy and medication-related harm (Reeve et al., 2015).

Contemporary evidence indicates that deprescribing interventions may reduce medication burden without negatively affecting clinical outcomes (Page et al., 2016). Recent studies additionally emphasize the importance of multidisciplinary interventions involving physicians, pharmacists, nurses, and primary care professionals in improving medication safety and prescribing quality (Kurczewska-Michalak et al., 2021).

However, barriers to deprescribing remain significant and include patient concerns regarding medication discontinuation, fragmented healthcare systems, insufficient communication between healthcare professionals, and limited consultation time (Ibrahim et al., 2021; Shrestha et al., 2021).

A structured deprescribing approach is presented in Table 5.

Table 5. Structured deprescribing approach

Step	Description
1	Compile a complete list of medications
2	Identify potentially inappropriate drugs
3	Assess risk–benefit ratio
4	Discontinue or taper medications
5	Monitor patient outcomes

Sources: Scott et al. (2015); Reeve et al. (2015); Page et al. (2016); Rankin et al. (2018); Ibrahim et al. (2021)

Discussion

The findings of this review confirm that multimorbidity and polypharmacy remain major clinical and public health challenges in aging societies. Although multiple medications are frequently necessary for chronic disease management, inappropriate or excessive prescribing may substantially increase treatment burden and adverse clinical outcomes.

Importantly, not all polypharmacy should be considered inappropriate. Appropriate polypharmacy may be clinically justified when evidence-based pharmacotherapy provides benefits that outweigh potential risks (Pazan & Wehling, 2021).

Current evidence increasingly supports structured medication review, deprescribing interventions, pharmacist-led care, and interdisciplinary collaboration as effective strategies for improving medication safety among older adults (Rankin et al., 2018; Kurczewska-Michalak et al., 2021; Aubert et al., 2021).

Effective management of polypharmacy additionally requires healthcare system-level interventions, including integration of pharmacists into primary care, implementation of deprescribing protocols, improved continuity of care, and development of patient-centered medication management strategies. Growing healthcare expenditure associated with population aging further highlights the importance of optimizing pharmacotherapy and reducing avoidable medication-related harm in older adults.

Public Health Implications

The increasing prevalence of multimorbidity and polypharmacy among older adults represents an important healthcare system and public health challenge worldwide.

Polypharmacy contributes substantially to healthcare expenditure, emergency department visits, hospitalization rates, long-term care utilization, and caregiver burden. Effective strategies aimed at improving medication safety may therefore reduce healthcare costs and improve quality of care in aging populations.

Healthcare systems should increasingly support multidisciplinary medication review, deprescribing interventions, pharmacist involvement in primary care, and development of patient-centered prescribing strategies for older adults with multimorbidity.

Limitations

This study has several limitations. As a narrative review, it is subject to potential selection bias and does not provide quantitative synthesis of evidence. Additionally, heterogeneity among included studies may limit direct comparison of findings.

Conclusions

Multimorbidity and polypharmacy substantially contribute to clinical complexity, medication-related harm, and healthcare burden among older adults. Regular medication review, individualized prescribing, deprescribing interventions, and interdisciplinary collaboration are essential for improving medication safety and optimizing pharmacotherapy in aging populations. Future healthcare strategies should increasingly focus on patient-centered and system-level approaches aimed at reducing inappropriate polypharmacy and improving outcomes among older adults.

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