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Review of Safety Management and Nursing Strategies for Polypharmacy in Older Adults

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Abstract

With accelerated population ageing and the growing prevalence of multimorbidity, polypharmacy in older adults has become a major challenge for medication safety and treatment effectiveness. Inappropriate polypharmacy not only increases financial burden but also substantially elevates the risks of drug-drug interactions, adverse drug reactions (ADRs), and regimen-related complexity, thereby compromising clinical outcomes and quality of life. From the perspective of nursing safety management and evidence-based practice, this narrative review summarizes key factors associated with medication-safety risks in older adults with polypharmacy and outlines management strategies focused on deprescribing, standardized processes, risk stratification, and individualized guidance. Available studies suggest that structured medication reconciliation, standardized risk assessment tools, and tailored medication education may help reduce medication-related adverse events and improve safe medication use. In addition, this review discusses current limitations in the researches and outlines directions for future research and practice, providing a theoretical basis for improving the safety and effectiveness of polypharmacy management in older adults.

Keywords

Older Adults, Polypharmacy, Medication Safety, Safety Management, Nursing Strategies

1. Introduction

Polypharmacy has been variably defined across studies; in clinical and epidemiological research, it is most commonly operationalized as the concurrent use of five

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or more medications. In China, approximately 42% of older adults (defined as individuals aged 65 years and above in this review) have two or more chronic conditions, most frequently involving combinations of hypertension, diabetes, coronary heart disease, stroke, and chronic respiratory diseases, with prevalence increasing over time [1] [2]. Many patients with diabetes also have hypertension, and patients with hypertension often have dyslipidemia. Consequently, polypharmacy among older adults with multimorbidity is widespread and often unavoidable.

However, polypharmacy is associated with increased risks of potentially inappropriate medication (PIM), drug-drug interactions, and adverse drug reactions (ADRs) [3], which may lead to serious harm. Therefore, identifying medication-safety risks and establishing effective, integrated management strategies are of substantial clinical value for improving medication safety, enhancing healthcare quality, and controlling medical expenditures. This review summarizes key medication-safety risks associated with polypharmacy in older adults and outlines nursing-focused management strategies. The management strategies discussed in this review apply across inpatient, discharge-transition, and outpatient/community settings, with particular emphasis on continuity of medication management across care transition.

2. Factors Associated with Medication-Safety Risks in Older Adults with Polypharmacy

2.1. Physiological Factors

Ageing is accompanied by progressive declines in the function of multiple organs and systems, which can substantially alter pharmacokinetics and pharmacodynamics. Typical changes include reduced physiological reserve, slower compensatory and recovery responses, and impaired homeostatic regulation. As a result, older adults may show increased sensitivity to medications and reduced adaptive capacity.

In addition, deterioration in sensory function (e.g., vision and hearing) can impair medication understanding and administration. Reduced mobility may increase the difficulty of medication handling. Cognitive decline (e.g., impaired memory and judgment) can directly lead to nonadherence, including missed doses and incorrect dosing.

2.2. Pathological Factors

Multimorbidity is a direct driver of polypharmacy. A study by Chang reported a chronic disease comorbidity rate of 82.39% among older inpatients. In patients with concomitant hypertension, diabetes, and coronary heart disease, combined use of antihypertensive, glucose-lowering, and antiplatelet agents is often required, resulting in highly complex treatment regimens [4] [5]. In addition, interactions between diseases may further increase medication-related risks. For instance, anticholinergic agents may precipitate urinary retention in patients with

benign prostatic hyperplasia, and nonsteroidal anti-inflammatory drugs used for osteoarthritis may exacerbate heart failure [6].

Geriatric syndromes—including frailty, malnutrition, and sarcopenia—not only alter pharmacological responses but also reduce patients' physical and cognitive capacity to manage complex regimens, potentially creating a vicious cycle [7]. Moreover, overlapping, subtle, or atypical symptoms and signs may complicate clinical diagnosis and therapeutic decision-making.

2.3. Medication- and Regimen-Related Factors

According to international consensus tools such as the Beers Criteria [8] and the STOPP/START criteria [9], potentially inappropriate medication use is common in older adults. In this population, the risks of certain drugs (e.g., long-acting benzodiazepines and strongly anticholinergic medications) may outweigh potential benefits, and these agents are therefore considered clearly inappropriate in many situations.

Regimen complexity—such as multiple daily dosing, strict timing requirements, and varied dosage forms—may directly reduce adherence and increase the likelihood of medication errors. In addition, therapeutic goals across chronic conditions may differ or even conflict. For example, cardiovascular disease management emphasizes blood pressure and lipid control, whereas diabetes management prioritizes glycemic targets. Certain antihypertensive agents (e.g., thiazide diuretics) can increase blood glucose levels, potentially counteracting glycemic control goals. Combined pharmacotherapy may also introduce competing targets related to metabolism, volume status, or bleeding risk, necessitating individualized benefit-risk assessment and careful regimen optimization [10].

2.4. Healthcare System and Process Factors

Structural deficiencies in healthcare systems and care processes are important contributors to medication-safety risks in older adults. Under fragmented care models, older patients often seek care across multiple institutions without a unified mechanism for medication management and coordination, leading to dispersed medication information and increased risk of prescription conflicts [11].

Insufficient communication and imperfect coordination mechanisms among physicians, pharmacists, and nurses may hinder the establishment of an effective closed-loop process spanning medication assessment, decision-making, and implementation [12]. Key medication-related procedures may also be inconsistently executed, particularly at high-risk transitions such as admission, inter-department transfer, and discharge [13]. Furthermore, lack of interoperability among electronic medical record systems across institutions can limit information sharing and compromise the accuracy of clinical decision-making [14]. Collectively, these system-level factors interact and reinforce each other, constituting core structural barriers to improving the quality of polypharmacy safety management in older adults.

3. Safety Management Strategies for Older Adults with Polypharmacy

3.1. Medication Optimization Centered on Deprescribing

Deprescribing was proposed by Woodward in 2003 as an approach to guide polypharmacy management in patients with chronic diseases [15]. Deprescribing refers to systematically discontinuing ineffective, unnecessary, or inappropriate medications while maintaining therapeutic effectiveness; this process requires coordinated collaboration among physicians, nurses, and pharmacists to ensure medication safety. Tian *et al.* also evaluated deprescribing interventions in older populations [16]. Scott's team further proposed a five-step deprescribing framework and discontinuation workflow: 1) assess appropriateness—determine whether a medication provides no meaningful benefit, causes toxicity, lacks indication, has contraindications, or presents risks exceeding benefits; 2) assess risks of stopping—evaluate potential withdrawal or relapse, and if needed, taper gradually with monitoring; 3) implement the deprescribing plan—carry out a plan jointly developed by clinicians and patients; 4) monitor outcomes—observe whether symptoms remain controlled after deprescribing; and 5) reassess and adjust—if symptoms recur, consider restarting therapy; otherwise, maintain the simplified regimen with ongoing monitoring [17]. Overall, deprescribing reflects a patient-centered approach and can strengthen collaboration between healthcare professionals and patients, thereby maximizing patient benefit [18]-[20].

3.2. Risk Screening and Assessment Using Standardized Tools

Standardized assessment tools provide an objective basis for identifying and managing medication-related risks in older adults with polypharmacy. Regimen complexity can be quantified using the Medication Regimen Complexity Index (MRCI), which incorporates dosage forms, dosing frequency, and additional administration instructions. The cumulative functional burden associated with sedative and anticholinergic medications can be further evaluated using the Drug Burden Index (DBI) or the Anticholinergic Cognitive Burden (ACB) scale as complementary measures [21].

In addition, a research team at the University of Basel developed a medication literacy assessment tool for adults aged ≥ 65 years (MELIA) in 2022 [22]. This instrument offers practical guidance for nurses, pharmacists, and family physicians, and supports healthcare professionals in better addressing patients' medication-related needs. Collectively, these tools help clinicians design individualized deprescribing plans and enable systematic identification and management of medication-related risks.

3.3. Strengthening the Central Role of Nurses throughout the Medication-Management Continuum

The primary contribution of nursing interventions is not to alter medications di-

rectly, but to reduce medication-related risks by improving the completeness of medication information, the accuracy of implementation, and patients' medication adherence. Nurses function as a key bridge between clinical decision-making and patient execution; nurse-led continuum management is therefore pivotal to ensuring medication safety in older adults with polypharmacy.

By performing dynamic medication assessments, implementing standardized medication reconciliation, delivering individualized medication education, and providing ongoing follow-up, nurses can build a closed-loop management pathway spanning hospital to home. In Wang's research, nurse-led interventions can improve adherence and reduce the incidence of adverse drug events in older patients [23].

3.4. Establishing a Structured Multidisciplinary Collaboration

An efficient multidisciplinary collaboration system is a fundamental safeguard for medication safety in older adults with polypharmacy. Building a stable team comprising internal medicine, surgery, pharmacy, nutrition, and rehabilitation; conducting regular joint ward rounds; holding medication review meetings; and developing standardized management pathways supported by data-sharing mechanisms can facilitate systematic evaluation and dynamic optimization of medication regimens.

This approach also integrates the strengths of different disciplines, reduces potentially inappropriate medication use, and improves the overall effectiveness of medication safety management. For example, during deprescribing, pharmacists may identify potentially inappropriate medications, physicians assess disease-related risks of discontinuation, and nurses monitor symptom changes and adherence—together forming a practical closed-loop process.

Within this collaborative framework, responsibilities can be clearly delineated as follows:

Nurse-led tasks primarily involve front-line screening and continuity management, including medication reconciliation, preliminary risk screening, adherence assessment, medication education, teach-back verification, caregiver instruction, symptom monitoring, and follow-up after discharge. When nurses identify red flags, such as suspected adverse drug events (ADEs), severe nonadherence, cognitive barriers affecting safe medication use, duplicated therapy, or high-risk medications in the context of renal dysfunction, the case should be escalated to the prescribing clinician and/or pharmacist for formal medication review.

Pharmacist-led or pharmacist-supported tasks encompass structured medication review, identification of potentially inappropriate medications (PIMs), drug-drug interaction checks, regimen-complexity assessment, and technical recommendations for optimization.

Prescriber-led tasks focus on final clinical decision-making on initiation, dose adjustment, tapering, discontinuation, and disease-specific therapeutic prioritization.

3.5. Individualized Patient Management Based on Risk Stratification

Risk-stratified individualized management is an important strategy for improving polypharmacy safety in older adults. In clinical practice, risk stratification should be based on a minimum set of patient-level factors, including the number of medications and comorbidities, renal and hepatic function, cognitive status, history of falls or adverse drug events (ADEs), and regimen complexity. Where feasible, standardized tools may also be used to assess medication burden, such as the Medication Regimen Complexity Index or measures of anticholinergic burden.

Based on these factors, patients may be categorized into lower-, moderate-, or higher-risk groups and matched with corresponding management pathways. Lower-risk patients may receive routine medication reconciliation and standard education, whereas moderate-risk patients may require enhanced teach-back, simplified medication lists, and earlier follow-up. Higher-risk patients should undergo multidisciplinary review, closer monitoring, caregiver-supported education, and follow-up reassessment, particularly during care transitions.

This risk-stratified approach helps identify vulnerable patients more accurately, supports more rational allocation of healthcare resources, and shifts management from broad, non-specific intervention toward more targeted prevention and control [24].

3.6. Full-Process Medication Execution and Monitoring System

Reports suggest that monitoring the entire medication-use process—from prescription issuance and drug dispensing, to nursing administration, and subsequent evaluation of effectiveness and adverse reactions—combined with standardized monitoring pathways and an adverse-event reporting system, can enable closed-loop management and substantially reduce medication errors and risk events [25].

3.7. Multilevel Patient Education Programs

Educational programs should be individualized according to patients' cognitive status and overall health condition, and should extend across the care pathway, including hospitalization, care transitions, and community-based follow-up. A comprehensive program may include personalized in-hospital medication guidance, concurrent education for family caregivers, and continued support after discharge.

With the use of visual educational tools, teach-back verification, and scheduled follow-up, patients and caregivers can more reliably understand medication instructions and self-management skills, thereby reducing medication-related risks attributable to cognitive limitations or administration errors [26].

3.8. Full-Process Medication-Safety Pathway and Key Control Points

Based on available evidence and clinical practice consensus [17] [27]-[29], medi-

cation safety management for older adults with polypharmacy can be implemented along a continuous pathway across care settings: medication reconciliation → risk stratification → prescription optimization → discharge handover → follow-up reassessment.

Medication reconciliation should be performed at key transition points, including hospital admission and discharge, as well as during outpatient visits or community follow-up. This should ideally be completed within 24 hours of admission (or the first clinical encounter) to establish a baseline medication list that includes prescription drugs, over-the-counter (OTC) products, and supplements. Risk screening should then be conducted using the Beers Criteria and STOPP/START tools, with additional assessment of regimen complexity or anticholinergic burden when indicated. For high-risk patients—such as those using ≥ 10 medications, with reduced renal function, cognitive impairment, a history of falls, or prior adverse drug events (ADEs)—a multidisciplinary (MDT) prescription review and optimization process involving physicians, pharmacists, and nurses is recommended.

Deprescribing/optimization can follow a structured sequence—defining therapeutic goals, identifying high-risk medications, evaluating benefit-risk balance, adjusting the regimen, and monitoring with reassessment—together with explicit monitoring indicators and reassessment intervals. At major care transitions, medication lists should be reconciled and verified, and the teach-back method should be used to confirm patient understanding. Follow-up and reassessment should be arranged after care transitions—particularly after hospital discharge—with review at 3 - 7 days and at 30 days when clinically indicated, to improve continuity and safety of medication use.

3.9. Implementation Considerations

To facilitate the translation of the above strategies into real-world clinical practice, several common implementation barriers and corresponding mitigation approaches should be considered:

Fragmented medication records, which may lead to incomplete or inconsistent information across care settings, can be addressed by using a standardized shared medication list template across transitions;

Time constraints in busy clinical settings may be mitigated by adopting brief structured screening tools and scripted teach-back prompts;

Low health literacy or medication literacy can be addressed through the use of plain-language instructions, pictorial aids, and repeat-back verification;

Limited caregiver availability requires early identification of the primary medication-support person and tailored follow-up planning;

Poor cross-disciplinary communication can be improved by establishing clear trigger criteria for pharmacist or physician referral and simple escalation pathways.

4. Conclusion

With accelerating population aging and increasing multimorbidity, polyphar-

macy in older adults has become a central issue in medication safety management. Studies have shown that while polypharmacy may confer therapeutic benefits, it also increases the risks of drug-drug interactions, adverse drug reactions, and regimen complexity. Accordingly, standardized medication reconciliation, combined with structured risk assessment and individualized medication education, may reduce medication-related risks and improve medication safety.

In this review, we summarize key risk factors and propose a management framework characterized by deprescribing as the backbone, risk stratification as the operational lever, and nursing-led continuity management across the entire care pathway. Nurses occupy a pivotal position in medication reconciliation, risk assessment, and patient education, and can facilitate effective physician-pharmacist-nurse collaboration in practice [20]. Looking ahead, future work should focus on three directions: 1) developing informatized platforms to enable shared medication lists and intelligent alerts for high-risk medications; 2) clarifying the scope of advanced nursing roles in geriatric medication management and establishing corresponding training pathways to normalize multidisciplinary collaboration; and 3) conducting real-world, longitudinal follow-up and effectiveness evaluations to validate long-term outcomes and cost-effectiveness of different management strategies, thereby supporting implementation of a continuous medication safety management system spanning hospital, community, and home settings.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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