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EVALUATING PERSONALIZED PHARMACOTHERAPY STRATEGIES TO ENHANCE MEDICATION SAFETY AND TREATMENT EFFECTIVENESS IN OLDER ADULTS

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ABSTRACT

The increasing prevalence of chronic diseases, multimorbidity, and polypharmacy among older adults has created significant challenges for safe and effective medication management. Age-related physiological changes can influence drug absorption, distribution, metabolism, and elimination, making older individuals more vulnerable to adverse drug reactions, drug interactions, inappropriate prescribing, and treatment-related complications. Personalized pharmacotherapy offers an individualized approach to medication management by considering patients' medical conditions, functional abilities, kidney and liver function, medication histories, treatment preferences, and individual risks. This research evaluates personalized pharmacotherapy strategies designed to enhance medication safety and treatment effectiveness in older adults. It examines the importance of comprehensive medication reviews, appropriate prescribing, deprescribing, pharmacokinetic and pharmacodynamic assessment, pharmacist-led interventions, clinical decision support systems, and shared decision-making. The study adopts a qualitative and descriptive methodology based on secondary information obtained from peer-reviewed academic literature, clinical guidelines, and geriatric pharmacotherapy research. The findings indicate that individualized medication reviews and multidisciplinary interventions can improve prescribing appropriateness, identify potentially harmful drug combinations, reduce unnecessary medication use, and support patient-centered treatment decisions. Evidence also suggests that the effects of medication optimization on broader outcomes, including mortality, hospitalization, and quality of life, are variable and require further investigation. The research emphasizes that medication decisions should not depend solely on the number of prescribed medicines but should consider the expected benefits, potential risks, functional status, life expectancy, and personal healthcare goals of each patient. The study concludes that personalized pharmacotherapy can strengthen medication safety and improve the quality of geriatric healthcare when supported by evidence-based guidelines, professional collaboration, regular monitoring, and meaningful patient participation.

KEYWORDS

Personalized Pharmacotherapy, Older Adults, Medication Safety, Polypharmacy, Adverse Drug Reactions, Deprescribing, Medication Optimization, Geriatric Healthcare.

INTRODUCTION

The increasing life expectancy of populations worldwide has contributed to a growing number of older adults living with multiple chronic health conditions. Diseases such as hypertension, diabetes, cardiovascular disorders, arthritis, chronic respiratory illnesses, and neurological conditions frequently occur together in later life, requiring long-term medical treatment and continuous medication management. Although pharmaceutical developments have improved

disease control and life expectancy, the simultaneous use of multiple medicines can create complex treatment requirements. Older patients may receive prescriptions from several healthcare professionals, making it difficult to coordinate medication decisions and monitor possible interactions. Consequently, medication safety and treatment effectiveness have become important priorities in geriatric healthcare. Personalized pharmacotherapy provides an approach to addressing these challenges by considering the individual characteristics, clinical circumstances, and treatment goals of each patient rather than applying identical medication strategies to everyone.Age-related physiological changes significantly influence the way medicines behave within the human body. Changes in body composition, reduced total body water, increased body fat, altered gastrointestinal function, and changes in kidney and liver activity can affect drug absorption, distribution, metabolism, and elimination. These changes may increase the duration of medication effects or alter drug concentrations in the bloodstream. Older adults may also experience increased sensitivity to particular medicines because of changes in pharmacodynamic responses. Such differences can increase the likelihood of adverse drug reactions, falls, confusion, bleeding, and other medication-related complications. Daunt et al. (2024) explain that age-related changes, multimorbidity, and complex medication regimens contribute to the risk of problematic polypharmacy and medication-related harm. Therefore, treatment decisions must account for physiological changes rather than relying exclusively on standard adult prescribing practices.Polypharmacy is a major concern in older populations, particularly when several medicines are prescribed without regular evaluation of their combined benefits and risks. The use of five or more medicines is commonly described as polypharmacy, although the number of medicines alone does not determine whether a treatment regimen is appropriate. Some older patients require multiple medicines to manage different chronic conditions, and such prescribing may be clinically justified. However, problematic polypharmacy can occur when medicines are unnecessary, ineffective, duplicated, associated with harmful interactions, or no longer consistent with a patient's treatment goals. Woodford (2024) emphasizes that evaluating the appropriateness of medication use is more meaningful than relying solely on the number of prescribed medicines. This distinction is essential because the objective of personalized pharmacotherapy is not simply to reduce medication quantity but to ensure that every medicine has a reasonable clinical purpose and an acceptable balance of benefits and risks.

Medication-related harm is particularly important among older adults because adverse drug reactions can lead to emergency visits, hospitalization, functional decline, and reduced quality of life. Multiple medicines may interact with one another or with existing medical conditions, increasing the complexity of treatment. For example, the simultaneous use of medicines affecting blood pressure, blood glucose, blood clotting, or the central nervous system may require careful monitoring in vulnerable patients. Reduced kidney function can also affect the elimination of certain medicines, making dose adjustment necessary. The American Geriatrics Society (AGS) 2023 Updated Beers Criteria identify medications and medication combinations that may present

particular risks for older adults, including medicines that require avoidance, caution, or dose modification under specified circumstances. These criteria provide an important evidence-based resource for identifying potentially inappropriate medication use, although they must be applied alongside clinical judgment and individual patient circumstances (American Geriatrics Society 2023 Updated AGS Beers Criteria® Update Expert Panel, 2023).Personalized pharmacotherapy involves the systematic assessment of a patient's health status, medication requirements, treatment response, and personal preferences. It requires healthcare professionals to consider factors such as age, frailty, cognitive function, functional independence, kidney and liver performance, nutritional status, disease severity, and life expectancy. The same medicine may provide substantial benefit to one older patient while creating unnecessary risks for another patient with different clinical characteristics. Thompson and McDonald (2024) identify deprescribing as an important component of individualized medication management, particularly when the potential benefits of long-term treatment need to be reconsidered in relation to changing health conditions and patient priorities. This approach supports treatment decisions that are more closely aligned with individual needs and reduces the likelihood of continuing medicines without sufficient clinical justification.

Comprehensive medication review is one of the most important strategies for implementing personalized pharmacotherapy. It involves examining all prescribed medicines, non-prescription products, supplements, medication doses, administration schedules, treatment indications, and possible drug interactions. The review also considers whether medicines remain necessary, whether doses are appropriate, and whether important treatments have been unintentionally omitted. The STOPP/START criteria provide a structured method for identifying potentially inappropriate prescriptions and potential prescribing omissions in older adults. O'Mahony et al. (2023) updated these criteria to include 190 validated recommendations, reflecting the expansion of evidence concerning medication use in older people. Their work demonstrates the importance of reviewing both excessive prescribing and the failure to prescribe clinically indicated treatments.Deprescribing is another important component of personalized pharmacotherapy. It refers to the planned and supervised reduction or discontinuation of medicines when their potential risks, limited benefits, or lack of continuing indication justify a change in treatment. Deprescribing should not be understood as the automatic withdrawal of medication from older patients. Instead, it requires careful consideration of the original reason for prescribing, current clinical condition, expected treatment benefits, potential withdrawal effects, and patient preferences. Some medicines may no longer provide meaningful benefits because of changes in health status or life expectancy, while others may create unnecessary treatment burdens. Thompson and McDonald (2024) emphasize that deprescribing can be feasible and safe when conducted through appropriate clinical assessment, shared decision-making, and follow-up monitoring. This makes it an important strategy for reducing problematic medication use while preserving necessary treatment.

Pharmacists and other healthcare professionals play an important role in improving medication safety through multidisciplinary collaboration. Physicians are responsible for diagnosing conditions and making treatment decisions, while pharmacists contribute specialized knowledge about drug selection, dosage, interactions, medication reconciliation, and adverse reactions. Nurses can support medication administration, patient education, and monitoring, while caregivers may provide important information about adherence, daily functioning, and treatment difficulties. Daunt et al. (2024) highlight the need for multifaceted and interdisciplinary approaches to managing problematic polypharmacy. Collaborative medication reviews can help identify discrepancies between prescriptions and actual medication use, improve communication between healthcare providers, and ensure that treatment changes are appropriately documented and monitored.Advances in digital healthcare technologies have also created opportunities to support personalized pharmacotherapy. Electronic health records, computerized prescribing systems, clinical decision support tools, and medication interaction databases can help healthcare professionals identify potential prescribing problems. These systems may provide alerts concerning drug interactions, inappropriate doses, duplicate prescriptions, and medicines that require adjustment according to kidney function or other clinical factors. Das et al. (2026), in an umbrella review of interventions for medication management in older adults, found that clinical decision support and multidisciplinary approaches can contribute to improved prescribing practices and medication appropriateness, although evidence for some major clinical outcomes remains inconsistent. Digital systems should therefore support professional judgment rather than replace direct clinical assessment and communication with patients.

Despite the potential benefits of personalized pharmacotherapy, several challenges affect its implementation. Limited consultation time, fragmented healthcare services, incomplete medication records, inadequate professional training, financial constraints, and insufficient communication between healthcare providers can make individualized medication management difficult. Older patients may also experience problems related to memory, vision, physical limitations, and complex medication schedules, which can affect adherence. Furthermore, deprescribing discussions may be difficult when patients believe that every prescribed medicine must be continued indefinitely or when healthcare professionals are uncertain about the consequences of discontinuation. Daunt et al. (2024) emphasize that problematic polypharmacy requires coordinated interventions adapted to different healthcare settings. These challenges demonstrate the importance of education, structured medication review, professional collaboration, and patient involvement.This research evaluates personalized pharmacotherapy strategies for enhancing medication safety and treatment effectiveness in older adults. It examines the relationship between age-related physiological changes, multimorbidity, polypharmacy, inappropriate prescribing, and medication-related complications. It also considers the contributions of comprehensive medication reviews, deprescribing, multidisciplinary healthcare teams, clinical decision support systems, and shared decision-making. The study emphasizes that effective pharmacotherapy should be individualized according to the patient's

medical condition, treatment goals, functional abilities, and personal preferences. By examining existing research and clinical recommendations, the study aims to identify strategies that can strengthen medication management and improve the quality of healthcare for older populations.

RESEARCH OBJECTIVES

1. To examine the importance of personalized pharmacotherapy in improving medication safety and treatment effectiveness among older adults.
2. To analyze the role of medication reviews, deprescribing, and multidisciplinary interventions in reducing medication-related risks and inappropriate prescribing.
3. To identify the major challenges and opportunities associated with implementing individualized medication management strategies in geriatric healthcare.

RESEARCH QUESTIONS

1. How does personalized pharmacotherapy contribute to medication safety and treatment effectiveness among older adults?
2. What role do comprehensive medication reviews, deprescribing, and multidisciplinary healthcare interventions play in reducing medication-related complications?
3. What clinical, organizational, financial, and technological challenges affect the implementation of personalized pharmacotherapy in older populations?

LITERATURE REVIEW

Personalized pharmacotherapy has become an important area of geriatric medical research because older adults frequently experience multiple health conditions and require complex medication regimens. Existing literature emphasizes that medication decisions in later life should consider individual differences in physiological functioning, disease burden, frailty, functional status, and treatment preferences. Standard prescribing approaches may not adequately address the needs of older patients with multimorbidity because clinical guidelines are often developed around individual diseases rather than the combined health conditions experienced by many older people. Daunt et al. (2024) explain that applying several disease-specific treatment recommendations without considering their combined effects can contribute to problematic polypharmacy. Their review emphasizes the importance of coordinated and individualized approaches to medication optimization.The relationship between polypharmacy and medication safety is widely discussed in geriatric pharmacotherapy literature. Polypharmacy may be necessary when several clinically important conditions require treatment, but inappropriate medication combinations can increase the risk of adverse drug reactions, drug interactions, falls, and hospital admissions. Woodford (2024) argues that healthcare professionals should distinguish appropriate polypharmacy from problematic medication use by examining whether

each medicine remains clinically necessary and beneficial for the individual patient. This approach challenges the use of medication counts as the sole indicator of prescribing quality. It also supports comprehensive medication assessment, in which the potential benefits and risks of each medicine are considered in relation to the patient's overall health status.

The American Geriatrics Society 2023 Updated Beers Criteria provide an important framework for identifying potentially inappropriate medications in older adults. The criteria were developed through an interprofessional expert review of available evidence and include medicines that should generally be avoided or used with caution under particular clinical circumstances. They also address important drug-disease interactions, drug-drug interactions, and medications that require special consideration in patients with reduced kidney function. The AGS expert panel emphasizes that the criteria should support, rather than replace, shared clinical decision-making (American Geriatrics Society 2023 Updated AGS Beers Criteria® Update Expert Panel, 2023). Their work demonstrates the importance of combining structured prescribing guidance with individual clinical assessment, especially when patients have multiple chronic conditions or increased vulnerability to adverse effects.Another important contribution to personalized pharmacotherapy is the development of the STOPP/START criteria. These criteria are designed to identify potentially inappropriate prescribing and potential prescribing omissions in older patients. The STOPP component focuses on medicines that may be unsuitable because of their risks, interactions, or lack of clinical justification, while the START component identifies treatments that may be beneficial but have not been prescribed when indicated. O'Mahony et al. (2023) published the third version of these criteria after reviewing relevant evidence and obtaining expert consensus. The updated version includes 133 STOPP and 57 START criteria, making a total of 190 recommendations. This development highlights the importance of addressing both excessive medication use and undertreatment. It also demonstrates that medication optimization requires a balanced evaluation of what should be discontinued, what should be continued, and what may need to be initiated.Deprescribing has emerged as a significant strategy for improving medication appropriateness among older adults. Thompson and McDonald (2024) reviewed the evidence concerning polypharmacy and deprescribing and identified the importance of reassessing medicines that may no longer provide meaningful benefits. Their review suggests that deprescribing is generally feasible and can be undertaken safely when supported by appropriate clinical evaluation and monitoring. However, the authors also identify continuing uncertainty about which deprescribing approaches produce the greatest improvements in patient outcomes and which clinical settings benefit most. This finding indicates that deprescribing should be considered an individualized clinical process rather than a routine effort to reduce the total number of medicines. Decisions should take into account the original indication, current health status, treatment burden, possible withdrawal effects, and the patient's personal goals.Research has also examined the importance of aligning medication decisions with patients' individual goals of care. Masnoon et al. (2024) conducted a systematic review of goal-directed medication reviews in older adults. Their review included 17 studies and

examined prescribing outcomes, clinical outcomes, patient-reported measures, and healthcare utilization. The authors reported evidence of reductions in drug-related problems and potentially unnecessary use of selected medication groups. Some studies also demonstrated improvements in quality of life and other patient-centered outcomes. However, the findings were not uniform across all included studies, and the authors emphasized the need for larger and longer-term investigations. This research supports the importance of incorporating patient preferences, functional priorities, and treatment goals into medication reviews instead of focusing exclusively on prescribing indicators.

Daunt et al. (2024) further examined the challenges associated with problematic polypharmacy and the interventions available to improve drug therapy in older adults. Their review highlights the contribution of multidisciplinary care, structured medication review, deprescribing, and emerging digital technologies. The authors emphasize that fragmented healthcare systems and disease-specific prescribing practices can contribute to unnecessary medication accumulation. They also discuss the importance of patient-centered decision-making and the need to adapt interventions according to individual healthcare settings. This literature indicates that successful personalized pharmacotherapy requires coordination between different healthcare professionals and continuous communication with patients. It also suggests that identifying inappropriate medicines is only one part of medication optimization; recommendations must be implemented and monitored to achieve meaningful benefits.Recent evidence has also examined the effectiveness of broader medication management interventions. Das et al. (2026) conducted an umbrella review of 71 systematic reviews examining strategies to optimize medication management among older adults. Their review included pharmacist-led medication reviews, deprescribing interventions, educational programmes, clinical decision support systems, and community-based initiatives. The authors found that pharmacist-led and multidisciplinary medication reviews showed consistent improvements in medication appropriateness and reductions in potentially inappropriate prescribing. However, evidence concerning mortality, quality of life, cognitive function, and some healthcare utilization outcomes was variable. These findings are important because they distinguish improvements in prescribing quality from improvements in broader clinical outcomes. They also highlight the need for high-quality research using standardized outcome measures.Woodford (2024) further emphasizes that medication optimization should involve shared decision-making, careful follow-up, and communication of treatment changes. Older adults may have different priorities regarding symptom control, functional independence, treatment burden, and the prevention of future complications. A medicine that offers long-term preventive benefits may not always be the most appropriate choice for a patient with severe frailty or limited life expectancy, particularly when the treatment burden is substantial. Conversely, stopping an effective medicine without appropriate assessment may expose the patient to avoidable complications. These considerations demonstrate that personalized pharmacotherapy must balance clinical evidence with individual

circumstances and patient preferences.

The literature also identifies the importance of professional collaboration and technological support in improving medication management. Pharmacists can help identify drug interactions, inappropriate doses, and medication discrepancies, while physicians can evaluate the clinical relevance of proposed treatment changes. Nurses and caregivers can support adherence and monitor changes in patient functioning. Clinical decision support systems may assist by screening medication lists and identifying potential prescribing risks, but their recommendations require professional interpretation. Das et al. (2026) found that digital decision support and multidisciplinary interventions can improve selected medication management outcomes, while also identifying limitations in the consistency of evidence for major clinical outcomes. Overall, the literature indicates that personalized pharmacotherapy is most effective when structured medication assessment, professional expertise, patient participation, and regular monitoring are combined within a coordinated healthcare strategy.

METHODOLOGY

This research adopts a qualitative and descriptive methodology based on secondary data collected from peer-reviewed academic publications, systematic reviews, clinical guidelines, and established research concerning geriatric pharmacotherapy. The study examines personalized medication management as a strategy for improving medication safety and treatment effectiveness among older adults. Published literature concerning polypharmacy, adverse drug reactions, inappropriate prescribing, deprescribing, medication reviews, and multidisciplinary healthcare interventions was considered to develop a comprehensive understanding of the subject. Particular attention was given to research addressing the clinical and organizational challenges associated with medication management in older populations.The research focuses on several major areas, including age-related pharmacokinetic and pharmacodynamic changes, multimorbidity, medication interactions, comprehensive medication reviews, and individualized prescribing decisions. It also examines the contribution of structured assessment tools, including the AGS Beers Criteria and STOPP/START criteria, in identifying potentially inappropriate medications and potential prescribing omissions. Additional attention is given to deprescribing, pharmacist-led interventions, shared decision-making, clinical decision support systems, and the monitoring of treatment outcomes. These areas were selected because they represent important components of personalized pharmacotherapy and are directly relevant to the research objectives.A thematic approach was used to organize and interpret the information obtained from the selected literature. Relevant findings were grouped into themes concerning medication safety, treatment effectiveness, prescribing appropriateness, deprescribing, patient participation, professional collaboration, and implementation barriers. Findings from different publications were compared to identify common conclusions and areas where evidence remains inconsistent. Clinical guidelines were considered to understand established recommendations for medication

assessment, while systematic reviews and other scholarly publications were examined to evaluate reported outcomes and limitations. The study does not involve original patient recruitment, clinical experiments, or the collection of primary medical records. Instead, it provides an analytical interpretation of existing evidence to evaluate the role of personalized pharmacotherapy in geriatric healthcare.

RESEARCH DESIGN

The study follows a descriptive and analytical research design to evaluate personalized pharmacotherapy strategies and their contribution to medication safety and treatment effectiveness among older adults. The descriptive component explains the characteristics of medication use in older populations, including age-related physiological changes, multimorbidity, polypharmacy, and increased vulnerability to adverse drug reactions. It also describes the major strategies used to individualize pharmacotherapy, including medication reconciliation, comprehensive medication review, appropriate dose selection, deprescribing, and shared decision-making. The analytical component examines how these strategies may influence prescribing quality, medication-related risks, treatment continuity, and patient-centered outcomes.The research design is based on the systematic organization and comparison of secondary academic information rather than primary clinical data collection. Peer-reviewed studies, systematic reviews, and established geriatric prescribing guidelines were considered according to their relevance to the research objectives. Particular attention was given to evidence examining the effectiveness of medication optimization interventions and the limitations associated with their implementation. The study also considers the distinction between prescribing-related outcomes, such as reductions in potentially inappropriate medicines, and broader clinical outcomes, including hospitalization, mortality, falls, and quality of life. This distinction is important because improvements in medication appropriateness do not automatically guarantee improvements in every clinical outcome.The study also incorporates a patient-centered healthcare perspective to examine the importance of individual treatment goals and multidisciplinary collaboration. Medication decisions are considered in relation to the patient's medical conditions, functional status, frailty, cognitive abilities, treatment preferences, and expected benefits. The research design recognizes that appropriate pharmacotherapy may differ between patients with similar diagnoses because their health circumstances and personal priorities may not be identical. It therefore examines personalized medication management as an ongoing process involving assessment, treatment planning, implementation, monitoring, and reassessment. This design provides a framework for identifying practical strategies that can support safer and more effective medication use in older populations.

DATA ANALYSIS

The reviewed literature indicates that age-related physiological changes are important factors

influencing medication safety among older adults. Changes in kidney and liver function, body composition, drug metabolism, and pharmacodynamic sensitivity can affect medication concentrations and treatment responses. These changes may increase the risk of adverse reactions when standard doses are used without appropriate consideration of individual health characteristics. The analysis therefore indicates that personalized pharmacotherapy should include assessment of organ function, frailty, comorbidities, concurrent medicines, and previous treatment responses. Such assessment can help healthcare professionals identify patients who may require dose adjustments, alternative medicines, or closer monitoring.The analysis also demonstrates that problematic polypharmacy is a major concern in geriatric medication management. Multiple medicines may be clinically necessary, but unnecessary prescriptions, duplicate treatments, inappropriate drug combinations, and medicines without continuing indications can increase medication-related risks. The AGS Beers Criteria and STOPP/START criteria provide structured methods for identifying potentially inappropriate prescriptions and potential treatment omissions. The updated STOPP/START version includes 190 criteria, reflecting the expanding evidence base concerning medication use in older adults (O'Mahony et al., 2023). These tools can improve the consistency of medication assessment, although their recommendations must be interpreted according to individual clinical circumstances.The analysis further identifies comprehensive medication reviews and deprescribing as important strategies for improving medication appropriateness. Medication reviews can identify unnecessary medicines, harmful interactions, inappropriate doses, and treatments that no longer correspond to a patient's current condition. Deprescribing may reduce medication burden when the potential risks of a medicine outweigh its expected benefits. Thompson and McDonald (2024) emphasize that deprescribing can be feasible and safe when supported by appropriate clinical assessment and follow-up. Masnoon et al. (2024) also identify the potential value of goal-directed medication reviews, particularly for addressing drug-related problems and aligning treatment with patient priorities. These findings support a patient-centered approach in which medication changes are discussed, justified, documented, and monitored.The analysis of multidisciplinary and digital interventions suggests that collaboration between healthcare professionals can strengthen medication management. Pharmacists, physicians, nurses, and caregivers can contribute different forms of information and expertise, helping to identify medication problems and improve treatment coordination. Clinical decision support systems can assist in detecting drug interactions, inappropriate prescribing, and other potential risks. Das et al. (2026) found that pharmacist-led and multidisciplinary interventions showed consistent improvements in medication appropriateness, although evidence concerning mortality, quality of life, and other major clinical outcomes remained variable. The analysis therefore indicates that medication optimization can improve prescribing quality, but its effect on broader health outcomes should not be overstated. Regular evaluation and further clinical research remain necessary.

FINDINGS

The study finds that personalized pharmacotherapy is an important approach for improving medication safety and treatment effectiveness among older adults because it considers individual physiological, clinical, and functional differences. Age-related changes in drug metabolism and elimination can influence treatment response and increase susceptibility to adverse reactions. The findings indicate that medication selection and dosage decisions should therefore account for kidney and liver function, frailty, multimorbidity, cognitive status, concurrent medicines, and individual treatment requirements. A standardized prescription may not provide the same balance of benefits and risks for every older patient, making individualized assessment essential.The research further finds that problematic polypharmacy contributes to medication-related risks when medicines are unnecessary, inappropriate, duplicated, or associated with harmful interactions. However, the number of prescribed medicines alone is not a reliable measure of prescribing quality because some patients require multiple medicines for effective disease management. The AGS Beers Criteria and STOPP/START criteria can support healthcare professionals in identifying potentially inappropriate medication use and possible prescribing omissions. The findings emphasize that these tools should guide clinical assessment rather than replace professional judgment or individual treatment discussions.Another major finding is that comprehensive medication reviews, deprescribing, and multidisciplinary collaboration can improve medication appropriateness and support safer treatment decisions. Pharmacist-led interventions can help identify drug interactions, inappropriate doses, and medication discrepancies, while physicians and other healthcare professionals can assess the clinical significance of proposed changes.

Deprescribing can reduce unnecessary medication exposure when conducted through careful assessment, shared decision-making, and appropriate monitoring. Nevertheless, improvements in prescribing quality do not always result in measurable improvements in mortality, hospitalization, or quality of life. The evidence therefore supports medication optimization while recognizing the need for further research into long-term clinical benefits.Finally, the study finds that successful implementation of personalized pharmacotherapy depends on patient participation, professional training, effective communication, and appropriate healthcare infrastructure. Digital decision support systems can assist in identifying medication risks, but they require reliable clinical information and professional oversight. Financial limitations, fragmented medical records, inadequate consultation time, and insufficient coordination between healthcare providers can restrict the effectiveness of individualized medication management. The findings indicate that a coordinated approach combining clinical assessment, evidence-based prescribing, regular medication reviews, patient education, and follow-up monitoring offers the most practical foundation for improving medication safety in older adults.

CONCLUSION

Personalized pharmacotherapy is an important strategy for improving medication safety and

treatment effectiveness among older adults. Age-related physiological changes, multimorbidity, frailty, and the use of multiple medicines can increase the complexity of medication management and expose patients to adverse drug reactions and inappropriate treatment. The findings of this research demonstrate that medication decisions should be based on individual clinical characteristics rather than relying exclusively on standard prescribing practices. Assessment of kidney and liver function, functional abilities, existing medical conditions, medication histories, and treatment preferences can help healthcare professionals develop safer and more appropriate treatment plans.The study concludes that comprehensive medication reviews, evidence-based prescribing criteria, deprescribing, and multidisciplinary collaboration are essential components of personalized pharmacotherapy. The AGS Beers Criteria and STOPP/START criteria can support the identification of potentially inappropriate medicines and potential prescribing omissions. Pharmacists, physicians, nurses, and caregivers can contribute to medication assessment, treatment coordination, patient education, and ongoing monitoring. Deprescribing can also reduce unnecessary medication exposure when the potential risks of continuing treatment outweigh its expected benefits.

However, all medication changes must be based on careful clinical evaluation and should not be undertaken solely to reduce the total number of medicines.The research further concludes that patient-centered decision-making is necessary for achieving meaningful improvements in geriatric pharmacotherapy. Treatment decisions should consider individual health goals, quality of life, functional independence, treatment burden, and patient preferences. Digital clinical decision support systems may strengthen medication review processes by identifying potential interactions and inappropriate prescribing, but their recommendations must be evaluated by qualified healthcare professionals. Healthcare institutions should also improve communication, maintain accurate medication records, and establish regular review procedures to support continuity of care.Ultimately, personalized pharmacotherapy can contribute to safer and more effective medication management when clinical evidence is combined with individualized assessment, professional collaboration, and patient participation. Governments and healthcare organizations should support professional education, accessible medication review services, and appropriate clinical technologies to improve geriatric healthcare. Further research is required to evaluate the long-term effects of personalized medication interventions on adverse drug reactions, hospitalization, mortality, functional independence, and quality of life. A comprehensive and patient-centered approach can help ensure that older adults receive medicines that are clinically appropriate, beneficial, and consistent with their individual healthcare needs.

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