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Polypharmacy: An Overview of The Definition, Terminology, And Implications

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Abstract:

Background: Polypharmacy, the concurrent use of multiple medications, has long been recognized as a major concern, particularly for older adults. Initially defined by excessive drug use, the concept has evolved to address unnecessary or inappropriate medication use. Polypharmacy is linked to heightened risks of adverse outcomes such as falls, frailty, disability, and increased mortality, particularly in older adults with chronic diseases. The World Health Organization stresses minimizing inappropriate polypharmacy while ensuring medications are evidence-based and appropriate for individual patients.

Aim: This article aims to provide a comprehensive overview of polypharmacy, exploring its definition, implications, and evidence-based strategies to mitigate its risks, particularly in older adults.

Methods: The article synthesizes contemporary data on polypharmacy and its impacts, focusing on evidence-based practices and the importance of identifying appropriate versus inappropriate polypharmacy. It also discusses common issues such as multi-morbidity, adverse drug effects, drug interactions, non-adherence, prescribing cascades, and the role of over-the-counter medications.

Results: Polypharmacy is increasingly common, especially in elderly populations, due to multi-morbidity and aging-related physiological changes. The use of multiple medications raises the risk of adverse drug effects, interactions, and non-adherence. Inappropriate polypharmacy often results from lack of clinical reasoning and is linked to detrimental outcomes. Effective management through regular medication reviews, deprescribing, and patient education can significantly reduce the risks.

Conclusion: Polypharmacy presents both challenges and opportunities in clinical practice. When appropriately managed, polypharmacy can prevent unplanned hospital admissions, but inappropriate prescribing practices increase the risk of adverse outcomes. A patient-centered, interdisciplinary approach to medication management, along with regular reviews and evidence-based prescribing, is essential for optimizing therapeutic outcomes and minimizing harm.

Key Words: Polypharmacy, multi-morbidity, adverse drug effects, medication adherence, prescribing cascades, older adults, drug interactions, medication reviews.

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Introduction:

The concept of polypharmacy has been recognized for over one and a half centuries, initially denoting issues related to the concurrent use of multiple medications and the excessive consumption of drugs. Over time, the definition has evolved to encompass various scenarios, such as "unnecessary drug use" and "medication use without indication." A comprehensive review of contemporary data establishes the use of five or more medications as a practical and widely accepted definition of polypharmacy. This threshold of five medications is strongly associated with heightened risks of adverse outcomes in older adults, including falls, frailty, disability, and increased mortality rates [1]. While the numerical aspect provides a foundation for defining polypharmacy, the World Health Organization emphasizes that the primary focus should remain on evidence-based practices aimed at minimizing inappropriate polypharmacy. The overarching goal is not merely to count medications but to ensure their appropriateness, safety, and efficacy for individual patients. This nuanced approach acknowledges that the challenge lies in identifying and discontinuing unnecessary or harmful medications while maintaining optimal therapeutic outcomes. The United States is among the nations with the highest per capita medication usage, reflecting both the advancements and challenges within its healthcare system. Managing polypharmacy presents a significant challenge for healthcare providers across disciplines, particularly in the context of aging populations and the prevalence of chronic diseases. This article explores evidence-based strategies to mitigate the risks associated with polypharmacy and enhance medication management practices. By fostering an interdisciplinary approach, healthcare professionals can address this critical issue and improve health outcomes for patients [2].

Function:

Historically, polypharmacy has been perceived as a phenomenon to be avoided, primarily due to its strong association with inappropriate prescribing practices. Evidence indicates that such practices contribute to adverse patient outcomes. However, recent studies highlight that when appropriately managed, polypharmacy can play a crucial role in preventing unplanned hospital admissions. For instance, patients managing six or more comorbid conditions while being prescribed four to six medications exhibit no higher risk of unexpected hospital admissions than those taking one to three medications. This finding underscores the importance of distinguishing between appropriate and inappropriate polypharmacy in clinical practice. Appropriate polypharmacy occurs when all prescribed medications serve a specific therapeutic purpose, and the medication regimen is optimized to minimize adverse drug reactions while achieving desired health outcomes. Conversely, inappropriate polypharmacy arises when one or more medications are prescribed without valid clinical indications, leading to detrimental patient outcomes and failing to meet therapeutic objectives. This form of polypharmacy often results from a lack of clinical reasoning, contributing to unnecessary risks for the patient. Recent research has challenged the long-standing assumption that polypharmacy is inherently harmful. It emphasizes the necessity of evaluating the rationale behind medication prescriptions to ensure they align with clinical goals. The primary objective of healthcare providers should be to guarantee that patients receive only appropriate and targeted drug therapies tailored to their specific disease management needs. By fostering a patient-centered approach and emphasizing evidence-based prescribing, clinicians can mitigate the risks of inappropriate polypharmacy while harnessing its potential benefits [3].

Issues of Concern

Polypharmacy in the Elderly:

Polypharmacy is a significant concern among older adults, who represent approximately 14% of the total population but account for over one-third of outpatient prescription medication expenditures in the United States. Projections indicate that the number of individuals aged 65 years and older will increase substantially from 46 million today to over 98 million by 2060, underscoring the growing prevalence of age-related health challenges. Older adults are disproportionately affected by polypharmacy due to their higher likelihood of having multiple chronic conditions requiring concurrent use of medications. This situation leads to heightened risks of adverse drug effects, drug interactions, medication errors, and complications in disease management. The physiological and pharmacokinetic changes that occur with aging, such as reduced renal and hepatic clearance, further exacerbate the risks associated with polypharmacy. Moreover, older individuals are more vulnerable to prescribing cascades, medication non-adherence, and transitions of care, which often contribute to adverse outcomes. Effective management of polypharmacy in this population requires an evidence-based approach that considers the complexities of multimorbidity, prioritizes appropriate prescribing, and minimizes unnecessary medication use. As the elderly population continues to grow, the healthcare system must adapt to address the unique challenges posed by polypharmacy in this demographic. Comprehensive interventions, including regular medication reviews, patient education, and improved communication among healthcare providers, are essential to optimize therapeutic outcomes and reduce the risks associated with polypharmacy in older adults [4].

Multi-Morbidity:

Multi-morbidity, defined as the presence of two or more chronic health conditions, is a prevalent issue among older adults due to age-related physiological and pathological changes. These changes increase susceptibility to chronic diseases, necessitating the concurrent use of multiple medications for effective management. The presence of multi-morbidity creates a complex therapeutic scenario, where each condition may require distinct treatments, potentially leading to polypharmacy. This complexity is further compounded by the interdependence of various health conditions, as medications prescribed for one condition may impact the progression or management of another. For instance, cardiovascular diseases, diabetes, and arthritis frequently coexist in older adults, requiring medications that often interact or produce cumulative side effects. Additionally, the physiological alterations associated with aging, such as decreased renal and hepatic function, reduce the body's capacity to metabolize and eliminate drugs efficiently. This increases the risk of drug toxicity and adverse effects, necessitating vigilant monitoring and dosage adjustments. Managing multi-morbidity in older adults requires a holistic, patient-centered approach that goes beyond disease-specific treatment paradigms. Clinicians must carefully evaluate the benefits and risks of each medication, prioritizing those that provide the most significant therapeutic value while discontinuing unnecessary or redundant prescriptions. Interdisciplinary collaboration among healthcare providers is crucial to ensure comprehensive care, reduce medication-related risks, and improve the quality of life for older adults with multi-morbidity [5].

Adverse Drug Effects:

Adverse drug effects (ADEs) are a significant concern in older adults, often resulting from the use of multiple medications. ADEs refer to any injury caused by drug use, while adverse drug reactions (ADRs), a subset of ADEs, specifically denote harm caused by a drug at standard dosages. Among geriatric populations, ADEs account for 5% to 28% of acute medical admissions, reflecting the profound impact of inappropriate medication use. The most commonly implicated drug classes include cardiovascular agents, anticoagulants, hypoglycemics, diuretics, and nonsteroidal anti-inflammatory drugs (NSAIDs). Older adults are particularly vulnerable to ADEs due to age-related physiological changes, including reduced renal and hepatic clearance, which impair the body's ability to metabolize and eliminate drugs. Furthermore, the likelihood of ADEs increases with the number of medications prescribed, creating a cumulative risk for adverse outcomes. Preventable ADEs, often linked to inappropriate prescribing, contribute to significant morbidity, including falls, delirium, and hospitalizations. Effective strategies to mitigate ADEs in older

adults involve regular medication reviews, deprescribing unnecessary medications, and optimizing dosages to align with age-related pharmacokinetic changes. Healthcare providers must also educate patients and caregivers about potential drug-related risks to enhance adherence and early detection of ADEs. By adopting a proactive and evidence-based approach, clinicians can reduce the burden of ADEs and improve therapeutic outcomes in older populations [5].

Drug Interactions:

Drug interactions are a critical issue in the context of polypharmacy, as the simultaneous use of multiple medications increases the likelihood of pharmacologic or clinical responses that deviate from the expected effects of each drug when administered alone. Drug-drug interactions are particularly concerning among older adults, as they are often prescribed medications that may interact adversely, leading to serious clinical consequences. Cardiovascular drugs are the most frequently implicated in drug interactions, with common outcomes including neuropsychological effects such as delirium, acute renal failure, and hypotension. The risk of drug interactions is exacerbated by age-related changes in drug metabolism and clearance, which alter the pharmacokinetics of many medications. For example, decreased hepatic enzyme activity and renal function in older adults can prolong drug half-lives and intensify interactions. Identifying and mitigating drug interactions require careful medication reviews and a thorough understanding of each patient's therapeutic regimen. Healthcare providers must remain vigilant for symptoms of potential drug interactions, such as confusion, falls, or unexplained changes in clinical status, which are often misattributed to aging or underlying diseases. Optimizing drug regimens to avoid harmful combinations and employing clinical decision support tools can aid in minimizing the risk of adverse drug interactions. Ensuring effective communication among healthcare teams and with patients is also essential to address this critical aspect of polypharmacy management [6].

Medication Non-Adherence:

Medication non-adherence is a significant challenge in older adults experiencing polypharmacy, as it undermines the effectiveness of therapeutic regimens and contributes to adverse health outcomes. Non-adherence often arises from the complexity of managing multiple medications, which may be compounded by cognitive or visual impairments commonly associated with aging. Forgetfulness, difficulty in understanding dosing instructions, or inability to access medications due to physical or financial barriers further exacerbate the issue. Poor adherence can result in treatment failures, worsening of chronic conditions, and increased hospitalizations. The psychological burden of taking multiple medications, often referred to as "pill fatigue," also contributes to non-adherence. Healthcare providers must address these barriers by simplifying medication regimens, utilizing adherence aids such as pill organizers or reminders, and educating patients on the importance of following prescribed treatments. Engaging caregivers in medication management can also improve adherence in patients with significant cognitive or physical limitations. Regular follow-ups and open communication between patients and healthcare providers are essential to identify and resolve adherence challenges, ensuring that therapeutic goals are met. By adopting a patient-centered approach and leveraging available resources, healthcare providers can mitigate the risks of non-adherence and improve health outcomes in older adults experiencing polypharmacy [5].

Prescribing Cascades:

Prescribing cascades represent a critical issue in polypharmacy, occurring when new medications are prescribed to address adverse drug effects (ADEs) caused by existing medications. These cascades often stem from misinterpreting an ADE as a new medical condition, leading to unnecessary prescriptions and increased medication burden. Clinical examples in the literature illustrate this phenomenon, such as prescribing medications to manage side effects like constipation, confusion, or falls without addressing the underlying drug-related cause. Older adults are particularly vulnerable to prescribing cascades due to the overlap between drug side effects and symptoms of normal aging, which may obscure the true etiology of their clinical presentation. Common symptoms, such as fatigue, decreased alertness, or gastrointestinal disturbances, are often misdiagnosed, leading to the addition of unnecessary drugs. Managing prescribing cascades requires a thorough evaluation of the patient's medication history and clinical status to identify

and mitigate ADEs. Healthcare providers must adopt a systematic approach to deprescribing, discontinuing medications that are no longer necessary or contributing to adverse outcomes. Regular medication reviews, patient education, and interdisciplinary collaboration are essential to prevent and address prescribing cascades effectively. By promoting a culture of evidence-based prescribing and vigilant monitoring, clinicians can minimize the risks associated with prescribing cascades and improve the quality of care for older adults experiencing polypharmacy [2][7][8].

Risk of Hip Fractures:

Polypharmacy has been identified as an independent risk factor for hip fractures in older adults, as evidenced by findings from case-control studies. The increased risk is often linked to the use of central nervous system (CNS)-active drugs, including sedatives, antipsychotics, and antidepressants, which are associated with impaired balance, drowsiness, and falls. While the number of medications prescribed is itself a marker of risk, it often serves as a proxy for the use of specific high-risk drug classes. Hip fractures in older adults are associated with significant morbidity, mortality, and healthcare costs, highlighting the critical need for preventive strategies. Regular assessment of fall risk, optimizing medication regimens, and minimizing the use of CNS-active drugs are essential steps in reducing the risk of hip fractures. Incorporating non-pharmacological interventions, such as physical therapy and environmental modifications, can also support fall prevention efforts. Clinicians must remain vigilant in monitoring older adults for signs of fall risk and adverse effects from prescribed medications. By addressing the multifactorial contributors to hip fractures, healthcare providers can enhance patient safety and reduce the burden of injury in this vulnerable population [9].

Use of Over-the-Counter and Complementary Medications:

The use of over-the-counter (OTC) and complementary medications is increasingly prevalent among older adults, presenting unique challenges in managing polypharmacy. OTC medications such as analgesics, laxatives, vitamins, and minerals are commonly used but often without the knowledge of healthcare providers. Additionally, many older adults rely on dietary supplements or herbal remedies, which may interact with prescribed medications, leading to adverse outcomes. A significant concern is the lack of regulation by the U.S. Food and Drug Administration (FDA) over dietary supplements, resulting in limited information about their ingredients and potential interactions. This lack of transparency poses safety risks, particularly for herb-drug interactions. Studies indicate that fewer than half of older adults discuss their use of OTC or complementary medications with their healthcare providers, creating gaps in care and increasing the likelihood of adverse events. Healthcare providers must actively inquire about all medications, including non-prescription and complementary therapies, during routine assessments. Patient education is crucial to ensure safe and informed use of these products, emphasizing the importance of disclosing all medications to healthcare teams. Enhanced communication and awareness can help mitigate the risks associated with the use of OTC and complementary medications in older adults, improving overall medication safety and therapeutic outcomes [10].

Changes in Pharmacokinetics Associated with Aging

Pharmacokinetics:

Pharmacokinetics encompasses the processes of drug absorption, distribution, metabolism, and elimination within the human body [12]. These processes are fundamental to understanding how medications exert their therapeutic effects and how they are subsequently cleared from the system. In the context of aging, pharmacokinetics undergo significant alterations due to physiological changes that affect each stage of drug handling. These modifications can influence the efficacy and safety of pharmacological treatments in older adults, necessitating careful consideration during drug therapy management. As individuals age, variations in body composition, organ function, and enzymatic activity collectively impact the pharmacokinetic profiles of medications, thereby altering their clinical outcomes. Comprehensive knowledge of these changes is essential for optimizing pharmacotherapy, minimizing adverse drug reactions, and enhancing therapeutic efficacy in the elderly population.

Absorption:

Aging does not markedly influence the overall extent of drug absorption; however, it can decelerate the absorption rate. Consequently, older patients may experience lower peak serum concentrations and a delayed time to reach these peaks compared to younger individuals. Despite these changes in absorption kinetics, the bioavailability—the total amount of drug absorbed—remains largely unchanged across different age groups. Exceptions to this general trend include medications subject to a significant first-pass effect. In older adults, reductions in liver size and hepatic blood flow diminish the liver's capacity to extract certain drugs, potentially leading to elevated serum concentrations and increased bioavailability [12]. Additional factors that may affect drug absorption in the elderly include the mode of drug administration, concomitant ingestion of food or other substances, the presence of comorbid conditions, and alterations in gastrointestinal enzyme activity, either through inhibition or induction. These variables necessitate a nuanced approach to dosing and drug selection in older populations to ensure therapeutic efficacy while minimizing the risk of adverse effects.

Distribution:

The distribution phase of pharmacokinetics pertains to the dispersion of a drug throughout the body's tissues and fluids, quantified as the volume of distribution (Vd) measured in liters or liters per kilogram (L/kg) [13]. In older adults, physiological changes such as decreased body water and lean body mass result in a reduced volume of distribution for hydrophilic, or water-soluble, drugs. Examples of such medications include ethanol and lithium, which exhibit lower Vd values in the elderly due to these compositional changes. Conversely, aging is associated with increased adipose tissue, leading to an expanded volume of distribution for lipophilic, or fat-soluble, drugs. Medications like diazepam, trazodone, and flurazepam demonstrate higher Vd in older individuals, reflecting their greater affinity for fat stores. Additionally, albumin levels, the primary plasma protein to which many drugs bind, typically decline with age. This reduction results in a higher proportion of free, pharmacologically active drug in the circulation. While younger patients can efficiently eliminate excess unbound drugs, the elderly experience diminished elimination capabilities, leading to potential drug accumulation. Examples of drugs affected by these changes include ceftriaxone, phenytoin, valproate, warfarin, diazepam, and lorazepam. These alterations necessitate careful dose adjustments and monitoring to prevent toxicity and ensure therapeutic effectiveness in older populations.

Metabolism:

Drug metabolism, a critical component of pharmacokinetics, involves the biochemical transformation of medications primarily within the liver, but also in the intestinal wall, lungs, skin, kidneys, and other organs. Aging induces a decline in hepatic blood flow and liver mass, resulting in up to a 30% reduction in the clearance of certain drugs metabolized by the liver [14]. Metabolic processes occur via two primary pathways: Phase I and Phase II. Phase I metabolism encompasses reactions such as hydroxylation, oxidation, dealkylation, and reduction, predominantly mediated by cytochrome P450 (CYP) enzymes. While Phase I reactions generally convert drugs into less active metabolites, some medications, like diazepam, are transformed into more active compounds through these pathways. Phase II metabolism involves conjugation processes, including glucuronidation, conjugation, and acetylation, facilitating the excretion of drugs via urine or bile. An illustrative example is lorazepam, which undergoes initial Phase I oxidation followed by Phase II glucuronidation. In the elderly, Phase I reactions are more susceptible to impairment compared to Phase II pathways, making medications metabolized through Phase II preferred for this demographic. These metabolic changes necessitate strategic drug selection and dosage adjustments to mitigate the risk of adverse drug reactions and enhance therapeutic outcomes in older adults.

Elimination:

Elimination refers to the final removal of drugs from the body, typically measured by parameters such as half-life and clearance. The kidneys are the primary organs responsible for drug elimination, processing medications either in their parent form or as metabolites. In older adults, renal physiology

undergoes significant changes, including reduced kidney size, decreased renal blood flow, and a decline in glomerular filtration rate (GFR). These alterations impair the kidneys' ability to effectively eliminate drugs, leading to prolonged half-lives and potential drug accumulation [12]. Additionally, aging is associated with decreased creatinine production due to reduced lean muscle mass, which can mask declines in renal function. As a result, serum creatinine levels may remain within normal ranges despite diminished creatinine clearance, rendering serum creatinine an unreliable marker of renal function in the elderly. To more accurately estimate creatinine clearance and adjust medication dosing appropriately, the Cockcroft-Gault equation is often utilized. This equation accounts for age-related changes in body composition and renal function, providing a more precise assessment of a patient's ability to eliminate medications. Understanding these pharmacokinetic alterations is crucial for preventing drug toxicity and ensuring safe and effective pharmacotherapy in the aging population.

Age-Associated Changes in Pharmacodynamics:

Pharmacodynamics refers to the study of the molecular, biochemical, and physiological effects of drugs and how they interact with the body. In aging individuals, pharmacodynamic changes are observed, but these alterations are highly specific to the particular medication and the measured effect [15]. Controlled investigations into drug effects necessitate the assessment of plasma concentrations or site-specific drug activity to identify age-related differences in responses. For instance, elderly patients exhibit a diminished beta-adrenergic receptor response to certain ligands. This reduction is evident with drugs such as salbutamol, a beta2-adrenergic agonist, and propranolol, a beta-adrenergic antagonist. The attenuated responses result from impaired post-receptor mechanisms, specifically a decline in cyclic adenosine monophosphate (cAMP) synthesis [16]. Such pharmacodynamic alterations underscore the importance of tailored therapeutic approaches in older populations to optimize drug efficacy while minimizing adverse effects. A comprehensive understanding of these age-related changes can facilitate better drug selection and dosing regimens, ensuring that clinical outcomes align with the unique physiological characteristics of elderly patients.

Deprescribing:

The process of deprescribing involves the intentional discontinuation of medications. In clinical practice, deprescribing is often reactive, initiated in response to adverse drug reactions or therapeutic failure. However, a more proactive approach is recommended, wherein clinicians and patients collaboratively decide to discontinue a medication following a thorough risk-benefit analysis [17]. This proactive strategy aims to optimize pharmacological therapy by reducing polypharmacy, minimizing medication-related complications, and enhancing the overall quality of life for patients. Proactive deprescribing involves regular evaluation of a patient's therapeutic regimen, considering the evolving health status, potential drug-drug interactions, and the diminishing therapeutic benefits of certain medications over time. Such a methodical approach ensures that the cessation of medications is both clinically justified and aligned with the patient's health goals, thereby fostering a more patient-centered model of care. By emphasizing the importance of deprescribing as a routine component of medication management, healthcare professionals can mitigate the risks associated with prolonged or unnecessary drug use in elderly populations.

Beers Criteria:

The Beers Criteria, updated by the American Geriatrics Society (AGS) in 2023, provides invaluable guidance on the use of potentially inappropriate medications (PIMs) in older adults. These criteria have become an essential resource for clinicians, educators, researchers, and healthcare administrators across the United States [18][19]. The Beers Criteria serve as a comprehensive framework for identifying medications that may pose a higher risk of adverse effects in geriatric patients due to age-related physiological changes and altered pharmacokinetics and pharmacodynamics. By categorizing medications based on their risk profiles and providing recommendations for safer alternatives, the criteria empower healthcare professionals to make informed prescribing decisions. This evidence-based tool promotes the optimization of pharmacotherapy in older adults, enhancing medication safety and reducing the incidence

of adverse drug events. Furthermore, the Beers Criteria support educational initiatives and research efforts aimed at improving geriatric care and fostering a deeper understanding of medication management in aging populations. The widespread adoption of these guidelines underscores their critical role in advancing patient-centered care and ensuring the judicious use of pharmacological interventions in older individuals.

Clinical Significance:

Managing the care of older adults presents considerable challenges, particularly because these individuals often require multiple medications to address complex health conditions. A key aspect of geriatric care involves optimizing medication regimens to balance therapeutic benefits against potential risks. One significant concern is the occurrence of preventable adverse drug events, which should be carefully considered as a possible cause when evaluating older patients presenting with new symptoms. Proactively addressing such events can reduce the likelihood of prescribing cascades and associated hospitalizations. Furthermore, awareness of the complications linked to polypharmacy, such as an increased risk of hip fractures, falls, and cognitive decline, is essential to mitigating adverse outcomes and lowering healthcare costs. While prescribing multiple medications may be unavoidable in certain scenarios, healthcare providers must strike a balance between over-prescribing and under-prescribing. This involves evaluating medication appropriateness based on individual patient factors, including life expectancy and overall care goals. Long-term opioid use often exemplifies the complexities of polypharmacy. Administering interacting medications alongside opioids can significantly increase the risk of overdose. A recent study investigated the association between opioid overdose and non-opioid medications dispensed within the 90 days preceding the overdose event. The study adjusted for prescription opioid dosages and concurrent benzodiazepine use, revealing an increased odds ratio (OR) for overdose with such combinations. Polypharmacy involving opioids and benzodiazepines particularly heightens risks of confusion, falls, and hip fractures [20]. The 2023 American Heart Association (AHA) and American College of Cardiology (ACC) Guideline for Chronic Coronary Disease underscores critical strategies, including optimal prescribing practices, reducing medication burden and polypharmacy, implementing deprescribing measures, and minimizing adverse drug reactions [21]. These principles emphasize the importance of tailored pharmacological interventions to improve outcomes and ensure safer medication management in elderly populations.

Other Issues

Strategies to Prevent Polypharmacy

To prevent the risks associated with polypharmacy, a series of strategic measures should be implemented. Firstly, maintaining an accurate and updated medication list and medical history is essential. Patients should be encouraged to bring all medications, including prescribed drugs, over-the-counter (OTC) products, supplements, and herbal preparations, during consultations. Reviewing any changes to the medication regimen with both the patient and caregiver is important, and when possible, these modifications should be documented in writing to ensure clear communication. The aim should be to prescribe the fewest medications possible, using the simplest dosing regimen to reduce complexity. It is also advisable to link each prescribed medication directly to a specific diagnosis, discontinuing any unnecessary medications to further streamline treatment.

Another key element is screening for potential drug-drug and drug-disease interactions to prevent adverse effects. A team-based approach, involving caregivers, family members, and a community pharmacist, can further enhance medication management. It is crucial to avoid initiating medications that are potentially harmful, and the Beers Criteria should be used as a reference to guide these decisions. When starting new medications, they should be introduced at the lowest effective dose, with gradual titration as needed. Medications should not be prescribed to manage side effects from other drugs, and careful medication reconciliation is necessary during care transitions. Proper communication and follow-up are critical, particularly after hospital discharge, to update the medical history and prevent medication errors, treatment failures, and rehospitalizations [22]. Furthermore, the appropriateness of medications should be assessed based on the patient's goals of care and life expectancy. It is important to note that polypharmacy

refers not only to medications that are started but also to those whose doses have been reduced without being discontinued [23]. The integration of tools such as STOPP (Screening Tool Of Older Person's Prescriptions) and START (Screening Tool to Alert to Right Treatment) can be valuable in reviewing medications for older adults with multiple health conditions in clinical settings [24]. Recent advancements in artificial intelligence (AI) offer promising potential in addressing polypharmacy. A study explored AI's role in reducing polypharmacy, highlighting the need for interdisciplinary collaboration between specialists in AI, medicine, biostatistics, pharmacy, public health, law, and ethics. This multi-disciplinary approach provides a comprehensive perspective on the clinical, social, and ethical implications of polypharmacy and its solutions [25]. However, challenges related to HIPAA compliance, data privacy, and ethical considerations must be addressed before AI can be fully integrated into healthcare systems for polypharmacy management [26].

Enhancing Healthcare Team Outcomes

The effective management of medications for each patient requires active participation from every healthcare team member, including pharmacists and nurse practitioners. It is crucial that healthcare professionals consistently assess the medications each patient is taking, with medication monitoring being a collaborative effort among the interprofessional team. In cases where duplicate medications are identified, these should be removed from the patient's regimen, following consultation with the clinician who originally prescribed them. It is essential that both the prescribing date and the duration of medication usage are clearly documented during each clinic visit. If nursing staff suspects the presence of duplicate therapies, they should immediately consult a pharmacist and notify the prescribing clinician. The primary aim of this process is to avoid polypharmacy, which can lead to serious adverse effects on patient health. If any healthcare team member identifies a potential duplication or inappropriate medication, it is imperative that they consult the prescriber or pharmacist without delay to confirm the issue and take corrective action. This approach underscores the importance of maintaining open lines of communication and ensuring comprehensive record-keeping.

Each year, a significant number of elderly patients experience injuries or even fatalities due to the adverse effects of polypharmacy. To mitigate these risks, pharmacists must maintain an up-to-date list of all the medications the patient is taking, informing the physician and nurse practitioner of any duplicate or unnecessary medications. It is also the responsibility of all members of the interprofessional healthcare team—clinicians, nurses, and pharmacists—to educate patients about the purpose of their prescribed medications and assist them or their caregivers in understanding the medication regimen. This information should be made available to the entire healthcare team to enable the elimination of duplicate and unnecessary medications from the patient's treatment plan. The OPERAM (Optimizing Therapy to Prevent Avoidable Hospital Admission in Multimorbid Older Adults) trial, a cluster-randomized controlled study, examined the impact of optimizing drug therapy on hospital admissions related to drug-related issues in older adults with polypharmacy and multimorbidity. The trial found that inappropriate prescribing is prevalent among older adults with multiple comorbidities and polypharmacy, contributing to hospital admissions. The study concluded that such admissions could be reduced by interventions aimed at optimizing pharmacotherapy. However, further initiatives are required to develop and implement strategies for optimizing pharmacotherapy interventions that can effectively reduce inappropriate prescribing and improve patient outcomes [27].

Conclusion:

Polypharmacy has emerged as a complex issue, particularly in aging populations where multi-morbidity is prevalent. Historically viewed as detrimental due to its association with inappropriate prescribing, polypharmacy has evolved into a more nuanced concept, with both benefits and risks. Appropriate polypharmacy, characterized by medications tailored to a patient's specific therapeutic needs, can support effective disease management, particularly in individuals with multiple chronic conditions. However, inappropriate polypharmacy, resulting from over-prescribing or lack of clinical reasoning, is linked to adverse outcomes, including drug interactions, medication errors, and a range of health

complications. Older adults, who often experience polypharmacy due to age-related physiological changes and the need for multiple medications to manage chronic diseases, are at higher risk of negative drug outcomes. The physiological alterations, such as reduced renal and hepatic function, exacerbate the potential for adverse drug effects (ADEs) and drug-drug interactions. These risks are compounded by issues like medication non-adherence, prescribing cascades, and the increasing use of over-the-counter and complementary medications, which may not be fully accounted for in routine clinical assessments. Addressing these issues requires a comprehensive, interdisciplinary approach to care. Healthcare providers must prioritize regular medication reviews, deprescribing unnecessary medications, and optimizing drug regimens to prevent ADEs. Patient-centered care, where medication regimens are aligned with individual therapeutic goals, is critical in reducing the risks associated with polypharmacy. Educating patients and caregivers about medication management, potential side effects, and the importance of adhering to prescribed regimens can improve patient outcomes. Additionally, better communication between healthcare teams and the inclusion of all medications, including OTC and complementary products, in patient assessments are vital for comprehensive care. In conclusion, while polypharmacy presents significant challenges, it is not inherently harmful when properly managed. By adopting evidence-based practices, enhancing clinical reasoning, and focusing on the appropriateness of medications, healthcare professionals can mitigate the risks of polypharmacy and improve health outcomes for older adults. Regular assessments, a patient-centered approach, and collaborative care are essential in navigating the complexities of polypharmacy.

References:

[1] Masnoon N, Shakib S, Kalisch-Ellett L, Caughey GE. What is polypharmacy? A systematic review of definitions. BMC Geriatr. 2017 Oct 10;17(1):230.

[2] Antimisiaris D, Cutler T. Managing Polypharmacy in the 15-Minute Office Visit. Prim Care. 2017 Sep;44(3):413-428.

[3] Hughes C. Appropriate and inappropriate polypharmacy-Choosing the right strategy. Br J Clin Pharmacol. 2021 Jan;87(1):84-86.

[4] Hosseini SR, Zabihi A, Jafarian Amiri SR, Bijani A. Polypharmacy among the Elderly. J Midlife Health. 2018 Apr-Jun;9(2):97-103.

[5] von Buedingen F, Hammer MS, Meid AD, Müller WE, Gerlach FM, Muth C. Changes in prescribed medicines in older patients with multimorbidity and polypharmacy in general practice. BMC Fam Pract. 2018 Jul 28;19(1):131.

[6] Lavan AH, Gallagher P. Predicting risk of adverse drug reactions in older adults. Ther Adv Drug Saf. 2016 Feb;7(1):11-22.

[7] Gill SS, Mamdani M, Naglie G, Streiner DL, Bronskill SE, Kopp A, Shulman KI, Lee PE, Rochon PA. A prescribing cascade involving cholinesterase inhibitors and anticholinergic drugs. Arch Intern Med. 2005 Apr 11;165(7):808-13.

[8] Woodford HJ. Calcium Channel Blockers Co-prescribed with Loop Diuretics: A Potential Marker of Poor Prescribing? Drugs Aging. 2020 Feb;37(2):77-81.

[9] Machado-Duque ME, Castaño-Montoya JP, Medina-Morales DA, Castro-Rodríguez A, González-Montoya A, Machado-Alba JE. Drugs With Anticholinergic Potential and Risk of Falls With Hip Fracture in the Elderly Patients: A Case-Control Study. J Geriatr Psychiatry Neurol. 2018 Mar;31(2):63-69.

[10] Rolita L, Freedman M. Over-the-counter medication use in older adults. J Gerontol Nurs. 2008 Apr;34(4):8-17.

[11] Villanyi D, Fok M, Wong RY. Medication reconciliation: identifying medication discrepancies in acutely ill hospitalized older adults. Am J Geriatr Pharmacother. 2011 Oct;9(5):339-44.

[12] Reeve E, Trenaman SC, Rockwood K, Hilmer SN. Pharmacokinetic and pharmacodynamic alterations in older people with dementia. Expert Opin Drug Metab Toxicol. 2017 Jun;13(6):651-668.

[13] Grogan S, Preuss CV. StatPearls [Internet]. StatPearls Publishing; Treasure Island (FL): Jul 30, 2023. Pharmacokinetics.

[14] Klotz U. Pharmacokinetics and drug metabolism in the elderly. Drug Metab Rev. 2009;41(2):67-76.
[15] Marino M, Jamal Z, Zito PM. StatPearls [Internet]. StatPearls Publishing; Treasure Island (FL): Jan 29, 2023. Pharmacodynamics.
[16] Mangoni AA, Jackson SH. Age-related changes in pharmacokinetics and pharmacodynamics: basic principles and practical applications. Br J Clin Pharmacol. 2004 Jan;57(1):6-14.
[17] Wright DJ, Scott S, Buck J, Bhattacharya D. Role of nurses in supporting proactive deprescribing. Nurs Stand. 2019 Feb 22;34(3):44-50.
[18] By the 2019 American Geriatrics Society Beers Criteria® Update Expert Panel. American Geriatrics Society 2019 Updated AGS Beers Criteria® for Potentially Inappropriate Medication Use in Older Adults. J Am Geriatr Soc. 2019 Apr;67(4):674-694.
[19] By the 2023 American Geriatrics Society Beers Criteria® Update Expert Panel. American Geriatrics Society 2023 updated AGS Beers Criteria® for potentially inappropriate medication use in older adults. J Am Geriatr Soc. 2023 Jul;71(7):2052-2081.
[20] Khan NF, Bykov K, Glynn RJ, Barnett ML, Gagne JJ. Coprescription of Opioids With Other Medications and Risk of Opioid Overdose. Clin Pharmacol Ther. 2021 Oct;110(4):1011-1017.
[21] Writing Committee Members. Virani SS, Newby LK, Arnold SV, Bittner V, Brewer LC, Demeter SH, Dixon DL, Fearon WF, Hess B, Johnson HM, Kazi DS, Kolte D, Kumbhani DJ, LoFaso J, Mahtta D, Mark DB, Minissian M, Navar AM, Patel AR, Piano MR, Rodriguez F, Talbot AW, Taqueti VR, Thomas RJ, van Diepen S, Wiggins B, Williams MS. 2023 AHA/ACC/ACCP/ASPC/NLA/PCNA Guideline for the Management of Patients With Chronic Coronary Disease: A Report of the American Heart Association/American College of Cardiology Joint Committee on Clinical Practice Guidelines. J Am Coll Cardiol. 2023 Aug 29;82(9):833-955.
[22] Calkins DR, Davis RB, Reiley P, Phillips RS, Pineo KL, Delbanco TL, Iezzoni LI. Patient-physician communication at hospital discharge and patients' understanding of the postdischarge treatment plan. Arch Intern Med. 1997 May 12;157(9):1026-30.
[23] Bergman-Evans B. A nurse practitioner led protocol to address polypharmacy in long-term care. Geriatr Nurs. 2020 Nov-Dec;41(6):956-961.
[24] O'Mahony D. STOPP/START criteria for potentially inappropriate medications/potential prescribing omissions in older people: origin and progress. Expert Rev Clin Pharmacol. 2020 Jan;13(1):15-22.
[25] Sirois C, Khoury R, Durand A, Deziel PL, Bukhtiyarova O, Chiu Y, Talbot D, Bureau A, Després P, Gagné C, Laviolette F, Savard AM, Corbeil J, Badard T, Jean S, Simard M. Exploring polypharmacy with artificial intelligence: data analysis protocol. BMC Med Inform Decis Mak. 2021 Jul 20;21(1):219.
[26] Murdoch B. Privacy and artificial intelligence: challenges for protecting health information in a new era. BMC Med Ethics. 2021 Sep 15;22(1):122.
[27] Blum MR, Sallevelt BTGM, Spinewine A, O'Mahony D, Moutzouri E, Feller M, Baumgartner C, Roumet M, Jungo KT, Schwab N, Bretagne L, Beglinger S, Aubert CE, Wilting I, Thevelin S, Murphy K, Huibers CJA, Drenth-van Maanen AC, Boland B, Crowley E, Eichenberger A, Meulendijk M, Jennings E, Adam L, Roos MJ, Gleeson L, Shen Z, Marien S, Meinders AJ, Baretella O, Netzer S, de Montmollin M, Fournier A, Mouzon A, O'Mahony C, Aujesky D, Mavridis D, Byrne S, Jansen PAF, Schwenkglenks M, Spruit M, Dalleur O, Knol W, Trelle S, Rodondi N. Optimizing Therapy to Prevent Avoidable Hospital Admissions in Multimorbid Older Adults (OPERAM): cluster randomised controlled trial. BMJ. 2021 Jul 13;374:n1585.

تعدد الأدوية: نظرة عامة على التعريف، المصطلحات، والتداعيات

الملخص:

الخلفية :تعدد الأدوية، وهو الاستخدام المتزامن لعدة أدوية، يُعد من القضايا المهمة منذ فترة طويلة، خاصةً لدى كبار السن. وقد تم تعريفه في البداية بالاستخدام المفرط للأدوية، إلا أن المفهوم قد تطور ليشمل الاستخدام غير الضروري أو غير المناسب للأدوية. يرتبط تعدد الأدوية بزيادة مخاطر حدوث نتائج سلبية مثل السقوط،

والضعف، والإعاقة، وزيادة معدل الوفيات، خاصة في كبار السن الذين يعانون من أمراض مزمنة. وتشدد منظمة الصحة العالمية على تقليل تعدد الأدوية غير المناسب مع ضمان أن الأدوية قائمة على الأدلة وملائمة للمرضى الفرديين.

الهدف :يهدف هذا المقال إلى تقديم نظرة شاملة حول تعدد الأدوية، من خلال استكشاف تعريفه، تداعياته، واستراتيجياته المبنية على الأدلة للتخفيف من مخاطره، خاصة لدى كبار السن.

الأساليب :يلخص المقال البيانات المعاصرة حول تعدد الأدوية وآثاره، مع التركيز على الممارسات المبنية على الأدلة وأهمية تحديد تعدد الأدوية المناسب مقابل غير المناسب. كما يناقش القضايا المشتركة مثل تعدد الأمراض، وتأثيرات الأدوية السلبية، وتفاعلات الأدوية، وعدم الالتزام بالعلاج، وتتابع الوصفات الطبية، ودور الأدوية التي تُصرف دون وصفة طبية.

النتائج :أصبح تعدد الأدوية أكثر شيوعًا، خاصة في الفئات العمرية المتقدمة، بسبب تعدد الأمراض والتغيرات الفسيولوجية المرتبطة بالشيخوخة. يزيد استخدام الأدوية المتعددة من خطر التأثيرات السلبية للأدوية، والتفاعلات، وعدم الالتزام بالعلاج. وغالبًا ما ينتج تعدد الأدوية غير المناسب عن نقص في التفكير السريري ويرتبط بنتائج ضارة. يمكن للإدارة الفعالة من خلال مراجعات الأدوية المنتظمة، وإيقاف الأدوية غير الضرورية، وتثقيف المرضى أن تقلل بشكل كبير من المخاطر.

الخاتمة :يُعتبر تعدد الأدوية من التحديات والفرص في الممارسة السريرية. عندما يتم إدارته بشكل مناسب، يمكن أن يمنع تعدد الأدوية دخول المستشفى غير المخطط له، لكن ممارسات الوصفات غير المناسبة تزيد من خطر حدوث نتائج سلبية. إن تبني نهج مركّز على المريض ومتعدد التخصصات في إدارة الأدوية، إلى جانب المراجعات المنتظمة والوصفات المبنية على الأدلة، أمر بالغ الأهمية لتحسين النتائج العلاجية وتقليل الأضرار.

الكلمات الرئيسية :تعدد الأدوية، تعدد الأمراض، تأثيرات الأدوية السلبية، الالتزام بالعلاج، تتابع الوصفات الطبية، كبار السن، تفاعلات الأدوية، مراجعات الأدوية.