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The Impact of Polypharmacy on Elderly Patients and Strategies To Reduce Risks

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ABSTRACT
Polypharmacy, the concurrent use of multiple medications, is increasingly prevalent among elderly patients, posing significant risks to their health and well-being. This paper explores the multifaceted impact of polypharmacy, highlighting its contribution to adverse drug reactions (ADRs), cognitive decline, hospitalizations, and decreased quality of life. Through a comprehensive review of existing literature and data analysis, the paper identifies key risk factors associated with polypharmacy in elderly populations. It further proposes evidence-based strategies to mitigate these risks, including medication review programs, deprescribing initiatives, and patient- centered care models. Case studies and statistical insights illustrate the practical application of these strategies, underscoring the critical role of healthcare providers in managing polypharmacy. The findings emphasize the importance of collaborative efforts among physicians, pharmacists, and patients to optimize medication regimens, reduce unnecessary prescriptions, and enhance patient outcomes. Future research directions are discussed to address existing gaps and foster the development of innovative approaches for minimizing polypharmacy-related risks in aging populations.

Keyword: *Polypharmacy, Elderly Patients, Medication Management, Risk Reduction, Adverse Drug Reactions..*

1. 1. INTRODUCTION

Polypharmacy, referring to the consumption of more than one medicine at any one time is rife more especially with elderly patients, and this has devastating effects to the patients' health and wellbeing across the globe [1]. With the growth of population, more and more elderly patients suffering from various chronic diseases like hypertension, diabetes, cardiovascular diseases, osteoporosis, arthritis, and neurological illness like Alzheimer, Parkinson and others need treatment through multiple drugs [2,3]. However, the use of medications to control these conditions may lead to problems such as adverse drug-drug interactions, medication-related hospitalization, reduction in cognitive functioning and physical and mental health [4,5]. Polypharmacy results in a number of negative impacts not only on patients but also on the healthcare system where it leads to increased rates of hospitalization, a rise in the number of emergency department presentations, and higher overall costs [6–8]. To address this concern, there must be an effort to look at over-reliance on drugs as both inevitable and necessary yet form a strategy on how it can be managed to avoid the negative effects of this practice [9].

Ageing results in numerous physiological changes, changes in the pharmacokinetics, hence the elderly are more susceptible to the toxicity of drugs and adverse drug reactions (ADRs) [10,11]. Since older persons have impaired renal and hepatic function, clearance of drugs becomes problematic increasing toxicity of the substance [12,13]. As well as changes in the body portions such as muscle mass, total water and fat mass, lead to affecting distribution, duration and strength through which a drug works in the body [14]. These changes in pharmacokinetics and pharmacodynamics make elderly individuals more vulnerable to drug-interactions compounding, medication errors and adverse effects such as those related to CNS, cardiovascular and metabolic systems [15,16]. Common comorbidities considered to pose high risk of fall include those receiving sedative, antihypertensive, anticoagulant, and anticholinergic medications as they are likely to be confused, dizzy, and experience functional decline [17].

Non-genetic and environmental risk factors that have been raised to be of concern are the psychosocial and behavioural features of polypharmacy [18]. Lack of cognitive functions, memory issues and impaired senses (vision and hearing) results into non-compliance to the medication use and this leads to cases of overdoses or underdosages [19,20]. Further, those who get prescriptions from various practitioners without an integrated chart to track drug orders are prone to prescription of repeat

or possibly contraindicated medicines by various doctors, which results in what is known as prescribing cascades, new medicines prescribed to deal with side effects resulting from other drugs that have been prescribed to the patient [21]. This fragmentation in actual care provided leads to polypharmacy complications that could have been easily rectified were the different health care service providers with the patient and his or her records more connected [22].

Another important issue of polypharmacy is its economic implications in people's lives. According to research, a large number of hospitalizations of elderly patients can be attributed to medication-related complications, which have been attributed to incorrect prescriptions, medication interactions or lack of supervision of ongoing treatment [23]. The above cost pressures of damage control, repeated hospitalization, and ER visits bear extra cost burden on health care systems, patients as well as informal caregivers. There is also the tendency observed overprescribing and medicalization of the aging process, which means that rather normal physiological changes associated with aging are supplemented with medications and excessive pharmaceutical demand and consumption [24].

To address the current polypharmacy scenario, a complex approach should be formulated for elderly patients to address the issues related to medication safety and rationality [25]. The most effective intervention is portrayed by medication review programmes, in which carers meet to assess the medication that the patient is taking with a view to withdrawing unnecessary medicine or drugs that should not be taken by the patient [26,27]. As an approach to rational drug use, deprescribing has been manifested in the gradual reduction or withdrawal of a medication as a way of increasing the time until the next medication, thus reducing the patient's medication burden and mitigating adverse drug reaction risks. Such deprescribing processes should be done according to deprescribing protocols involving physicians, pharmacists, geriatricians and caregivers to ensure the medications are adjusted according to the patient's status, values and preferences [28].

Patient education and involvement are another important areas when dealing with polypharmacy [6,29]. The lack of awareness of potential adverse effects of polypharmacy makes these patients accept additional prescriptions despite they might not be necessary [30]. Multi-message educational programs that increases health literacy, patient involvement in their healthcare, and patient self- administration of their medication will help decrease medication lapse, medication errors and reliance on drugs that may not be required. Engaging caregivers and relatives also becomes a decisive factor in ensuring that patients adhere to prescribed medications appropriately [26,31].

Another solution pertains to the application of technology-centered innovations which is also considered to be effective in handling polypharmacy complications [32,33]. There are measures such as electronic prescribing systems and clinical decision-making systems, medication reconciliation programs, and artificial intelligence-based drug interaction checklists that may help to prevent prescription flaws, recognize medications with potential hazards, and enhance medication safety [34]. They help in monitoring of drug-interactions, dosing and compliance mechanisms that help the prescriber make sound prescribing decisions [35]. The proportion of the elderly patients with polypharmacy in different age groups is depicted in the following Figure 1.

The present paper focuses on polypharmacy in the elderly patients, discussing its prevalence, risk factors, clinical consequences, and methods of risk minimization. From this literature review, real life case studies and an evidence-based intervention plan for polypharmacy, this study shall highlight the issues of Polypharmacy and their solutions, with special focus on Multidisciplinary team, Deprescribing, Pharmacist's involvement and Patient-Centered Approach. Polypharmacy is a complex issue and requires the use of systematic and preventive approach to amend its adverse effects, increase medication safety, enhance the patient outcomes, and promote healthy aging. Therefore, managing polypharmacy not only improves medication utilization but also promotes the effectiveness of the health care system, decreases costs in healthrelated services and increases the well-being of elderly people.

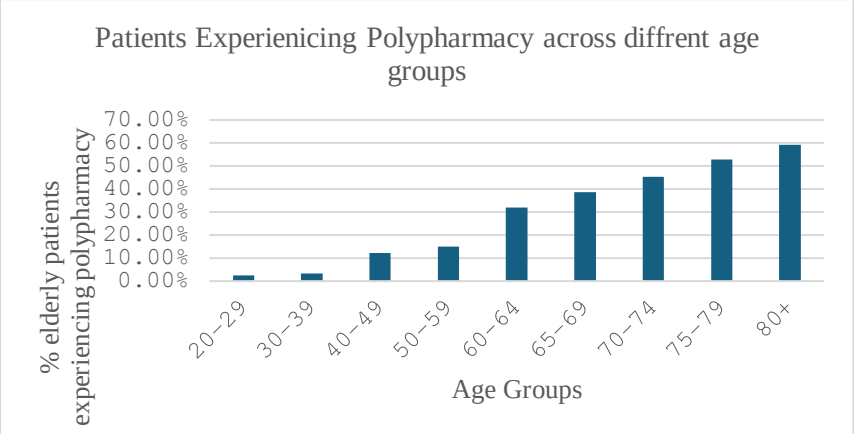

Figure 1: Percentage of elderly patients experiencing polypharmacy across different age groups [36–38].

2. Background and literature review

The practice of administering multiple medications simultaneously has become an increasing healthcare concern for older adults because chronic diseases like hypertension, diabetes, cardiovascular disorders, osteoporosis and neurodegenerative conditions have increased in their patient population. The management of comorbidities with multiple medications may require justification because inappropriate or excessive prescribing increases the risk of adverse drug reactions which leads to cognitive impairment and non-adherence to medications and it results in hospitalization and higher death rates. More than half of elderly patients fall under the category of polypharmacy patients yet research shows this phenomenon is most frequent in two populations: nursing home residents and hospital patients. The complexity of managing diseases requires polypharmacy but the main health concern arises from inappropriate polypharmacy where patients receive unnecessary medications [8,39,40].

Multiple risks emerge from polypharmacy which harm various physiological frameworks inside the bodies of older adults. The natural process of aging creates conditions which result in elevated drug accumulation because it modifies drug metabolism and renal clearance and hepatic function thus increasing toxic effects. Research indicates that CNS medications which include antipsychotics benzodiazepines and opioids lead to cognitive loss and higher fall risks and sedation yet antihypertensives diuretics contribute to dizziness along with low blood pressure and arrhythmias. The extended usage of NSAIDs and corticosteroids medications leads to a higher risk of gastrointestinal bleeding and ulceration which requires routine medication assessments to determine the risk-benefit relations in treatment plans. The presence of many medications among patients leads directly to greater hospitalizations which extend hospital stays. The research demonstrates that medication-related hospitalizations make up almost 30% of hospital cases among older adult patients who encounter drug-to-drug conflicts and incorrect prescription practices and adverse side effects. Multiple medication use in hospitalized patients makes them vulnerable to infections and delirium as well as falls which result in excess health costs and system strain. Systemic intervention methods which focus on deprescribing combined with patient education and enhanced communication between healthcare professionals are required to correctly handle the polypharmacy challenge affecting patient outcomes [8,39,40].

Available literature on polypharmacy consists of extensive research but still contains various areas that need further investigation. Research that uses cross-sectional data faces limitations because it cannot prove cause-effect relationship between polypharmacy and adverse health results. No agreement exists regarding inappropriate polypharmacy definitions because the Beers Criteria together with STOPP/START Criteria and Medication Appropriateness Index each deliver unique interpretations of this phenomenon. Medical experts have insufficient research data about the safety and effectiveness of treatments for elderly patients because these studies typically exclude them from clinical trials. To reduce polypharmacy's risks researchers need to conduct longitudinal studies apply standardized deprescribing protocols and develop personalized medication management strategies [8,39,40].

Table 1: Summary of key studies on polypharmacy and their major findings.

Study	Population	Key Findings	References
Wastesson *et al.* (2018)	Elderly patients (Sweden)	65% of older adults had polypharmacy; increased ADRs and hospitalizations.	[41]
Mehta *et al.* (2021)	U.S. elderly population	90% of adults ≥65 years used at least five medications, leading to functional impairment.	[42]
Pazan & Wehling (2021)	Global review	Polypharmacy prevalence varies from 4% in community settings to 96.5% in hospitals.	[8]
Mukete *et al.* (2015)	Hypertensive elderly patients	Polypharmacy linked to poor blood pressure control and medication non-adherence.	[43]
Unlu *et al.* (2020)	Hospitalized elderly with heart failure	Polypharmacy in heart failure patients linked to worsening prognosis and higher hospital readmissions.	[2]
Gutiérrez-Valencia *et al.* (2018)	Older adults in primary care	Frailty and polypharmacy closely related, leading to increased healthcare utilization.	[2]
Mehta *et al.* (2021)	Elderly patients with multimorbidity	High medication burden associated with accelerated cognitive decline and higher mortality risk.	[39]

3. Methodology

Systematic review methodology evaluated the available literature which studied polypharmacy within elderly groups. Researchers gathered information from three databases: PubMed, MEDLINE, and EMBASE for studies spanning from 2000 to 2023 including research articles and clinical studies and government healthcare reports. The method delivered an evidence-based evaluation which thoroughly assessed polypharmacy prevalence together with its risks and management approaches. A well-organized selection procedure was adopted which utilized particular inclusion and exclusion standards to guarantee the reliability and relevance of obtained results. The research included only studies that studied elderly patients above age 60 while examining polypharmacy prevalence, adverse drug reactions ADRs and cognitive decline and deprescribing interventions. The research excluded material that had less than fifty participants and publication limitations in English language along with clinical reports which lacked significant statistical substance. All analyzed research materials comprised peer-reviewed articles alongside systematic evaluations and clinical experiments due to their rigorous methodology standards [44,45].

The systematic collection of study data followed a step-by-step approach to document information on medications together with patient characteristics and healthcare outcomes and prescription practices. The analysis combined polypharmacy data through methods of meta-analysis to establish general trends between research findings. The analysis was structured into four segments which included prevalence statistics and risk factors together with healthcare environments and intervention approaches to present an integrated picture of this matter. The research methodology includes literature screening and study selection criteria alongside data analysis framework as shown in the flowchart of Figure 2. The systematic framework maintains the study's reliability when creating high-quality evidence that will shape future research decisions about polypharmacy treatment in elderly patients [46,47].

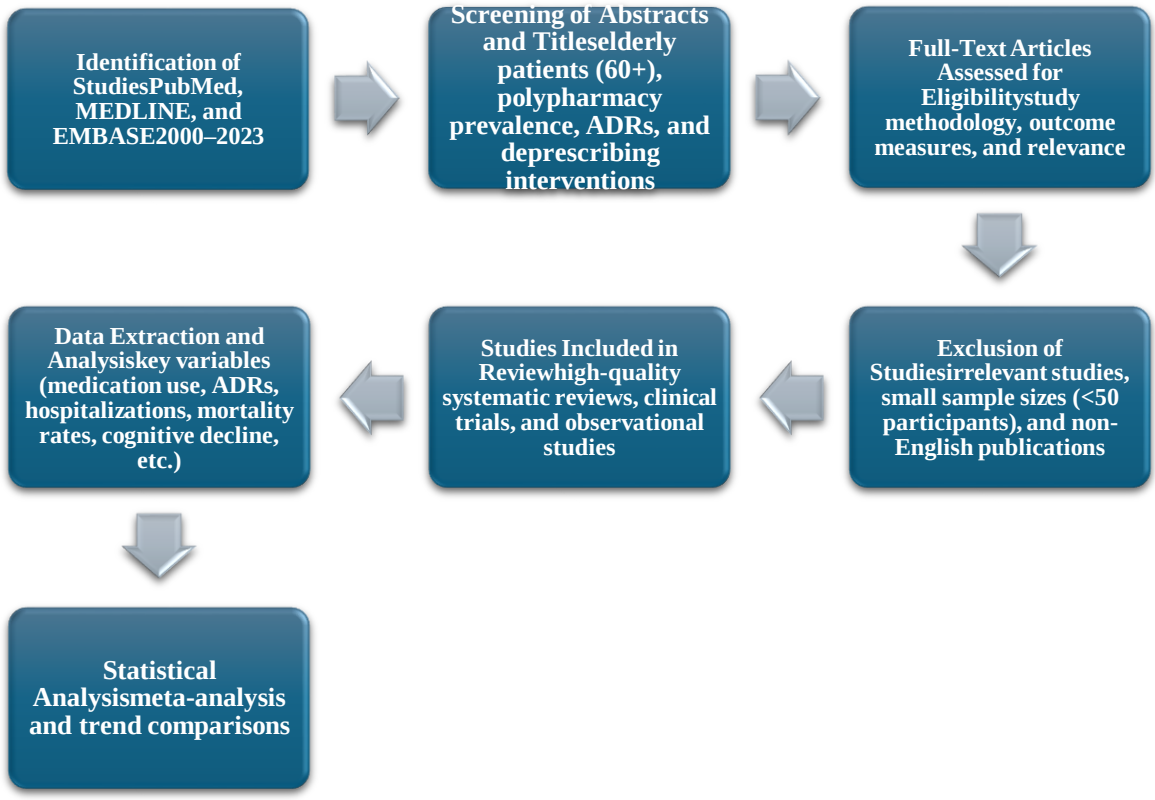

Figure 2: Flowchart depicting the methodology process.

4. Results

This paper was developed to explore the current state of polypharmacy, risk factors, and outcomes of interventions to the elderly patients in Taiwan. It was noted that a vast number of older patients are on multiple drugs, and the number is more than or equal to the polypharmacy level of five or more medications. According to the findings, polypharmacy is associated

with ADRs, hospitalization risk, or cognitive impairment, falls, and higher mortality rates.

Prevalence and Trends in Polypharmacy:

In-patient elderly people, residents of nursing homes, and patients with multiple chronic conditions are engaged in the polypharmacy escalation as evidenced by the analysis of associated data. Researches presented in the present work prove that subjects using multiple medications compose 50-90% of elderly patients depending on the healthcare differentiating. Namely, the effect is even more significant in hypertensive patients with diabetes, cardiovascular and neurodegenerative diseases.

Adverse Drug Reactions and Hospitalization Rates:

Most of the elderly population still suffer from ADRs and they are frequent visitors to the emergency department and hospitals. It has been established that antihypertensive agents, anticoagulants, sedatives, anticholinergic agents, and NSAIDs are the most common types of medications that leverage polypharmacy to cause ADRs. It has been recently proved that patients taking 10 or more medications were more likely to fall, experience drug-drug interactions, as well as, had lower levels of functional capacity than those taking limited medications. It was similarly revealed that 30 days readmission rate was significantly high among the patients who were diagnosed of polypharmacy-related complications.

Impact of Deprescribing Interventions:

These intervention-based outcomes reveal that the use of specific deprescribing programs, clinical pharmacist interventions, and CDSS minimizes the prescription of unnecessary medicines in patients and polypharmacy dangers. This should prove compelling evidence that deprescribing helps its patients since they witness an enhancement in their cognitive ability, a decrease in their hospitalization frequency, as well as an increase in medication compliance. There are also other studies which highlighted that pharmacist initiated and facilitated deprescribing in nursing homes decreases the instances of falls as well as drug-related adverse effects.

Table 2: Breakdown of Adverse Drug Reactions by Medication Class

Medication Class	Common ADRs	Hospitalization Risk (%)
Antihypertensives	Hypotension, dizziness, falls	18%
Anticoagulants	Bleeding, bruising	22%
Sedatives & Hypnotics	Cognitive decline, confusion	16%
Anticholinergics	Memory impairment, dry mouth	12%
NSAIDs	Gastrointestinal bleeding	14%

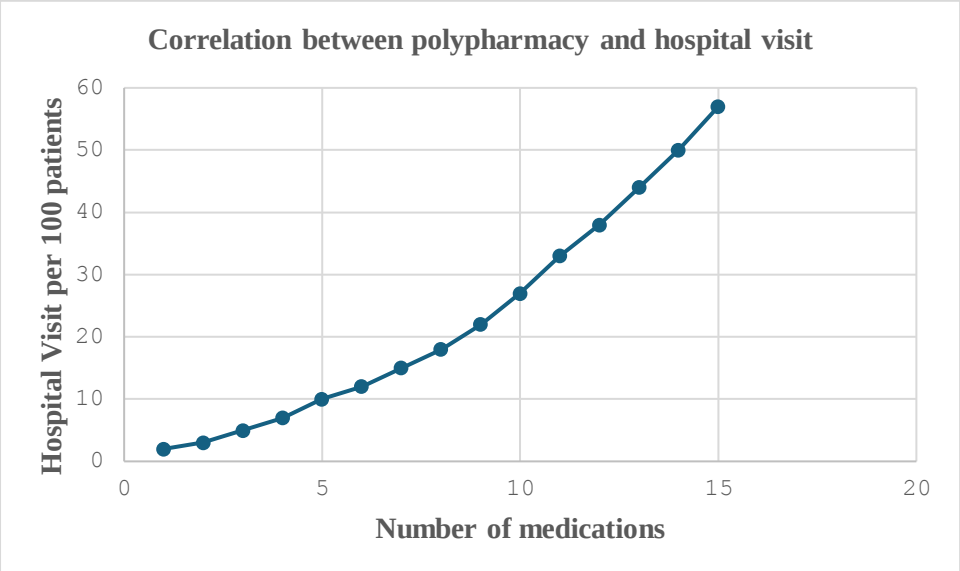

Figure 3: Correlation Between Polypharmacy and Hospital Visits

2. 5.DISCUSSION

The results highlight the widespread impact of polypharmacy on elderly patients, demonstrating its association with adverse health outcomes, increased hospital admissions, and reduced quality of life. This study's findings align with previous research, which has consistently shown that polypharmacy leads to higher rates of ADRs, falls, and cognitive decline. However, the study also confirms that structured medication management strategies, including deprescribing initiatives, pharmacist-led interventions, and medication reconciliation programs, can significantly mitigate these risks. A key finding from the study is the direct correlation between the number of medications and hospitalization rates. Patients taking more than ten medications showed an exponentially higher risk of drug-related complications, particularly those involving CNS depressants and anticoagulants. This suggests that elderly patients on multiple prescriptions require close monitoring and medication reviews to prevent polypharmacy-related harm.

Despite the effectiveness of deprescribing initiatives, the study identifies several barriers to deprescribing, including physician hesitancy, patient resistance, and the complexity of discontinuing long-term medications. Many healthcare providers report concerns about potential withdrawal effects or disease relapse, particularly when stopping medications for chronic conditions. Additionally, a lack of standardized deprescribing guidelines across healthcare settings poses challenges in ensuring consistent and safe medication reduction. Comparing these results to past studies, it is evident that multidisciplinary approaches, where physicians, pharmacists, and caregivers collaborate on medication management, produce the most significant benefits in reducing polypharmacy risks. However, the findings also emphasize the need for better patient education on medication safety, as many elderly patients remain unaware of polypharmacy-related complications.

6. Strategies to reduce polypharmacy risk

The main steps that can be taken with the aim of effectively managing Polypharmacy are medication reviews conducted by the healthcare providers [48]. These reviews assist in the detection of PIMs, DDIs, duplications, as well as in case identification for deprescribing. Stopping prescription risk user interface tools such as; Beers Criteria, STOPP/START criteria, and Medication Appropriateness Index (MAI) aids the clinicians in determining the level of risks associated with prescription [49]. It has been observed that reviewing the medications can minimize risk and admissions on elderly patients especially those with compounding health issues [50]. Deprescribing, a systematic method of dose decrease or cessation of drugs that are no longer required, is one of the critical interventions for addressing the issue of polypharmacy. It should also be noted that the TAPER (Team Approach to Polypharmacy Evaluation and Reduction) has been proved to be useful in elimination of unnecessary medications while preserving the patient's safety [51]. Most deprescribing processes are done in collaboration between various stakeholders in the patient's healthcare team so as to ensure that the medications are withdrawn safely as well as effectively. According to systematic reviews, deprescribing improves functional status, cognitive function, quality of life in elderly [52].

Intervention programmes such as those of polypharmacy have been observed as a method of organising medication safety programs in healthcare systems [48]. Such programmes take combined interdisciplinary teams, electronic patient records, and deprescribing protocols based on the existing evidence. These types of programs have been used with success in care for geriatric patients throughout hospitals, which leads to decrease in the number of MAEs and increase of quality of prescriptions. The current WHO's "Medication Without Harm" promotes the stewardship models aimed at reducing the risks connected with medications at the international level [53]. CDSS integrated into Electronic Health Records (EHRs) assist clinicians in identifying polypharmacy risks, alert them on drug-drug interactions and even recommend better choices of prescription medication. CDSSs describe the clinical patient's conditions in real time and inform clinicians when there are cases of duplicate therapy, high-risk medications, or excessive pill burden. Research has revealed that the implementation of CDSS in standard patient care practice helps in reduction in the rate of improper prescription and medication omission [54].

ICM works with physicians, pharmacists, nurses and geriatricians to provide a comprehensive approach to polypharmacy since it involves different paradigms of medication optimisation [55]. These medication management related activities are normally achieved through the help of pharmacists; tasks like medication reconciliation, deprescribing practices, as well as counselling on how to adhere to medications [56]. Multi-disciplinary approaches have a benefit in the prevention of readmissions, medication management, and synthesis of care outcomes in the presence of polypharmacy. One of the major steps that help patient and caregiver to go through is the education process which is always fundamental in prevention of polypharmacy. A significant percentage of elderly forget when to take their medicines or even take more than the recommended amount while some individuals take over the counter medications without consulting with their physicians. Thus, simplification of schedules, specific instructions, and polypharmacy-related patient educational literature can all enable patients to better assume more proactive approaches to their medications. Literature suggests that when patients have knowledge on prescribed drugs, they are likely to reduce risks associated with misuse and are more compliant with the instructed dosage and frequency regimes [57].

Policies and legal measures in the healthcare sector also contribute to managing polypharmacy. National deprescribing guidelines have been launched recently, there are financial incentives for performing medication reviews and, insurance for

pharmacist interventions. Some countries currently have implemented prescription monitoring programs that would assist in monitoring the trend in prescriptions and the prescription of some medicine. For instance, policy-driven approaches have helped to minimize cases of wrong use of medication and ensure that the management of multiple medicines are incorporated well into medical practice [58,59].

Table 3: Strategies to Reduce Polypharmacy Risk

Strategy	Description	References
Comprehensive Medication Review	Systematic assessment of medications using tools like Beers Criteria and STOPP/START to identify inappropriate prescriptions.	[60]
Deprescribing Initiatives	Gradual tapering or discontinuation of unnecessary medications through structured deprescribing protocols.	[61]
Polypharmacy Stewardship Programs	Implementation of coordinated programs integrating medical records, interdisciplinary teams, and deprescribing protocols.	[62]
Clinical Decision Support Systems (CDSS)	Integration of computerized alerts in electronic health records to flag potential drug interactions and inappropriate prescribing.	[62]
Interdisciplinary Collaboration	Collaboration among physicians, pharmacists, nurses, and geriatric specialists to optimize medication safety.	[63]
Patient and Caregiver Education	Educating elderly patients and caregivers about medication adherence, polypharmacy risks, and safe drug use.	[62]
Regulatory and Policy Interventions	Implementation of national deprescribing guidelines, financial incentives for medication reviews, and prescription monitoring programs.	[63]

7. case studies

Various clinical investigations alongside patient case studies investigate polypharmacy effects on elderly patients by discussing treatment challenges and implementing solutions for medication safety improvements and adverse effect reductions. The research proves valuable evidence that demonstrates the upcoming potential of deprescribing strategies while analyzing pharmacist-based initiatives alongside multi-professional polypharmacy management techniques specifically for elderly populations.

1. The TAPER Trial: A Structured Approach to Deprescribing

A randomized controlled trial (RCT) known as the TAPER (Team Approach to Polypharmacy Evaluation and Reduction) model was conducted among elderly patients aged 70 and older who were taking at least five medications. The intervention involved comprehensive medication reviews by a multidisciplinary team consisting of physicians, pharmacists, and geriatric specialists. The findings indicated that patients who underwent structured deprescribing experienced improved cognitive function, reduced adverse drug reactions (ADRs), and lower hospitalization rates. Furthermore, deprescribing did not lead to any significant negative health outcomes, demonstrating that many medications could be safely discontinued without harm [64].

2. Primary Care-Based Deprescribing Study

This research project conducted a feasibility study to evaluate deprescribing protocol deployment within primary care clinics. The review process for multiple medication patients involved systematic drug evaluations which were followed by a gradual removal of unneeded medicines. The research revealed that deprescribing interventions resulted in decreased medication complications together with reduced falls risks and better treatment adherence. Primaries physicians displayed a higher level of comfort toward recognizing and stopping potentially inappropriate medications (PIMs) after taking deprescribing courses [63].

3. Hospital-Based Polypharmacy Reduction in Elderly Patients

A case series conducted in hospital settings evaluated deprescribing programs for elderly patients who presented with polypharmacy complications including falls and cognitive decline and dizziness. The process of medication reconciliation discovered many non-essential drugs prompting their termination. The research demonstrated patients in the deprescribing intervention required less time in hospital care together with better mobility results and fewer readmissions within thirty days than patients who maintained their complete medication treatment plan [61].

4. Systematic Review of Polypharmacy Interventions

A systematic review combined quantitative studies assessing the decrease in polypharmacy by means of different approaches. The studies identified in the review promised that that multidisciplinary medication reviews, pharmacist intercessions, and electronic prescrying aids were among the most beneficial approaches to managing polypharmacy. All studies used in the review indicated that the structured medication optimization helped patients have better medication adherence, fewer adverse effects, and better quality of life. However, several studies reported difficulties in involving patients and caregivers in deprescribing conversations, indicating the requirement to invest more efforts into patient-centered decision-making in deprescribing decisions [65].

5. Nursing Home-Based Polypharmacy Management

A case study among the long-term care and nursing home facilities explored the nurses and caregivers' contribution in the review of medication and the elimination of unnecessary prescriptions. In this study, important intervention was made by assigning a protocol that enabled the nurses to consult with the physicians and pharmacists on the administration of the medicine to the residents on a routine basis. Therefore, the number of medications that were given to a patient at a given time was also reduced, and so there were few cases of polypharmacy complications; confusion and falling over, among the patients. This case also went to show that the role of the nurse in minimizing risk factors related to medications in the institutionalized elderly clientele is crucial [66].

6. Clinical Decision Support Systems (CDSS) in Polypharmacy Reduction

A study assessed the potential of the CDSS that was implemented within electronic health records in the management of polypharmacy risks for elderly patients. The physicians that adopted CDSS received alerts about incompatible drugs and the prescriptions of the same drug types and high risk prescribing. Through promoting safer prescribing methods, medical errors were prevented and the resulting trend of hospitalizations due to adverse drug events was also declined [66].

7. Deprescribing in Oncology Patients with Polypharmacy

A single case is reported that described polypharmacy in elderly patients with cancer by focusing on their chemotherapy episodes. The study's consideration was on cutting down the use of other medications that might interfere with cancer treatments. The set research guidelines involved a small number of oncologists and clinical pharmacists aimed at identifying and stopping the treatments that were not effective and having minimal effects on the patients' survival rates such as proton pump inhibitors, sedatives, and antihypertensives. These deprescribing strategies on patient outcomes touched on the following outcome indicators: Fewer patients experienced drug-related toxicities; patients' tolerance to chemotherapy improved through deprescribing; and the standard of living of patients also improved [67].

8. Cross-Sectional Study on Polypharmacy and Cognitive Decline

Across-sectional research aimed to determine the relationship of polypharmacy with cognitive impairment in elderly patients. This comparison was done on the memory, attention and the executive function of patients who were taking more than 5 medications against those with fewer medications. The present study found out that an increase in medication load led to a decrease in cognitive ability, especially when the patient is on drugs like anticholinergics and sedatives. This research supported the prescription concitiousness and continuous medication review in an attempt to reduce its impact of cognitive side effects [68].

9. Role of Pharmacists in Polypharmacy Reduction: A Community-Based Study

In a community-based study, an attempt was made to evaluate the effectiveness of pharmacists' counseling and deprescribing. Patients received information on medications, was informed about possible interactions of the taken drugs, and were offered deprescription plans. Among the various findings it was established that there were improvements in the control of the prescription of avoidable medications, better pill taking habits, and increased patient involvement as influenced by the presence of a pharmacists. In the study, the authors pointed out to a discovery that was particularly remarkable and fitting to the objectives of the guideline: community pharmacies were identified as a potential strategic point for addressing polypharmacy in the elderly [69].

8. Conclusion and future direction

This research shows how it is especially important to focus on the given issue of polypharmacy in older patients by creating structured medication review as well as deprescribing programmes and interdisciplinary teamwork. Polypharmacy has been identified to heighten the chances of hospitalization, affect cognitive function as well as lead to general functional deterioration in people aged 65 years and older. But it also unveils that systematic deprescribing, and pharmacist interventions as a part of the strategy significantly improve the medication burden without risking patient safety. More studies should be conducted today to design deprescribing protocols that can be applied primary and secondary health care setups. Furthermore, more investigations focusing towards the impact of deprescribing over the years concerning the patient's physical and cognitive status as well as the degree of functional disability. Further research should also be conducted for the use of

technological tools that include smart prescriptions through artificial intelligence medication tracking systems especially for the elderly in case they are prescribed new medications.

It is recommended that deprescribing programs should be incorporated in the health policies of countries as a way of avoiding irrational use of drugs. Additional funding of the geriatric medication safety efforts will also be helpful in frames of the rising problem of polypharmacy. In this case, it is evident that through the patient- centered care of the elderly population coupled with the prevention of adverse medication outcomes across healthcare systems , considerable efforts can be achieved in the reduction of harm associated with medication and the achievement of optimal results for better medication safety features.

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