A Review on the Impact of Polypharmacy on Medication Adherence among Geriatrics

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ABSTRACT:
Polypharmacy, the concurrent use of multiple medications, is a common and complex issue in the healthcare of geriatric patients. This review aims to explore the multifaceted relationship between polypharmacy and medication adherence in the elderly population. As the geriatric population continues to grow, managing their medication regimens becomes increasingly crucial for maintaining their health and well-being. Several factors contributing to medication non-adherence among geriatrics in the context of polypharmacy are explored, including cognitive impairment, physical limitations, financial constraints, and the complexity of medication regimens. Additionally, the role of healthcare providers in addressing these challenges is discussed, with a focus on strategies to enhance medication adherence while minimizing polypharmacy-related risks.

I. INTRODUCTION:
The term Polypharmacy was coined centuries ago to explain the issues associated with multiple drug use. There is no standard definition for polypharmacy. However, in simple terms, it can be defined as the use of multiple drugs. The World Health Organization defines polypharmacy as the routine use of five or more medications. This includes over-the-counter, prescription and/or traditional and complementary medicines used by a patient. In U.S., it was reported that the prevalence of polypharmacy increased from 8.2% in 2000 to 15% in 2012 indicating that there is a twofold increase in prevalence of polypharmacy.

POLYPHARMACY IN GERIATRICS:
Elderly patients are more prone to develop adverse drug events because of the metabolic changes which will proportionately increase as the number of drugs increase. According to India's National Health and Nutrition Examination Survey (NHANES III), 74% of the aged population take prescribed drugs. Polypharmacy is a critical health-related concern, particularly among the elderly, that must be addressed urgently, as polypharmacy can negatively impact the elderly's quality of life.

Aging and the onset of various diseases increase the necessity to take medications to the point where the number of prescriptions taken can reach 6–9. Polypharmacy is more likely to occur when a patient visits multiple doctors or is hospitalized. This is because new prescriptions may be recommended for the patient. One of the most prominent reasons of polypharmacy is a patient's lack of literacy and information. Another reason is when the patients self-medicate for their symptoms and take it with their prescribed medicines.

Polypharmacy is more likely to be developed in people who are hospitalized or in patients who visit multiple prescribers. Lack of communication of the patients with the doctors,
nurses or with the pharmacists can lead to a situation where in the patient may take the 2 different drugs for the same condition prescribed by two different prescribers. Several studies on elderly population showed that polypharmacy was present in almost >50% of their study population and the average number of medications ranged from 6-14. In most of the studies it was found that polypharmacy was significantly more prevalent in elderly women than in elderly men.\textsuperscript{5,6,7,8,9,10}

**CONSEQUENCES OF POLYPHARMACY:**

Polypharmacy has an impact on numerous aspects of medication safety. First, it has been related to an increased risk of adverse drug reactions, particularly among the elderly, due to physiological changes that occur with age and may alter the pharmacokinetics and pharmacodynamics of some drugs.

Studies revealed that there is an increased risk for an ADE visit with increasing number of medications. Also there has been reports of increased risk of hip fracture and some other commonly reported ADRs among study participants with polypharmacy were falls, sedation, constipation, hyperkalaemia, and hyperglycemia.\textsuperscript{11,12,13,14,15,16}

Second, it is associated with an increased risk of potentially inappropriate medications (PIMs), as evidenced by several studies that found approximately 20% of PIMs in prescriptions.\textsuperscript{4,17,18,19,20} Third, it has been reported to be associated with medication non-adherence in a disease-specific older population.\textsuperscript{10} Furthermore, increased medicine use may result in rising healthcare expenses. As a result, a comprehensive understanding of the epidemiology of polypharmacy among the elderly is required.\textsuperscript{20}

Drug-drug interactions and the risk of a prescription cascade are both increased by polypharmacy. When an adverse medication event is misinterpreted as a new medical illness and additional pharmacological therapy is recommended to treat this medical condition, a prescribing cascade occurs.\textsuperscript{3} Several studies showed that there was a positive correlation between the number of drugs dispensed and the number of drug interactions i.e., as the number of medications increased, the incidence of drug drug interactions increased as well.\textsuperscript{21,22,23,24}

Patients and their families are also burdened by polypharmacy because they must understand the purpose of several prescriptions provided by multiple clinicians, obtain refills, take each medication at the correct time of day, and notice side effects. It can result in negative pharmacological effects, drug interactions, noncompliance, and a prescription cascade.

**MEDICATION NON-ADHERENCE**

Medication non-adherence is a multifaceted problem produced by a complex interaction of various modifiable and unmodifiable factors that can be classified into five dimensions (socioeconomic, patient-related, therapy-related, condition-related and health system-related). The more complicated a treatment plan is, the greater the chance of noncompliance\textsuperscript{25}

The causes could be linked to the patient, the treatment, or the health-care provider. As a result, a large number of patients do not get the most out of their medication, resulting in increased morbidity and mortality, as well as increased societal expenses. Non-compliance has negative consequences such as increased morbidity, death, and expenses\textsuperscript{26}

There are two types of approaches for measuring adherence: direct and indirect ways of measurement. Direct approaches include direct observed therapy, detecting or measuring a biological marker added to the drug formulation in the blood, and measuring the level of a medication or its metabolite in blood or urine. Patient questionnaires, patient self-reports, pill counts, prescription refill rates, clinical response assessment, and electronic medication monitors are examples of indirect approaches\textsuperscript{27}

**Polypharmacy and Adherence**

Polypharmacy is often associated with medication non-adherence. Multimorbid patients are more likely to have polypharmacy and frailty, rendering them more prone to non-adherence and its consequences\textsuperscript{27}

Polypharmacy can cause challenges with drug adherence in older persons, particularly if it is linked to visual or cognitive deterioration, which is common with ageing and can lead to negative outcomes such as treatment failure or hospitalisation\textsuperscript{25}. Complex dose schedules, prescription instruction confusion, high drug costs, side effects, and frequent refills are all ways that polypharmacy affects adherence.

According to multiple studies, patients were shown to adhere to their therapy when they took fewer number of medicines and as the number of medications increased, adherence
While just a few studies demonstrate that patients who took more medications had improved adherence,\textsuperscript{37, 38} interventions to reduce polypharmacy

Medication adherence is an important consideration in patient care especially in the geriatric population. The elderly people will usually have multiple co morbidity conditions for which they will be prescribed with multiple medications. Although polypharmacy cannot be avoided always, certain approaches like eliminating pharmacological duplication, reducing dose frequency and medication mistake, and reviewing the drug regimen on a regular basis with the support of clinical pharmacy services can all help to simplify the medication routine.\textsuperscript{39} The medication schedule can be made simpler by removing pharmacological overlap, decreasing dose repetition and medication errors, and regularly assessing the drug regimen with the assistance of clinical pharmacy services. The primary care physician can try to reduce the number of medications by adapting any of the following methods.

**Deprescribing**: has a number of advantages, including improved health outcomes by resolving adverse drug reactions, improved medication adherence, and lower direct medical healthcare expenses. Deprescribing, on the other hand, might lead to withdrawal symptoms and the aggravation or recurrence of medical issues. These risks can be reduced with proper planning, monitoring, and, if necessary, re-initiation of drugs. Several research studies have been done on deprescribing and was associated with improved clinical outcomes.\textsuperscript{40, 41, 42, 43, 44}

**Beers criteria**: The 2019 update employs five criteria: medications that should be avoided in older patients in general, medications that should be avoided in older patients with specific conditions, medications that should be used with caution due to benefits that may outweigh risks, medication interactions, and changes in dosing based on kidney function. In addition to these criteria, medication decisions should take a variety of factors into account, such as discontinuing medications when they are no longer beneficial. Some studies have applied Beers criteria and have identified use of potential inappropriate medications.\textsuperscript{19, 45, 46, 47} Beers criteria can be used by pharmacists, physicians and other health care providers as an important tool to identify the potentially inappropriate medication and polypharmacy. Therefore, the pharmacist can play an important role in decreasing inappropriatemedications used which can eventually reduce polypharmacy.

**START/STOFF Criteria**: Screening Tool of Older Persons' potentially inappropriate Prescriptions (STOPP)/Screening Tool to Alert doctors to the Right Treatment (START) criteria was developed when 18 Irish and British experts in geriatrics, clinical pharmacology, geriatric psychology, and primary medicine formed a panel that created a list of 65 drugs that shouldn't be prescribed for specific diseases and 22 drugs that should be prescribed for particular conditions.\textsuperscript{48} START/STOFF criteria are useful in detecting PIMs in the elderly population, especially in patients with polypharmacy.\textsuperscript{49, 50} Thus, the detection of PIMs necessitates further evaluation of its impact on clinical outcomes, as well as efforts to implement interventions to improve prescribing practice in the elderly.

**Medication Appropriate Index**: It was created with the goal of evaluating the effectiveness of medications in all age groups. This tool is designed to evaluate patients' self-medications practices as well as the appropriateness of medications prescribed by a healthcare provider. It is a 10-item questionnaire with a maximum score of 18 representing inappropriateness and a minimum score of 0 representing appropriateness.\textsuperscript{51} It has proven to be effective in identifying potentially inappropriate medications (PIMs), emphasizing the importance of an appropriate prescribing pattern in the elderly.\textsuperscript{51}

**IMPROVING ADHERENCE IN ELDERLY**

Medication non-adherence can lead to treatment failure and hence methods to improve adherence has to be followed. There are several strategies available to enhance adherence in the elderly. Simple medication regimens, educating patients and caregivers about their disease and medications, using medication adherence tools such as pill boxes, medication adherence apps, and easy availability of cheaper medications can all help to improve overall adherence.\textsuperscript{52} The difference between improving adherence among the elderly and others is that most of the elderly will have a caregiver present. As a result, improving adherence...
among the elderly includes both intervention with the elderly and intervention with the caregiver.

II. CONCLUSION

Several research studies have shown that polypharmacy can have varying effects on drug adherence, potentially influencing it positively or negatively by either enhancing or diminishing adherence levels. When polypharmacy decreases adherence, it leads to various consequences and hence methods to reduce polypharmacy has to be considered along with the methods to increase adherence. Clinicians in all settings should consider medication reviews and dosing adjustments for elderly patients in order to detect changes in patient status such as renal or liver impairments.

Medication reviews can help to identify the PIMs, reduce polypharmacy and help in the improvement of medication adherence. Overall, polypharmacy can complicate medication adherence, but with proper support, education, and communication between patients and healthcare providers, it is possible to improve adherence and ensure better health outcomes for patients on multiple medications.

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