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Original Study

Deprescribing as a Clinical Improvement Focus

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A B S T R A C T

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Objectives: Polypharmacy is a concern in the practice of geriatrics because of consequences such as adverse drug events and poorer quality of life. Deprescribing, a response to polypharmacy, refers to the systematic, programmed, and appropriate reduction in drug number and dose. Although now broadly recognized, challenges exist in practice for effective implementation. This study was conducted to determine the deprescribing success rate and relate it to drug classes and clinical settings, and to identify factors that influence the deprescribing process.

Design: As a performance improvement (PI) project, fellows in geriatric medicine, under supervision of faculty geriatricians, attempted deprescribing during at least 1 encounter daily at 2 long-term care (LTC) facilities and an outpatient geriatrics clinic (C) in Bronx, New York, from August 2018 to January 2019. Deprescribing was initiated following discussion and consent from patient or caregiver. Following the data collection, involved fellows and faculty physicians participated in a survey to identify factors that influenced the process.

Results: Out of 449 encounters, 383 encounters were included for analysis. Average patient age was 78.2 years (LTC: 77.9, C: 79.1). Average patient comorbidities was 6.5 (LTC: 6.7, C: 5.8). Deprescribing was successful in 90.1% of encounters (LTC: 96.9%, C: 67.4%). On average, 1.3 medications were deprescribed per encounter (LTC: 1.4, C: 1.0). Analgesics (32.2%), multivitamin-minerals supplements (29.7%), lipid-lowering agents (22.9%), antihistamines (46.7%), and acid blockers (26.2%) had highest success.

Conclusions and Implications: Deprescribing is possible in practice in both LTC and community settings at each encounter, until it is no longer applicable. Factors that contribute to successful deprescribing primarily include meaningful and earnest provider effort, ideally in collaboration with interdisciplinary team members (nurses, pharmacists, social worker, and others), besides interactions with consultants for the patient. Certain medication classes such as vitamins, minerals, analgesics, and proton pump inhibitors can be deprescribed with high success, as noted in our study, whereas antipsychotic agents, antidepressants, and ophthalmic preparations, prescribed by specialists, proved harder to deprescribe. An understanding of barriers to deprescribing (outlined in the article) and addressing them are crucial in enabling success. The study demonstrates that as a performance improvement project in collaborative effort with multiple disciplines, deprescribing is possible in health care. Factors promoting success and barriers to deprescribing are detailed. Appropriate deprescribing has the potential to help lower adverse drug events, costs of care, and possibly improve quality of life.

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The concept was presented in part as a poster at the AMDA National Meeting in 2018, and was a winner in the Quality Improvement Category.

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Polypharmacy is commonly encountered in the geriatric population in the United States. The National Health and Nutrition Examination Survey data indicate that many older adults consume an inappropriately excessive number of medications and supplements.¹ Multimorbidity, indicating the coexistence of 2 or more chronic health disorders, is typical in older adults and associated with use of multiple medications and polypharmacy. Definitions of polypharmacy vary, with no consensus on the medication number. Based on a database search, definitions of polypharmacy may be categorized as numerical (number of medications, ranging from ≥ 2 to ≥ 11), numerical for a certain duration of therapy or setting (eg, during hospital stay), or descriptive (using a brief description to define polypharmacy).² In simplest terms, polypharmacy refers to the prescription of an inappropriately high number of medications for a patient. The prevalence of polypharmacy in the United States based on a definition of ≥ 5 prescription drugs, in a database, has increased from 8.2% in 1999–2000 to 15% in 2011–2012.¹ Data suggest that the proportion of community-dwelling older adults (62–85 years old) on 5 or more medications (including prescribed, over-the-counter, or dietary supplements) is rising.³ An editorial states that rather than pill counts, perhaps the definition of polypharmacy may be defined in the era of deprescribing by related outcome measures.⁴

Polypharmacy leads to an increased risk of adverse drug interactions and events⁵; an adverse drug event refers to harm caused by the use of a drug or inappropriate use of a drug.⁶ Examples include falls, syncope, delirium, organ dysfunction and consequently related hospitalizations, impaired quality of life, and increase in health care costs.⁷ In a cross-sectional study, a third of older subjects were taking on average 3 herbal oral supplements, with potential for adverse drug interactions.⁸ A decline in physiologic reserves with aging and consequent impaired drug clearance renders geriatric patients more vulnerable to adverse drug events from polypharmacy compared with younger counterparts.⁹

As 1 means to address polypharmacy, the concept of deprescribing medications, or deprescription, is an approach recently used in the practice of medicine.¹⁰ Deprescribing refers to the programmed reduction in drug number or dosage of inappropriate medications supervised by a health care professional, with a goal to manage polypharmacy and improve outcomes, including adverse drug events.^{11,12} Although the deprescribing process is becoming widely recognized and is not a complex task, in practice, challenges exist with successful implementation. Oftentimes, providers miss the opportunity for deprescribing, the failure attributed to a lack of time or inertia, and reluctance on the part of patients to participate. However, data suggest otherwise, in that patients are more often than not interested and willing to deprescribe following discussion with a physician.^{13,14}

Methods

Our performance improvement (PI) project was intended to demonstrate that successful deprescribing is feasible in daily clinical geriatrics practice, and secondarily, to identify factors that facilitate or impede the deprescribing process.

The project conducted over a 6-month period from August 2018 to January 2019, by fellows in geriatric medicine (under full faculty supervision), was intended to attempt deprescribing during at least 1 patient encounter per day. The goal was to deprescribe at least 0.5 medication during the encounter, where appropriate. Clinical settings included 2 long-term care facilities and a geriatrics outpatient clinic, all in the Bronx, New York.

Fellows were educated and encouraged to strictly adhere to a deprescribing algorithm, outlined in [Figure 1](#). Demographics, comorbidities, recent laboratory data, diet, life expectancy, and a complete list of medications, including both prescribed and over the counter, were collected and tabulated in a data tool developed for this project.

Medication-related information was entered into an Excel Program; the list was categorized into 21 different drug classes. Every medication was critically reviewed for potential for discontinuation, or alternatively for reduction in dose. Where appropriate, suggestions from other health care providers, such as nursing staff or pharmacists, were considered in making decisions relating to deprescribing. All deprescribing attempts were supervised by board-certified geriatricians. Meaningful verbal discussion took place with every patient; if the patient did not have capacity, discussions were held with a caregiver to determine ultimate decision regarding deprescribing. If there was no caregiver, and in the absence of capacity, the provider did what was best in the patient's interests.

Post-deprescribing, patients were closely observed for any adverse consequences following withdrawal of medication(s). If clinically warranted, the deprescribed medications were reinstated. Incomplete data collection in some cases prompted exclusion of the encounter from analysis. Post data collection, all participating fellows and attending physicians participated in a survey to throw light on factors that influenced the deprescribing process. The answers fell into 3 categories: factors that facilitated deprescribing, factors that impeded deprescribing, and factors that prompted reinstatement of deprescribed medications.

Results

Exclusion Criteria

Data on 449 encounters were obtained; 8 encounters were excluded because of incomplete data collection. The 58 encounters from acute care hospital setting were excluded from analysis as there appeared substantial differences in morbidity (mostly acute) of patients from the other clinical settings. The final pool included 383 encounters for analysis.

Demographics

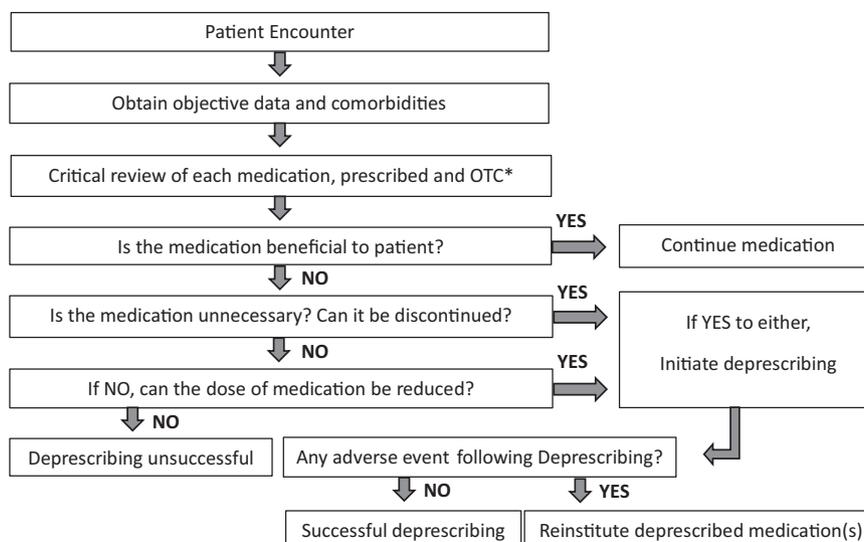
The 383 encounters included 294 long-term care (LTC) encounters and 89 outpatient clinic encounters. Overall, there were more females (64.5%) than males; average age was 78.2 years, 77.9 for LTC residents, and 79.1 for those in the outpatient clinic. Average number of comorbidities was 6.5 for the total, 6.7 for LTC residents, and 5.8 for outpatients. Average number of medications before deprescribing attempts was 11.1 for the entire group, 12.1 for LTC residents, and 8.0 for outpatients.

Outcomes: Successful Deprescribing

Outcomes were analyzed for both LTC and clinic settings. Deprescribing success rate was 90.1% of total encounters, 96.9% in LTC, and 67.4% in outpatient clinic. The average number of deprescribed medications per encounter was 1.3 in total, 1.4 in LTC, and 1.0 in the outpatient clinic.

Deprescribing Success Rate Based on Drug Classes and Clinical Settings

For each drug class, the success rate refers to the percentage of encounters where deprescribing was achieved. For example, lipid-lowering agents (statins) were deprescribed successfully in 46 of 201 encounters, a rate of 22.9%. Analgesics (32.2%); vitamins, minerals, and iron supplements (29.7%); lipid-lowering agents (22.9%); antihistamines (46.7%); and proton pump inhibitors and H2 blockers (26.2%) had highest success. Antipsychotic medications (9.3%), antidepressants (0.8%), thyroid hormone (4.1%), ophthalmic preparations (3.8%), and 5α reductase inhibitors and α 1-blockers (6.5%) had the lowest success. There was no meaningful difference



*OTC refers to Over the Counter

Fig. 1. Deprescribing algorithm.

between the clinical settings with regard to successful deprescribing for each drug class (Table 1).

Success Rate by Age Group

The patients were classified into 6 age groups. The largest group comprised those aged 75 to 84 years. The age group 85 to 94 years had the lowest success rate (84.5%), whereas the age group ≤ 55 years had the highest success rate (100%). Overall, there was no significant difference in success rates among age groups.

Discussion

Although the importance and concept of deprescribing has received emphasis,^{12,15–17} studies that quantify deprescribing efforts and comparisons at different clinical settings or for drug classes are scarce. Our project enabled an understanding of factors that contribute to successful deprescribing as well as the barriers encountered. Our efforts were directed to patients in 2 settings, which differed in patient profile relating to comorbidity, functional status, and remaining life expectancy. As a basic rule, it was important for providers to ensure that patient safety was never compromised, irrespective of setting.

Success and Clinical Setting

Successful deprescribing was achievable in both long-term care and outpatient clinic settings; we deprescribed at least 1 medication per encounter in both settings. Further, we were able to successfully deprescribe in 9 of 10 encounters, until there reached a stage when there were no further opportunities in a given patient. This fact demonstrated that an opportunity to deprescribe is largely available in daily geriatric practice and is achievable with meaningful provider efforts. Furthermore, the project suggests that deprescribing may be more successful in long-term care compared with the outpatient setting, although the difference was not significant. The major advantage in long-term care was in the opportunity offered by the system for review of residents' medications by multiple health care providers, such as specialists, pharmacists, nurses, or nutritionists. In fact, the effectiveness of interprofessional and interdisciplinary team efforts toward deprescribing has received favorable mention in recent

literature.^{18,19} In particular, deprescribing success and effectiveness appears to also vary with the class of drug and availability of pharmacist-led educational interventions.¹²

Drug Classes With High Success Rates

As stated, success rates varied with drug class. Antihistamines, with significant anticholinergic activity,²⁰ had the highest success for deprescribing at 46.7%. Because the class of drugs is commonly available over the counter, we found it crucial for providers to ask patients about their over-the-counter medication use. It was possible to deprescribe analgesics (32.2%), a class with potential for misuse and adverse drug events.²¹ Vitamins and supplements were another category that could be withdrawn with a high success rate, 29.7%. Notably, vitamins and supplements were the drug category taken by the largest number of people in our project. This is relevant because the use of dietary supplement use is on the increase, and in fact most in the ≥ 65 -year age group.²² Supplements tend to include unapproved pharmaceutical ingredients that may be harmful.²³ A new cohort study involving 30,899 US adults proved that there is no mortality benefit associated with dietary supplement use.²⁴ Other data also does not support a significant benefit for the routine use of oral multivitamin mineral or dietary supplements in the healthy old; in fact they may cause drug-supplement or disease interactions.^{25–27} Proton pump inhibitors and H2 blockers were deprescribed in 26.2% of encounters. Although proton pump inhibitors are currently known to be associated with adverse effects involving many organ systems, notably osteoporosis, fractures, *Clostridium difficile* infection, and pneumonia, among others, many patients were on acid-blocking agents without clear indications or for longer duration than recommended in guidelines.^{27,28} Lipid-lowering agents with limited benefit in older adults with short life expectancy²⁹ was another category that we could deprescribe without difficulty (22.9%).

Drug Classes With Low Success Rates

Certain drug categories had lower success rates. Antipsychotics were a drug class that we encountered difficulty in deprescribing. The chronic use of antipsychotic agents are linked to higher all-cause mortality,³⁰ and their use may be continued chronically without clear indications, with inadequate assessment for their need. The

Table 1
Deprescribing Success Rate Based on Drug Classes

Drug Classes	Total Encounters (N = 383)		Long-Term Care (n = 294)		Clinic (n = 89)	
	n	DeP, %	n	DeP, %	n	DeP, %
Antipsychotic medications	75	9.3	71	9.9	4	0
Antidepressant medications	128	0.8	114	0.9	14	0
Anxiolytics and sedative hypnotics	42	14.3	38	13.2	4	25.0
Medications for dementia, eg. donepezil, memantine	55	7.3	50	4.0	5	40.0
Analgesics	242	32.2	213	34.7	29	13.8
Antihypertensive agents	144	20.8	71	21.1	73	20.5
Diuretics	98	9.2	63	9.5	35	8.6
Lipid-lowering agents	201	22.9	139	28.1	62	11.3
Antiplatelet agents	175	13.1	129	13.2	46	13.0
Anticoagulants	54	5.6	47	2.1	7	28.6
Medications for asthma and COPD	79	15.2	70	14.3	9	22.2
Laxatives and stool softeners	250	8.8	226	7.5	24	20.8
Proton pump inhibitors and H2 blockers	107	26.2	91	26.4	16	25.0
5 α reductase inhibitors and α 1 blockers	62	6.5	58	6.9	4	0
Oral hypoglycemic agents	71	15.5	53	15.1	18	16.7
Insulin	60	13.3	53	13.2	7	14.3
Antihistamines	15	46.7	13	53.8	2	0
Ophthalmic preparations	105	3.8	86	4.7	19	0
Vitamin, mineral, and iron supplements	310	29.7	249	32.5	61	18.0
Thyroid hormone	49	4.1	37	2.7	12	8.3
Other classes of medications	252	17.9	198	18.2	54	16.7

COPD, chronic obstructive pulmonary disease; DeP, deprescribing.

n refers to the number of encounters.

N refers to total number of encounters.

American Family Physician Guideline (2018) recommends a re-evaluation for the need to continue antipsychotics at least every 3 months.³¹ A major barrier in the primary provider's deprescribing antipsychotic medications in our project related to the fact that the medications were largely managed by the psychiatrist. Further, nursing staff appeared to believe in perceived benefits from using the class of drugs. Antidepressants were also a category with a very low success rate. Although collaborative efforts with nurses and specialists were attempted where possible, in practice, successful deprescribing using this approach had limitations. A randomized, multicenter, double-blind, placebo-controlled trial in the United Kingdom suggested that sertraline or mirtazapine, commonly prescribed in older adults, actually did not show benefit compared to placebo; the suggestion was for providers to reconsider and individualize the approach in treating depression in dementia.³² Ophthalmic solutions (3.8%) were a category beyond the scope of primary care physicians to deprescribe, as they were largely managed by the ophthalmologist. However, providers should not overlook the potential systemic adverse drug effects caused by some ophthalmic preparations, such as beta blockers (bradycardia, syncope) and carbonic anhydrase inhibitors (acidosis, hypokalemia).^{33,34} Levothyroxine (4.1%) and 5 α reductase inhibitors and α 1-blockers (6.5%) were largely left alone, in the absence of clinical indications.

Examples of Existing Deprescribing Framework or Tools

Efforts have been made to develop frameworks or tools for effective deprescribing approaches. A concept of “deprescribing rainbow” suggests consideration for physical, financial, social, psychological, and clinical aspects relevant to the specific patient when attempting deprescribing.³⁵ Some of these aspects were considered in our project and expressed by the patient to the provider while attempting deprescribing. A constructed mnemonic, “S-I-R-E,” used 4 questions to assess appropriateness of medications: S = symptoms (“Have symptoms resolved?”), I = indication (“Is there a valid indication?”), R = risks (“Do risks outweigh benefits?”) and E = end of life (“Is there short life expectancy limiting clinical benefit?”).³⁶ The feasibility of electronic medical record-enabled

computerized decision support systems to reduce prescribing of inappropriate medications is another means for effective and organized deprescribing,³⁷ although there is a view that electronic-driven deprescribing systems currently have barriers to overcome, especially the time-consuming patient data-entering process.³⁸

Use of a Deprescribing Algorithm, and Follow-up Post-deprescribing

For our project, we created an algorithm for deprescribing (Figure 1). Our algorithm is unique in that the process emphasizes follow-up post-deprescribing through a step at the end. A key point is that the credit for successful deprescribing (for data collection) was given to providers only after confirming the absence of adverse outcomes post-deprescribing. A recent review supports the importance of follow-up after deprescribing; primary care physicians are warned regarding the risk of relapse of symptoms when deprescribing a medication used long term, although it was deemed safe.³⁹ A recommendation is that providers perform serial therapeutic trials of prescribing and deprescribing, and optimize the regimens, considering the patient's own health outcome goals.⁴⁰ Although formal data collection was not attempted in our project, no significant adverse event followed the deprescribing process. On a few occasions, we had to reinstitute deprescribed medications due to relapse of manifestations (Table 2); for example, we reinstated antihypertensives if the blood pressure was not at target goals following deprescribing. Yet, the overall deprescribing success rate for antihypertensives was still relatively high (20.8%). Our observation is consistent with a recent Norwegian study, which demonstrated that a systematic and collegial medication review markedly reduces the use of antihypertensive drugs in nursing home residents, without an adverse effect on the blood pressure over time.⁴¹

Factors That Enabled Successful Deprescribing

We identified factors that enabled effective or successful deprescribing through a poststudy survey administered to the participating fellows and attending physicians (Table 2). Foremost, an earnest provider effort appeared to be the most important factor that

Table 2
Summary of Factors That Influenced the Deprescribing Process

	Factors Influencing Deprescribing
Factors that rendered success	<ul style="list-style-type: none"> • Earnest provider effort • A good patient-physician relationship • Providing relevant patient and caregiver education • Identifying redundant and unnecessary medications based on knowledge (physiology, pharmacology, current guidelines) • Systematic periodic medication review in collaboration with multidisciplinary health care providers
Factors that impeded process	<ul style="list-style-type: none"> • Insufficient provider effort (ie, lack of time) • New patients (first encounter, awaiting full information) • Those satisfied with current regimens appeared more reluctant to deprescribe • Patient or caregiver belief relating to recommendations from consultants or other providers • Resistance from consultants or other staff
Factors that required reinstatement of deprescribed medications	<ul style="list-style-type: none"> • Newer goals of care and warranted changes • Medications requiring adjustment based on new laboratory results, vital signs, or clinical manifestations (eg, elevation of blood pressure, hypotension, blood sugar changes, and behavioral manifestations) • Consultant's emphatic recommendations favoring prior regimen

enabled successful deprescribing. A Danish study concluded that providers should actively offer patients with multimorbidities an opportunity to review medications and identify those unnecessary.⁴² Meaningful patient and caregiver education based on the trust with the physician, in addition to the provider's solid clinical knowledge of pharmacophysiology and current guidelines, were relevant factors that contributed to success. During patient-initiated deprescribing process, providers as facilitators can help patients make decisions by providing pertinent medical information.⁴³ Systematic multidisciplinary collaborative efforts are crucial in deprescribing, especially in long-term care.^{18,19}

Factors That Made Deprescribing Difficult

We identified barriers during the deprescribing process as well. Based on our survey, insufficient provider effort largely attributed to a lack of time is a major reason for providers to lose opportunities to deprescribe. Other barriers are summarized in Table 2. Barriers to meaningful deprescribing are well outlined in a recent *JAMDA* editorial. They include the availability of increasing numbers and effectiveness of medication classes for chronic diseases (such as heart failure and diabetes mellitus); prescription cascades; pharmaceutical advertising directed to the public; preference for the ease of pill administration over attempting change of behavior in the patient; administration of medications rather than lifestyle change in long-term care residents; excessive belief in the powers of medications, which may even be a placebo effect; and finally resistance by the patient or caregiver, or both, to discontinue medications used for chronic symptoms despite no benefit and presence of adverse effects.⁴⁴ Although it is often difficult to overcome barriers in the deprescribing process, an understanding of barriers by itself is an important step for successful deprescribing.⁴⁵ Therefore, providers take meaningful, persistent efforts as much as possible in geriatric practice regardless of clinical settings.

Studies mention the difficulties, success, and failures when deprescribing certain classes of medications in older people, notably antipsychotics and sedative hypnotics. The Antipsychotic Use in Long-Term Care (HALT) deprescribing trial suggested that 39 of 133 participants never ceased their antipsychotic medication, or were represcribed their medication after initial deprescribing; nurses were the most common drivers of represcribing (63.2%), followed by family members (39.5%), general practitioners (23.7%), specialists (13.2%), and hospital staff (10.5%), with increased agitation and aggressive behavior being key reasons, although not objectively identified.⁴⁶ A protocol developed by an interdisciplinary team, with prescribing and deprescribing criteria, suggested that interventions performed in 35 patients in a single long-term care setting were followed by

withdrawal of antipsychotic treatment completely in 80% of the patients and dose reduction to minimum in 20% of the patients; a pharmacist was part of the team.⁴⁷ A New Zealand study suggested that a patient-centered deprescribing approach demonstrated a high uptake of deprescribing recommendations and success rate for anticholinergic and sedative medicine, with significant benefits in terms of mood, frailty, falls, and adverse reactions over a period of 6 months, suggesting that the process is feasible and improves health outcomes.¹⁷ In summary, rational deprescribing of anticholinergics, antipsychotics, and benzodiazepines is possible with effort in older adults.⁴⁸

Limitations

The study had limitations. Data were not formally collected on negative clinical outcomes following deprescribing, although routine follow-up of clinical status invariably took place, and appropriate actions were taken as needed. Lack of a control group of subjects was a limitation. Notably, significant adverse events were hardly encountered during the project. We did not follow long enough for mortality-related outcomes. Following the study, we learned that a well-designed tool for deprescribing should emphasize the importance of collecting data on clinical outcomes at specific intervals post-deprescribing so that potential adverse events do not escape detection. Such follow-up may be offered for days, weeks, or months, and best individualized.

Long-term measures of mortality benefits from deprescribing were not studied in our project; they are a consideration for long-term deprescribing projects. At times, a delay brought on during transfers of patients between clinical settings or because of delay in patient encounters made it difficult to perform meaningful follow-up. In particular, the process was more difficult in those patients discharged following an acute hospital stay to the community or long-term care site.

Conclusions and Implications

Our project suggested that meaningful, organized physician efforts can help achieve deprescribing of at least 1 medication per encounter in long-term care and community settings. Primary care providers, and in particular physicians who provide care for older adults, must maximize opportunities available in daily practice to deprescribe in an organized manner.⁴⁴ It is also important to recognize and understand barriers to successful deprescribing. Collaboration with other disciplines is desirable, an approach that was helpful in our project. Foremost, provider motivation is key to success. Properly executed, deprescribing is an inexpensive means to address the burden of

polypharmacy, minimize adverse drug events, lower costs, and perhaps improve the quality of life of older individuals.

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