



Mitigating the Dangers of Polypharmacy in Community-Dwelling Older Adults

Tools to help promote safe and appropriate medication prescribing and use.

ABSTRACT: Polypharmacy, the use by a patient of multiple medications, contributes to adverse drug events, hospitalizations, geriatric syndromes, and increased health care costs. In the United States, polypharmacy is increasingly widespread, particularly among community-dwelling adults over age 62. In 2005–2006, 31% of such adults used five or more prescription drugs and 8.4% used medication combinations associated with potential interactions. By 2010–2011, 36% used five or more prescription drugs and 15% used potentially problematic drug combinations. Reducing the dangers of polypharmacy, however, requires clinicians to broaden their focus, considering not only the number of drugs a patient takes, but also the prescription of potentially inappropriate medications and potential prescribing omissions. This article explores the factors that contribute to polypharmacy and discusses its negative physiological, psychological, and economic effects. It also describes strategies for reducing polypharmacy, including both “explicit” approaches, which are grounded in the findings of literature reviews and expert opinion, and “implicit” approaches, which are based on the provider’s interpretation of clinical data and the patient’s medication regimen.

Keywords: adverse drug events, community-dwelling adults, deprescribing, older adults, polypharmacy, potentially inappropriate medication, potentially inappropriate prescribing

TD is an 86-year-old woman with a history of chronic obstructive pulmonary disease (COPD), hypertension, hyperlipidemia, hypothyroidism, osteoarthritis, and angina. (This case is a composite based on my experience.) TD had a complicated left knee replacement nine years ago. Her mobility is still impaired, and she’s had frequent falls. Over the past few months, she has experienced headaches and vision problems. Based

on magnetic resonance imaging, these two symptoms were attributed to a slow-growing pituitary macroadenoma that is not currently amenable to surgical or medical intervention. In recent weeks, she has demonstrated both noticeable cognitive decline and reduced functional ability.

TD’s care is managed by her primary care physician, cardiologist, pulmonologist, orthopedist, endocrinologist, and neurologist. Her medical

record indicates that she is currently taking the following prescription drugs and over-the-counter (OTC) supplements:

- atenolol (Tenormin) 25 mg by mouth daily for hypertension
- ranolazine (Ranexa) 500 mg by mouth twice daily for angina
- gabapentin (Neurontin) 600 mg by mouth three times daily, though she couldn't recall why it had been prescribed or by whom
- hydrochlorothiazide (Microzide) 12.5 mg by mouth daily for hypertension
- levothyroxine (Synthroid) 25 mcg by mouth daily for hypothyroidism
- omeprazole (Prilosec) 40 mg by mouth daily for gastroesophageal reflux disease (GERD), prescribed by a gastroenterologist 10 years ago and subsequently renewed by her primary care physician
- low-dose (81-mg) aspirin once daily to prevent cardiovascular events
- fluticasone 250 mcg–salmeterol 50 mcg (Advair Diskus), one inhalation twice daily for COPD
- albuterol (Ventolin HFA) two puffs every six hours as needed for shortness of breath
- a self-prescribed daily multivitamin
- self-prescribed vitamin D₃ 50 mcg daily

TD has been reminded that it's important to take her prescribed medications as instructed and is aware that her mother had a massive fatal heart attack after she stopped taking her blood pressure medications. Nevertheless, TD frequently remarks that she's taking too many medications—that the costs are too high, the adverse effects too great, and that it's difficult to remember what medication to take and when. In fact, over the past year, she abruptly stopped using her fluticasone–salmeterol inhaler because of its high cost. She also stopped taking ranolazine and gabapentin owing to related dizziness and fatigue, respectively. Following these discontinuations, she continued to have significant dyspnea, angina, and generalized pain, all of which limited her activities of daily living.

Unfortunately, all of TD's providers remain focused on their specialty, with none attending to coordination of care or optimization of drug therapy. When, for unknown reasons, TD's systolic blood pressure reached 180 mmHg, her primary care physician recommended that she take an additional half of her daily 25-mg atenolol tablet. A week later,



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without communicating with TD's primary care physician, TD's cardiologist told her to double her daily 25-mg atenolol dose, exacerbating TD's concerns about the number of medications she's taking and the difficulty she's having in managing the regimen.

In fact, TD's concerns are not without foundation. Some of the medications she's taking may not be medically appropriate at this time.

This article takes a critical look at how we understand polypharmacy, its prevalence, consequences, and contributing factors, with a focus on ways to reduce the prescription and use of potentially inappropriate medications among community-dwelling older adults.

POLYPHARMACY: PREVALENCE AMONG OLDER ADULTS

The term *polypharmacy* describes the use by a patient of multiple medications, with some researchers having designated a threshold number of five or more. A 2016 analysis of longitudinal data from a nationally representative sample of community-dwelling U.S. adults, ages 62 to 85, found that the use of five or more prescription drugs in this group grew from 31% in 2005–2006 to 36% in 2010–2011.¹ When OTC medications and dietary supplements were included in the analysis, the percentages rose from 53% to 67% within this five-year period. The analysis further noted that in 2010–2011, more than 15% of these older adults were using medication combinations associated with potential drug–drug interactions, up from 8.4% in 2005–2006.¹

WHY POLYPHARMACY AMONG OLDER ADULTS IS A PROBLEM

“Numbers are not the enemy,” observed Steinman in a 2016 commentary published in *JAMA Internal Medicine*.² Five or more medications may be medically necessary to treat patients with multiple comorbidities. In 2012, 60% of U.S. adults ages 65 and older managed two or more chronic diseases.³ But polypharmacy is not without risks, especially among older patients. Drug interactions are a frequent cause of preventable adverse drug events (ADEs), and the single greatest ADE risk factor is the number of medications a patient takes.²

Age-related physiological changes can increase the risk of ADEs, which account for up to 10% of hospital admissions among older adults and are often preventable.⁴ Such changes include the following⁵:

- decreased gastric acidity
- increased body fat
- decreased total body water
- reduced blood flow to the liver and kidneys
- altered drug receptor sensitivity

These changes may significantly alter both pharmacokinetics (the effects of the body on a drug’s absorption, bioavailability, distribution, metabolism, and excretion) and pharmacodynamics (the biochemical, physiological, and molecular effects of a drug on the body). For example, age-related physiological changes may necessitate dosage adjustments of certain drugs to prevent either an exaggerated or a reduced drug–receptor response (see Table 1⁵).

Besides ADEs, polypharmacy poses other risks for older patients, including the following^{6,7}:

- nonadherence to medication regimens
- diminished ability to perform activities of daily living
- functional decline
- falls
- cognitive impairment
- urinary incontinence
- malnutrition
- higher costs for both patients and health care systems

FACTORS CONTRIBUTING TO POLYPHARMACY

The prevalence of polypharmacy among older adults in the United States can be attributed to numerous factors.

Demographics. The U.S. older adult population is increasing, and older adults are at greater risk for chronic disease. According to the Office of Disease Prevention and Health Promotion, U.S. residents ages 65 and older numbered 46.3 million in 2014, representing 14.5% of the U.S. population, and by the year 2060 that number is projected to reach 98 million, or 23.5% of the population.³

Comorbidities. The chronic diseases common in older adults, which include heart disease, cancer, COPD, stroke, diabetes, and Alzheimer’s disease,³ often coexist. Managing these comorbidities has inevitably increased prescription drug use in this population.

Table 1. Physiological Age-Related Changes and Effects on Drug Therapy⁵

Physiological Changes	Effects on Drug Therapy
Changes related to pharmacokinetics	
Absorption: decreased gastrointestinal motility; decreased gastric pH	Delayed or decreased absorption of acidic drugs
Distribution: increased percentage of body fat with concomitant decrease in muscle mass and total body water; decreased serum albumin levels	<ul style="list-style-type: none"> • Water-soluble drugs can reach toxic concentrations, and fat-soluble drugs may have prolonged effects • Increase in the free or unbound portion of protein-bound drugs
Metabolism: decrease in hepatic blood flow; decreased liver mass; decreased enzymatic activity of the cytochrome P-450 isoenzyme system	Standard doses of drugs with a high first-pass effect can reach toxic levels (because less of the drug is subject to immediate metabolism)
Excretion: decreased renal mass, renal blood flow, and glomerular filtration rate	Increased concentration of renally excreted drugs
Changes related to pharmacodynamics	
Altered sensitivity of drug receptors, possibly due to a reduced number of drug receptors, reduced receptor binding, or altered sensitivity of receptors with either enhanced or diminished cellular response	<ul style="list-style-type: none"> • Increased effects of anticholinergics, barbiturates, benzodiazepines, warfarin, and opioids • Decreased response to adrenergic agonists and some adrenergic antagonists (β-blockers, for example)

Potentially inappropriate prescribing is a major contributor to polypharmacy among older adults. *Potentially inappropriate prescribing* is a term that includes both of the following⁸:

- prescription of potentially inappropriate medications—that is, those that confer potential harms that are as great or greater than any potential therapeutic benefits
- potential prescribing omissions, in which medications that may significantly improve clinical status are not prescribed

A fragmented health care system perpetuates polypharmacy by providing insufficient monitoring. Ineffective coordination among health care specialists can result in therapeutic duplication and harmful drug interactions. Although pharmacists can identify problematic interactions during the dispensing phase, patients often use more than one pharmacy. A cross-sectional study of 59 adults ages 65 and older who were enrolled in an Ohio senior program found that 21 (35.6%) used five or more prescription drugs and 24 (40.6%) used multiple pharmacies.⁹ The use of mail-order pharmacies has also become increasingly common, particularly among older adults with Medicare Part D coverage, which promotes their services. While mail-order pharmacies are cost-effective and convenient, the absence of face-to-face interaction with a pharmacist may increase the risk of inappropriate prescribing.

Disease-specific guidelines are often based on findings from randomized controlled trials that exclude or underrepresent older adults with multiple comorbidities. And, as Wallis observes, such guidelines tend to focus on the addition of drugs, while providing little or no counseling on the time-consuming, poorly incentivized process of critically appraising complex medication regimens and safely discontinuing inappropriate drugs.¹⁰

Patient and caregiver expectations. Patient satisfaction is often tied to the quantity of health care services provided, including the number of treatments given and prescriptions written, though greater use of such services is also associated with higher mortality rates.¹¹ Moreover, providers with limited knowledge of age-related pharmacokinetic and pharmacodynamic changes may be reluctant to discontinue medications initiated by another provider and may even incorrectly interpret an ADE as a new diagnosis necessitating additional medication. A survey of 160 Italian physicians that assessed their feelings about deprescribing in older adults, found that 72% reported feeling confident in their ability to deprescribe, but only 53% said they were comfortable discontinuing medications endorsed by guidelines, 40% were reluctant to deprescribe medications prescribed by another physician, and 45% were hesitant to stop medications that either the patient or caregiver considered necessary.¹²

DEPRESCRIBING: POLYPHARMACY REDUCTION STRATEGIES

Deprescribing is the planned process of safely withdrawing potentially inappropriate medications. This underutilized therapeutic option can reduce ADEs, improve patient adherence, and lower costs.

Several clinical tools are available to assist providers with the identification of potentially inappropriate medications (see Table 2¹³⁻¹⁶). Levy categorizes these tools as either “explicit” approaches, such as the Beers Criteria¹³ and the STOPP/START tools,¹⁴ which are grounded in the findings of extensive literature reviews and expert opinion, or “implicit” approaches, such as the ARMOR protocol¹⁵ and the Tool for Identifying and Discontinuing Potentially Inappropriate Drugs,¹⁶ which are based on the provider’s interpretation of clinical data and the patient’s medication regimen.¹⁷ These criteria and tools can help providers identify drugs known to cause harm in older patients. Although none were developed explicitly for nurses, all can be used by nurses working in conjunction with a prescribing clinician.

Collaboration between the patient, nurse, and prescribing clinician can reduce medication-related harm.

Beers Criteria. Developed by the geriatrician Mark Beers in 1991, the Beers criteria were adopted by the American Geriatrics Society in 2011 and subsequently updated in 2012, 2015, and 2019. The Beers Criteria are applicable to all populations ages 65 and older in all settings, excluding hospice and palliative care. Their aim is to improve the care of older adults by reducing the prescription of potentially inappropriate medications. Consistent with the previous 2015 update, the 2019 update retains the following five types of criteria¹³:

- potentially inappropriate medications to avoid in most older adults (these include medications with strong anticholinergic properties, benzodiazepines, and α_1 -blockers)
- medications to avoid in specific diseases and syndromes
- drugs to be used with caution
- medications requiring dose adjustment with renal dysfunction
- common drug–drug interactions

Application of the 2019 Beers Criteria to TD’s case highlights two potentially inappropriate

Table 2. Deprescribing Tools

Name of Tool	Description
Beers Criteria ¹³	Lists medications to be avoided or used cautiously in adults ages 65 and older, drugs to avoid in older adults with certain conditions, medications requiring dose adjustment in patients with renal dysfunction, and common drug–drug interactions.
STOPP/START Tools ¹⁴	STOPP assists providers with the identification of potentially inappropriate medications. START draws attention to potential prescribing omissions. Version 2, the 2015 update, includes 80 STOPP and 34 START criteria.
ARMOR Protocol ¹⁵	Includes the following essential steps: <ul style="list-style-type: none">• Assess all medications• Review for interactions and adverse effects• Minimize nonessential medications• Optimize the dose based on renal and hepatic clearance• Reassess clinical status
Tool for Identifying and Discontinuing Potentially Inappropriate Drugs ¹⁶	Consists of 10 steps: <ol style="list-style-type: none">1. Determine the patient’s current drug use, including over-the-counter medications and supplements.2. Identify patients at risk for, or currently experiencing, an adverse drug reaction.3. Estimate life expectancy.4. Define goals of care.5. Match each medication with its associated indication.6. Determine the need for preventive medications.7. Weigh the risks and benefits of each drug.8. Rank drugs from highest to lowest utility.9. Identify drugs to be discontinued (with the patient’s approval).10. Devise and implement a safe drug discontinuation plan.

ARMOR = Assess, Review, Minimize, Optimize, Reassess; START = Screening Tool to Alert to Right Treatment; STOPP = Screening Tool of Older People’s Prescriptions.

medications. First, TD had been taking omeprazole for 10 years to treat GERD, although the Beers Criteria cautions against proton pump inhibitor use for longer than eight weeks. Moreover, she could not remember the last time she had experienced any symptoms of GERD or had been assessed by a gastroenterologist. With prolonged use, proton pump inhibitors may put patients at risk for *Clostridium difficile* (now *Clostridioides difficile*) infection, bone mineral density loss, and fractures.¹³ It is also known to impede the absorption of levothyroxine, which TD is taking for hypothyroidism. Second, there is little evidence supporting the efficacy of daily aspirin for the primary prevention of cardiovascular events in adults ages 70 and older.¹³

STOPP/START tools. The Screening Tool of Older People’s Prescriptions (STOPP) and the Screening Tool to Alert to Right Treatment (START)¹⁴ were first published in 2008 by Gal-

lagher and colleagues from the Department of Geriatric Medicine at Cork University Hospital in Ireland. The authors of STOPP/START version 2, published in 2015, reviewed and reassessed the 2008 criteria and, with input from an expert panel representing 13 European countries, added new evidence-based criteria and removed criteria that had since become obsolete. STOPP/START version 2 contains a total of 114 criteria, representing a 31% increase from the initial publication. The 80 STOPP criteria aim to more accurately identify current potentially inappropriate medications, whereas the 34 START criteria draw attention to potential prescribing omissions, both of which can adversely affect older patients.¹⁴

ARMOR protocol. The Assess, Review, Minimize, Optimize, Reassess (ARMOR) protocol was initially used in a long-term care setting, though its use is encouraged in the outpatient setting as well.¹⁵ The primary goal of application is to preserve the

patient's functional status and quality of life. The essential components of the ARMOR protocol are as follows¹⁵:

- assess all medications
- review for interactions and adverse effects
- minimize nonessential medications
- optimize dosages based on renal and hepatic clearance
- periodically reassess clinical status

The Tool for Identifying and Discontinuing Potentially Inappropriate Drugs. Developed by Scott and colleagues, this is an evidence-based discontinuation guide that consists of the following 10 steps¹⁶:

- Determine every drug the patient takes by asking the patient to bring *all* medications into the appointment for reconciliation. Emphasize the importance of including all OTC medications and supplements as well as prescribed medications.
- Identify patients at risk for or currently experiencing ADEs. This requires careful assessment, because subtle changes such as confusion and lethargy may be the only signs of an ADE in an older adult.
- Estimate the patient's life expectancy using a clinical prognostication tool or life span calculator.
- Discuss goals of care with the patient. For patients with an estimated life expectancy of less than two years, treatment should be conservative, minimizing the burden of unnecessary or unhelpful pills in order to preserve quality of life.
- Match each medication with its associated medical indication, discontinuing any therapeutic duplications and drugs with no clear clinical indication.
- Determine the need for preventive medications, discontinuing any for which time until expected treatment benefit exceeds estimated life expectancy. For example, patients whose life expectancy is less than one year would derive little benefit from preventive cardiovascular therapy with statins or bisphosphonate therapy to prevent osteoporosis and fractures.
- Delineate risks and benefits of the remaining drugs, ranking them from highest to lowest in utility.
- Identify all drugs that could potentially be discontinued, taking into account patient preferences.
- Discuss recommendations for any drug discontinuations with the patient and seek the patient's informed consent.
- Wean patients off discontinued drugs one at a time, monitoring patients closely for signs and symptoms of worsening disease or withdrawal symptoms.

THE NURSE'S ROLE IN MEDICATION MANAGEMENT

Nurses play a pivotal role in identifying and discouraging inappropriate prescribing. Interdisciplinary

collaboration between the patient, nurse, and prescribing clinician can promote patient safety and reduce medication-related harm. Comprehensive medication assessment and patient engagement are two nursing interventions that are essential to reducing polypharmacy. If patients or their families equate recommended drug discontinuations with substandard care, nurses can explain that the goal in appropriate deprescribing is to improve patients' health and quality of life, with all recommendations following a critical, conscientious appraisal of the drugs' costs and benefits, and taking into account patient concerns and preferences. Nurses may also be able to reduce polypharmacy by encouraging the adjunctive use of nonpharmacological interventions, such as guided imagery for pain and relaxation.

TD'S DEPRESCRIBING

When TD's family alerted her primary care physician to the problems she was having managing her medications, the physician initiated medication reconciliation and discovered that TD had previously stopped using the fluticasone-salmeterol inhaler, gabapentin, and ranolazine. Upon learning that the inhaler was a financial burden for TD, the physician prescribed a more cost-effective, generic version. When TD described the dizziness and fatigue she had experienced with ranolazine and gabapentin, the physician referred her to her cardiologist for further evaluation of her angina and, since she couldn't remember why she was taking gabapentin, supported her decision not to resume treatment with that drug. Because TD's blood tests revealed no evidence of vitamin deficiencies and TD frequently mentioned the burden of taking so many pills, her primary care physician further suggested she could eliminate supplemental vitamins from her medication regimen, provided she made a conscientious effort to include in her diet nutrient-dense foods high in vitamin D and calcium. TD thus stopped taking her self-prescribed daily multivitamin and vitamin D supplement. Furthermore, since TD had no symptoms of GERD and was unaware of any other condition for which she may have been prescribed a proton pump inhibitor a decade earlier, the primary care physician was able to oversee the safe discontinuation of TD's omeprazole, which is known to impede the absorption of levothyroxine, as well as her daily aspirin, which has recently been found to have little efficacy in the primary prevention of cardiovascular events in adults ages 70 and older. This reduction in pill burden improved TD's daily functioning and increased her adherence to her revised drug regimen.

With the reduced pill burden, TD found she was better able to manage her new medication regimen, taking all medications as prescribed. She developed a growing sense of confidence in her providers' ability to respond to her concerns and is now more apt to discuss any medication problems with her providers rather than discontinuing medications without consulting them. With her dyspnea under control, she is also better able to participate in activities of daily living and social events.

IMPROVING PRESCRIBING PRACTICES

Polypharmacy among community-dwelling older adults is a serious issue that's receiving increasing attention. But it's not simply the number of medications a patient takes that defines problematic usage; inappropriate prescribing and oversight can cause patients like TD to experience ADEs, functional decline, and geriatric syndromes. A multidisciplinary, systematic approach to identifying and safely discontinuing potentially inappropriate medications can improve outcomes and enhance quality of life for older adult patients. Institutional policies and financial incentives need to align with the process of appropriate deprescribing in order to improve prescribing practices throughout the U.S. health care system. ▼

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