Medication Overload:
America's Other Drug Problem

**How the drive to prescribe
is harming older adults**

April 2019

LOWN INSTITUTE

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About the Lown Institute

The Lown Institute is a nonpartisan think tank dedicated to transforming America's high-cost, low-value health system. We conduct research, generate bold ideas, and create a vision for a just and caring system of health that works for all.

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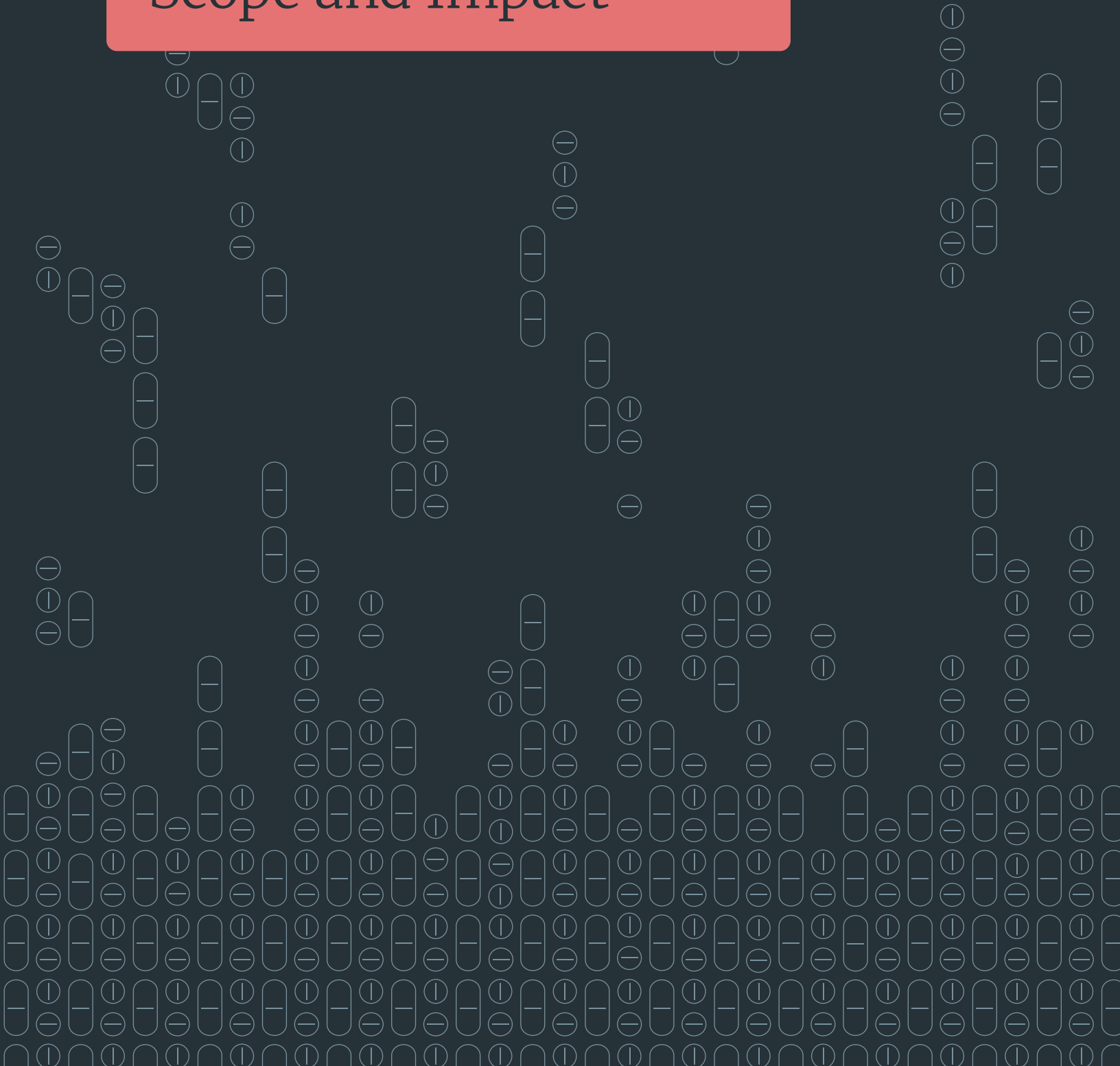
Introduction:
An Epidemic of Too Much Medication

Every day, 750 older people living in the United States (age 65 and older) are hospitalized due to serious side effects from one or more medications.[1] Over the last decade, older people sought medical treatment or visited the emergency room more than 35 million times for adverse drug events, and there were more than 2 million hospital admissions for serious adverse drug events *(see Appendix A, p. 40)*.[2] Older adults are hospitalized for adverse drug events at a greater rate than the general population is hospitalized for opioids.[3]

In the past decade, prescribing multiple medications to individual patients (called "polypharmacy" in the scientific literature) has reached epidemic proportions.More than four in ten older adults take five or more prescription medications a day, an increase of 300 percent over the past two decades.[4] Nearly 20 percent take ten drugs or more. When over-the-counter medications and supplements are included, the number of older people taking five or more drugs rises to 67 percent.[5]

Medications have improved the lives of individuals around the world, and many patients benefit from taking multiple drugs. Indeed, polypharmacy may be necessary for people who have more than one chronic disease. However, taking multiple medications also greatly increases a person's risk of suffering a serious, sometimes life-threatening side effect. Over the past few decades, medication use in the U.S., especially for older people, has gone far beyond necessary polypharmacy, to the point where millions are overloaded with too many prescriptions and are experiencing significant harm as a result.

Polypharmacy vs. Medication Overload

Polypharmacy

A term used in the scientific literature to describe the condition of taking multiple medications. Usually the threshold for polypharmacy is five or more medications, although the cutoff varies because there is not a single agreed upon definition. Polypharmacy can be helpful or harmful, depending on the patient's conditions and the specific medications.

Medication Overload

The use of multiple medications for which the harm to the patient outweighs the benefit. There is no strict cutoff for when the number of medications becomes harmful, but the greater number of medications a person is taking, the greater their likelihood of experiencing harm, including serious adverse drug events.

As the number of prescriptions has exploded, so has the frequency of polypharmacy-related harm, what we refer to in this paper as medication overload *(see Polypharmacy vs. Medication Overload, p. 03)*. The epidemic of medication overload is bound to get worse, given the rapid aging of the population and the trend of increasing medication use. Over the next ten years, there will be at least 4.6 million hospitalizations of older Americans and 15 times as many outpatient visits for side effects from medications. Yet the enormity of the problem is invisible to the vast majority of families and patients, most policymakers, and even many health care professionals. And while some clinicians and pharmacists are trying to reduce the burden of medications on their individual patients, no health care professional group, public organization, or government agency to date has formally assumed responsibility for addressing this national problem.

The problem of medication overload has remained hidden largely because the practice of excessive prescribing is deeply embedded in American health care. Like the air we breathe, the forces that lead to medication overload are everywhere and yet difficult to see. No single drug or class of drugs is the culprit, nor is any single disease.

Older people are prescribed drugs in nearly all health care settings, by primary care physicians, specialists, and other health care professionals such as nurse practitioners. In most cases, no single health care professional is assigned responsibility — or has the time, training, and resources — to coordinate patient care, keep track of all the drugs patients have been prescribed, and protect them from medication overload.

Numerous forces and incentives in the U.S. health care system make it easy for clinicians to prescribe medications and difficult to scale back the dosage or deprescribe (stop a prescription). This culture of prescribing is not the fault of any one group. Health care providers, patients, and industry all play a role. There is no magic bullet solution, no single technology, no one policy that can address this problem. A holistic, multi-pronged, and coordinated set of solutions will be necessary to make a meaningful dent in medication overload and the serious side effects that it can cause.

In this report, the Lown Institute calls for the development of a national strategy to address medication overload and help older people avoid its devastating effects on the quality and length of their lives. This report frames medication overload as a critical health care issue, outlining the scope of the problem and the harms that result; it analyzes how the culture, structure, and practices of the health care system both promote medication overload and stand in the way of health care professionals addressing it. Finally, we conclude by outlining some short-term and long-term solutions. A subsequent National Action Plan for Addressing Medication Overload will lay out a national strategy to address the epidemic of prescribing and ensure the safety of millions of older adults who are now at risk of preventable harm and premature death.
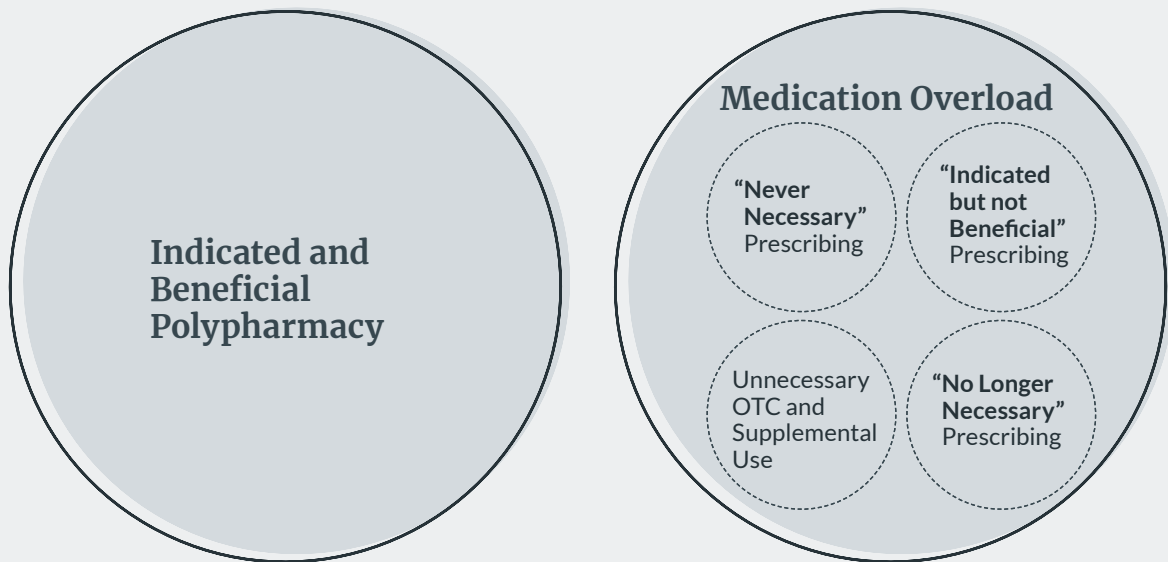
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Polypharmacy can be beneficial or harmful

Medication overload (harmful polypharmacy) can happen when a patient is prescribed medications that are not necessary, when the side effects from indicated medications outweigh the potential benefit, when a patient is prescribed a medication for longer than needed, and when a patient takes over-the-counter medications or supplements unnecessarily.

Polypharmacy

Indicated and Beneficial Polypharmacy

Medication Overload

"Never Necessary" Prescribing

"Indicated but not Beneficial" Prescribing

Unnecessary OTC and Supplemental Use

"No Longer Necessary" Prescribing

Polypharmacy:
A Red Flag for Potential Harm

In the scientific literature, polypharmacy is most often defined as taking five or more drugs.[6] This does not mean that every person taking five or more drugs will suffer an adverse drug reaction; some people with multiple chronic conditions require multiple medications to stay healthy. However, the more medications a person takes, the greater their risk of a serious, potentially life–threatening side effect from one or more of these drugs, or interactions between them.[2, 7, 8] In this way, the threshold of five or more medications serves as a "risk factor," like high blood pressure, a red flag that a patient is at increased risk of serious harm.

Drug reactions range from relatively mild symptoms such as drowsiness, nausea, or incontinence to more debilitating symptoms such as delirium (and the persistent cognitive changes often associated with it), falls, serious bleeding (including in the brain), or death. When injury occurs as the result of a drug, it is called an Adverse Drug Event (ADE). ADEs include adverse drug reactions, medication errors, allergic reactions, and overdoses.*

While prescriptions are written with the intention of helping patients live better and longer lives, the cumulative effect of multiple drugs can be devastating *(see What are the Harms of Medication Overload?, p. 08)*.

The threshold of **five or more medications serves as a "risk factor,"** like high blood pressure, a red flag that a patient is at increased risk of serious harm.

The risk of an adverse drug event increases by 7–10% with each medication.

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* An adverse drug reaction is defined as a negative reaction from use of a medication as prescribed. Adverse drug events include adverse drug reactions, but also include negative effects from non-regular use of a medication, such as medication errors and overdoses.

ADEs are one of the most common causes of medical harm, especially for older people. In 2014, the rate of Emergency Department visits for ADEs among older Americans was nearly 10 per 1000 individuals.[15] At a minimum, about 200,000 older adults were hospitalized that year because of an adverse drug event, and as many as 878,000 hospital stays for older adults included some kind of adverse drug event present on admission.[1, 15] People over 65 make up only about 14 percent of the population, but they account for 56 percent of the country's hospitalizations for adverse drug events.[15]

Additionally, many older adults seek medical care for ADEs at the offices of their primary care doctors, outpatient clinics, or emergency departments but are never hospitalized. Older adults taking five or more medications are at least 88 percent more likely to seek outpatient care for an adverse drug event compared to those taking just one or two.[2]

Taking into account the growth in the older population and increases in rates of ADEs over the last decade, we estimate that there have been nearly 5 million outpatient visits for ADEs for older adults in 2018, and 280,000 hospitalizations, at a cost of $3.8 billion *(see Appendix A, p. 40)*. At the same time, less than half of people experiencing an ADE recognize it and seek medical treatment, meaning that about ten million older people in the U.S. — about one in five — suffer from an adverse drug event each year.[2]

The potential ill effects of excessive prescribing go beyond ADEs and hospitalizations. People can be confused and overwhelmed by having to keep track of numerous medications — when they should be taken, how they should be taken, what they're for. Despite the best efforts of community pharmacists, family, and in some cases, long-term care facility staff, the mental effort of managing this "pill burden" is too much for many people, making it difficult for them to maintain their medication regimen.

> Older adults taking five or more medications are at least **88 percent more likely to seek outpatient care** for an adverse drug event compared to those taking just one or two.

> In 2018, there were more than **280,000 hospitalizations** of older people in the U.S. because of an adverse drug event, at a cost of $3.8 billion.

"Sometimes my patients' pills don't fit in one pill container, so they have to buy two. Taking so many medications, it gets to them."

— **Anonymous clinician participating in a focus group**

What are the Harms of Medication Overload?

Each additional medication prescribed increases the risk of harmful side effects, such as delirium, falls, and other adverse events that can be life-threatening.

Adverse Drug Events

For each additional drug in a patient's medication regimen, the **risk of adverse drug events increases by 7 to 10 percent**. [7, 8, 9]

Delirium

Older patients taking 6 or more drugs in the hospital are more than **twice as likely to experience delirium** compared to patients taking fewer drugs.[10] Older people taking more than 10 drugs are nearly 2.5 times more likely than those taking fewer than 5 drugs to experience impaired cognition.[11]
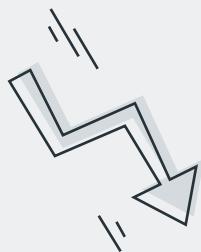
Falls

For older adults, taking 4 or more drugs is associated with an **18 percent greater risk of falls**. Taking 10 or more drugs is associated with a 50 percent higher risk of falls.[12, 13]

Mortality

For older adults, taking 6 to 9 medications is associated with a **59 percent greater chance of death** compared to taking no medications. Taking 10 or more medications is associated with a 96 percent greater chance of death.[14]

Medication adherence — i.e., taking medications as prescribed — decreases as the number of prescriptions increases: about 80 percent of patients on one medication take them as prescribed, compared to just 51 percent of patients on four or more medications.[22] Ironically, when patients are overburdened by prescriptions, they may neglect critically important drugs, which can lead to a deterioration in health and a decline in quality of life.[23]

Patients taking multiple drugs are also burdened by the financial cost. Although most older people in the U.S. have prescription drug coverage under Medicare Part D, many still have trouble with out-of-pocket medication expenses; in 2015, more than 40 percent of adults over 50 indicated in a survey that they were concerned about being able to afford their medications.[24] High costs can lead to non-adherence and anxiety. People may ration their medications, which in turn can create even more medical problems.[25]
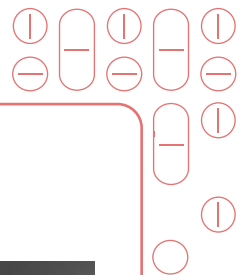
A week's worth of medication for a 92-year old patient, before and after deprescribing.

Photo reprinted with permission from Dr. David Alldred

Medications Most Likely to Cause Harm

Three classes of drugs contribute to 60 percent of emergency room visits for adverse drug reactions among older adults.[15]

Blood Thinners

Blood thinners such as aspirin or warfarin can cause severe bleeding, which can be life-threatening.

Diabetes Medications

Diabetes medications such as insulin or gliclazide can cause low blood sugar in older adults, increasing risk for falls, fractures, confusion, seizures, and hospitalization.

Opioids

Opioids prescribed to treat pain in older adults can be habit-forming and can lead to sedation, falls, cognitive impairment, and motor vehicle accidents.

Other classes of drugs have been shown to increase the potential for harmful side effects.

Sedative Hypnotics

Sedative hypnotics such as benzodiazepines (anti-anxiety medications) and many sleep medications, as well as antidepressants, increase the risk of falls, fracture, cognitive impairment, and other adverse effects.[18, 19]

Over-the-Counter Drugs

Many commonly used over-the-counter drugs, including bladder medications and antihistamines have anticholinergic properties. These medications can cause hallucinations, confusion, tachycardia, dry eyes, and other adverse effects, which become more pronounced at higher doses and in combination with each other.[20, 21]
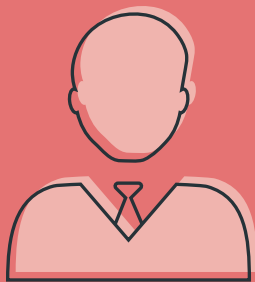
Blood Pressure Medication

Blood pressure medications, especially when used at high doses or in combination, can lower blood pressure too much and lead to falls, cognitive impairment, and other adverse effects.[16]

Antipsychotic Drugs

Antipsychotic drugs can lead to delirium, cognitive impairment, drug-induced movement disorders, and metabolic disturbances.[17]

"At the end of his life, Joe was taking over 20 medications and 31 pills a day, but not one physician saw this as a problem worth addressing."

Patient Story

Killed by a Prescription Cascade

How did Joe Esposito go from a man in remarkable health, effortlessly running half marathons in his 50s, to being debilitated and incapacitated, struggling at death's door, in just a few years? When Joe sought treatment for his mild to moderate Crohn's disease, his list of medications cascaded from one to six to twenty, as each new medication brought on a new side effect.

The steroids he was prescribed to treat Crohn's led to bone loss and anal fistulas. He was given antibiotics for the fistulas, which caused peripheral neuropathy in his feet. He couldn't sleep from the pain so he was prescribed benzodiazepines and Ambien for sleep, Lyrica for the nerve damage, and Tramadol for the pain. Several of the drugs gave him severe diarrhea. To treat his diarrhea, he was given opium drops, and other medications. Additional drugs weakened his kidneys, which in turn raised his blood pressure, so he was put on four blood pressure medications. And an experimental anti-inflammatory drug led to Joe contracting pericardial tuberculosis, which almost killed him.

At the end of his life, Joe was taking over 20 medications and 31 pills a day, but not one physician saw this as a problem worth addressing or even considered that his symptoms were caused by the drugs and not the Crohn's disease.

Story originally told by Joe's wife, Gayle Esposito

Prevalence of polypharmacy and medication overload:
## The "new normal"

The 21st century has already become the Era of the Prescription. In 2000, half of adults in the U.S. were taking at least one prescription drug; by 2012, that number had grown to nearly 60 percent.[26] Not only are more people taking prescription drugs, they are taking a greater number of drugs. From 2000 to 2012, the proportion of adults in the U.S. taking five or more drugs nearly doubled, from 8.2 percent to 15 percent.[26]

Prescription drug use has become the "new normal" for people of all ages, but especially older people. About 90 percent of people in the U.S. over age 65 take at least one drug; 42 percent take five or more drugs; and at least 18 percent take ten or more drugs per month.[4, 27]

From 1994 to 2014, the proportion of older adults taking five or more drugs tripled, from 13.8 percent to 42.4 percent.[4] Including over-the-counter medications and supplements, 67 percent of older people regularly take five or more drugs.[5]
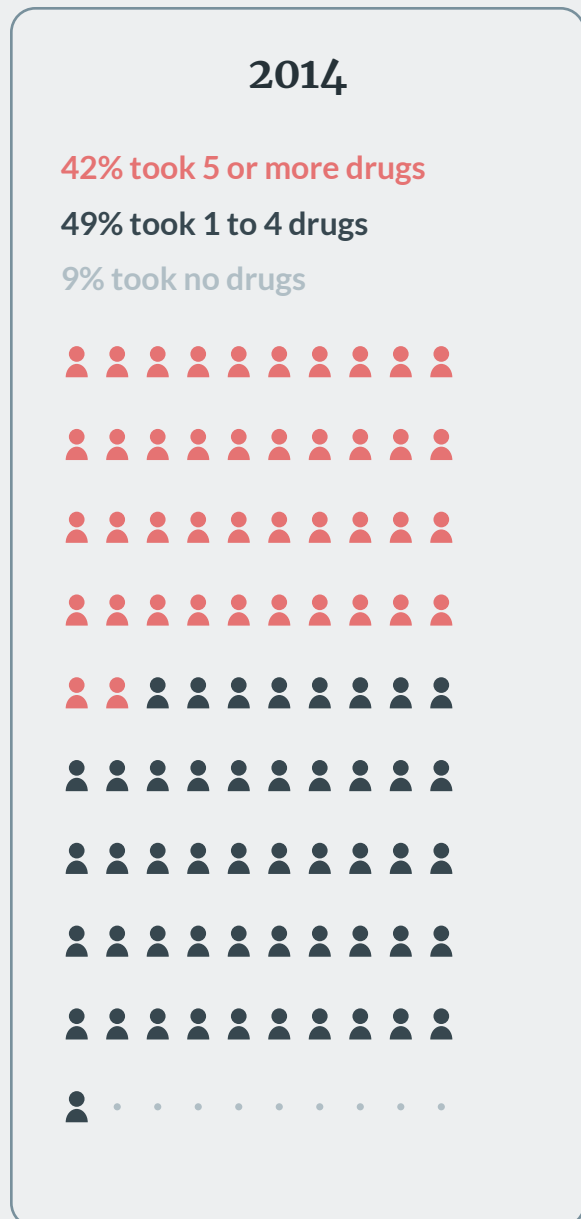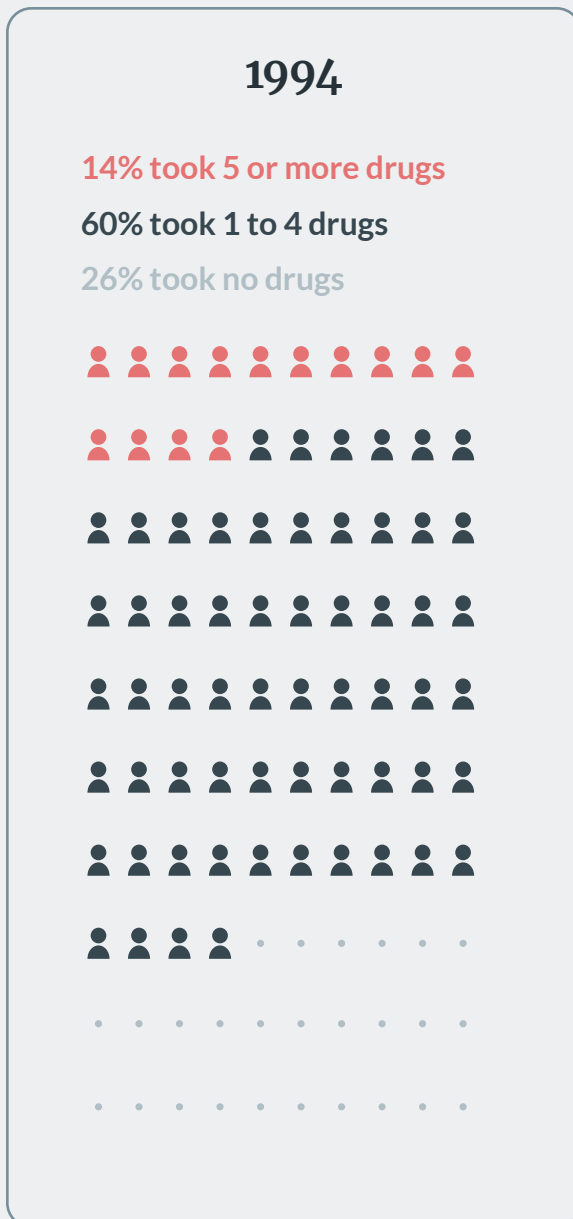
Groups with higher risk of medication overload

- **Long-term care residents:** The rate of polypharmacy is 40 to 50 percent higher for residents in long-term care facilities, compared to older adults living in the community.[28]

- **Cancer patients:** As many as 84 percent of older cancer patients are taking five or more medications. [29, 30]

- **Low-income seniors:** People who are dual-eligible for Medicare and Medicaid have a 25 percent higher rate of chronic conditions, increasing their risk for medication overload.[31]
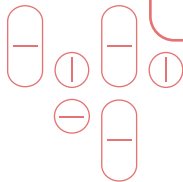
The Increasing Prevalence of Polypharmacy

From 1994 to 2014, the proportion of older adults taking five
or more drugs tripled, from 13.8 percent to 42.4 percent.

1994

14% took 5 or more drugs

60% took 1 to 4 drugs

26% took no drugs

2014

42% took 5 or more drugs

49% took 1 to 4 drugs

9% took no drugs

The Rising Tide:
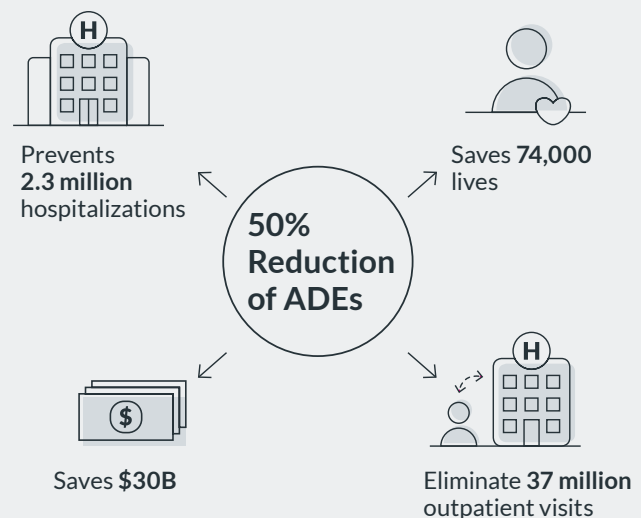# Projections of Future Prevalence and Harm From Medication Overload

Without swift action to reduce medication overload, we face a severe public health crisis in the near future. The rates of prescription drug use and adverse drug events have both increased dramatically over the past decade. Additionally, the U.S. population is rapidly aging, putting at least 20 million more people at risk of medication overload over the next decade.[32]

If nothing is done, adverse drug events will be responsible for at least 4.6 million hospitalizations of older people in the United States over the next decade. These hospitalizations will cost taxpayers, patients and families an estimated $62 billion, and lead to nearly 150,000 premature deaths. Additionally, we can expect 74 million outpatient visits as a result of older adults experiencing adverse drug events *(see Appendix A, p. 40)*.

The aging of America is inevitable, but we can lessen the potential harms of ADEs by reducing medication overload. If we could reduce the rate of ADEs by 50 percent, we would prevent about 2.3 million hospitalizations, saving 74,000 lives and $30 billion, and reduce the number of outpatient visits for ADEs by 37 million between 2020 and 2030.

What if we could reduce ADEs by 50%?

If we could reduce the rate of ADEs by 50 percent, we would prevent about 2.3 million hospitalizations, saving 74,000 lives and $30 billion, and reduce the number of outpatient visits for ADEs by 37 million between 2020 and 2030.

Prevents **2.3 million** hospitalizations

Saves **74,000** lives

50% Reduction of ADEs

Saves **$30B**

Eliminate **37 million** outpatient visits

Patient Journey

Meet Gary. He lives with his wife in Akron, Ohio. He's a retired teacher and loves fishing.

At age 65, Gary is prescribed medication **for high blood pressure** and **high cholesterol**.

At age 72, Gary is diagnosed with type 2 diabetes and prescribed **medication to control his blood sugar**.

Intervention

Doctor explains both medication and lifestyle-change options. **Gary opts to try lifestyle changes first**.

Updated guidelines put Gary's blood pressure in a higher risk category, and he is prescribed another **blood pressure medication**.

Intervention

Doctor notes that older patients like Gary may fall outside the new guidelines. They discuss the risks and benefits of a new medication and **decide NOT to prescribe**.

Gary feels light-headed and falls at the grocery store, **breaking his leg**. At the hospital, he is prescribed an **opioid for his pain**.

Intervention

Doctor understands the risks of opioids and **chooses ibuprofen instead**. The **primary care doctor is informed** about the fall and new medication.

Gary has trouble sleeping and feels depressed. The primary care doctor, unaware of the opioid prescription, prescribes **meds for sleep and depression**.

Intervention

Doctor talks with Gary and learns his brother has died. She refers him to a **grief counselor** and **provides sleep hygiene information**.

Gary gets the flu and becomes **dehydrated**, making him more susceptible to drug side effects.

Dizzy and confused, Gary rear-ends the car in front of him at a stop light. His family believes he is showing **signs of dementia** and may not be safe at home.

With his medication overload undetected, **Gary is placed in a nursing home and dies 5 years later.**

Suspecting medication overload, the doctor performs a **prescription checkup** and deprescribes unnecessary meds. **Gary lives 10 more years at home.**

Drivers of Medication Overload

No single cause explains the dramatic rise in the number of medications older people are taking. Rather, a broad array of forces is at work, with three overarching aspects of our health care system contributing to the epidemic of medication overload:

A Culture of Prescribing
The culture of prescribing has convinced patients and clinicians that there is a "pill for every ill."

Information and Knowledge Gaps
Clinicians and patients lack critical information and skills they need to appraise the evidence and make informed decisions regarding medications.

A Highly Fragmented System of Care
Our fragmented health care system, with its multiplicity of health care professionals in a variety of settings, leads to more — and more inappropriate — prescribing.

Culture of Prescribing

Twenty years of advertisements linking prescription medications to happiness and health, the increased medicalization of normal human aging and experiences, the hurried pace of medical care, and a desire on the part of both health care professionals and patients and their families to "do something" have together fostered a shared expectation that there is a "pill for every ill." Multiple factors shape this culture of prescribing and it, in turn, influences the way clinicians and patients think about drugs.

Prescribing is kind

Studies have found that both clinicians and patients think of prescribing medications as "kind." Getting a prescription validates patients. At the same time, health care professionals feel gratified they have done something to help.[33]

Prescribing is a "quick fix"

Prescribing is faster and easier than addressing lifestyle factors that contribute to chronic illness, such as lack of exercise, smoking, and alcohol use.[34] Health care professionals may not feel they have the time to discuss lifestyle changes with patients (who may not be open to these changes), or that they are adequately reimbursed to do so. In many cases, clinicians turn to (or patients expect) medications as a "quick fix" for illness or the symptoms of aging, without paying attention to, or being aware of, the potential for harm associated with taking too many.[35, 36]

Direct-to-consumer advertising

Marketing also contributes to the culture of prescribing. The U.S. is one of only two countries that allows direct-to-consumer pharmaceutical advertising that includes product claims. Drug makers spent $6 billion on advertising to patients in 2016, a more than four-fold increase since the late 1990s.[37] These advertisements, which bombard consumers, heavily promote the benefits of medications while using long, fast-spoken (or small-print) descriptions of harms. In one study of drug advertisements aired in 2015 and 2016, not a single one included a quantitative presentation of the risks.[38] This lack of context leads viewers to overestimate the benefits of drugs while underestimating the potential harms.[39]

Direct-to-consumer advertisements are also used to redefine normal, everyday symptoms as medical conditions that require pharmaceutical treatment. Known as medicalization, this process contributes to the culture of prescribing.[40-42] Over the past few decades, drugs have become the first line of treatment for common conditions such as sleeplessness, back pain, and acid reflux, replacing effective non-pharmacological therapies. For recently identified "conditions," medicalization is often the prelude to extensive marketing campaigns for prescription drugs to treat the new "disorders."[42] Medicalization essentially creates the "ill for every pill."

Marketing to doctors

The drug industry also markets heavily to health care professionals, spending more than $20 billion a year on face-to-face promotion, free samples, promotional meetings, continuing medical education, and other marketing activities.[37, 43] While the industry is not allowed to market drugs for unapproved conditions, companies often fund studies designed to prove their efficacy for common ailments.[44] Subsequently published abstracts and papers act as a marketing blitz, telling prescribers that medications are safer, more effective, and appropriate for a larger population of patients than they actually are.[45–47]

Primed for prescriptions

The trend of increasing medication use among older adults has contributed to its normalization. As more and more older people take multiple medications, younger people come to expect that they, too, will need numerous drugs when they grow older. Thus, we are "primed" to take multiple medications and are less likely to question our clinician when offered a prescription.[48, 49]

> "In this culture, accepting the inevitability of multiple drug use is an essential part of learning to be old."
>
> — **Margaret Cruikshank**
> Author, *Learning to Be Old: Gender, Culture, and Aging*

> "Starting a drug is like the thrill of marriage and stopping it is like the agony of a divorce."
>
> — **Doug Danforth**
> Pharmacist, Vancouver, British Columbia

Information and Knowledge Gaps

Clinicians and patients lack critical information and skills they need to appraise the evidence and make informed decisions regarding medications.[50] From medical school to residency to continuing medical education (CME), nowhere is learning about the dangers of excessive prescribing a mandated, formal part of the curriculum for physicians. The same is true for nurses, physician assistants, and other health professionals.

Lack of training

During the years that physicians, nurses, and pharmacists spend in training, they are rarely taught how to proactively monitor for and avoid medication overload, or how to pause or stop medications. Students and trainees also get scant training in how to adjust treatment for older adults — for example, using lower doses or watching for side effects that can masquerade as disease symptoms.[51, 52] As a result, clinicians often feel unprepared or unqualified to discontinue medications for their patients. Trainees who wish to prescribe less may feel pressure to follow the practice patterns at their institutions set by more senior clinicians, even when these are not based on evidence.[53]

Research gaps

Although the body of research on medication overload is growing fast, many gaps in our knowledge remain *(see Gaps in the research: Unanswered questions, p. 32)*. There is scant information about interactions between drugs in older patients. For health care professionals who are aware of the dangers of medication overload, and who would like to reduce the number of drugs their patients are taking, few guidelines are available for how to do so safely.[54]

> "If I lower my patient's blood pressure [to the point where] they fall and break their hip, I still get paid. But if their blood pressure is above the target, I fail the guideline."
>
> — **Andy Lazris**
>   Primary care doctor, Columbia, MD

Inadequate clinical guidelines

Doctors and other prescribers generally turn to clinical guidelines for guidance in treatment decisions. These guidelines, which are created by physician professional societies, are based on studies of selected patients, who are often younger, healthier, and have fewer chronic illnesses than the patients who will end up being treated. Thus, guidelines routinely do a poor job articulating the risks of medication-related interventions in patient groups (e.g., older adults) not well-represented in clinical studies.[54]

Guidelines often recommend prescribing medications as the first line of treatment and "stepping up" drug regimens when the first effort does not succeed. This often involves higher doses and/or additional medications without consideration of the patient's age, health, disease trajectory, or overall drug burden.[54, 55, 35] Guidelines rarely offer advice about lowering doses for older patients ("stepping down" therapy), considering the total number of drugs a patient is on, or considering stopping a medication.

Health care professionals often feel compelled to follow guidelines, even when they know the guidelines may not be entirely appropriate for the individual patient.[53] Insurers use clinical measurements laid out in guidelines, such as optimal blood pressure readings or cholesterol levels, to set performance standards for physicians and other prescribers. These performance standards are linked to payment and can push health care professionals to prescribe additional drugs, or higher doses to achieve the clinical goal — even when that goal runs counter to that patient's quality of life and even safety. For example, following blood pressure guidelines too diligently can lead to multiple prescriptions that can make older people dizzy and prone to falls *(see Clinician story: Hitting the target but missing the mark, p. 21)*.

Industry influence

The pharmaceutical industry contributes to the lack of reliable information on medications by influencing clinical drug trials (studies involving human subjects). The majority of clinical research is paid for by drug companies, which often design the trials themselves to increase the potential for positive outcomes. Companies also hire medical writers to spin results in ways that highlight the benefits and downplay potential side effects.[57–59] Industry money plays a role in clinical guidelines as well; many of the professional societies that publish guidelines rely heavily on industry funding, giving them less incentive to promote a culture of deprescribing.[60, 61]

> "When Manuel arrived at our clinic, he did not look like a man who two months earlier had been golfing three times a week."
>
> **— Dr. Deepa Ramadurai**
> Internal medicine resident, University of Colorado

Clinician Story

Hitting the Target But Missing the Mark

When Manuel* arrived at our clinic, he did not look like a man who two months earlier had been golfing three times a week and was able to take care of his young grandchildren. He said he was fatigued all the time and often dizzy.

After looking at Manuel's medical record and hearing his story, I had a hunch that polypharmacy was the cause of his symptoms. Considering his age and increased risk factors for heart attack and stroke, it was possible that his previous doctor had increased his blood pressure medications, which can cause lethargy and dizziness.

Despite the potential adverse side effects, older patients are regularly given these medications because physician guidelines recommend more aggressive treatment of high blood pressure for all patients, no matter their age or other conditions.

Sure enough, Manuel's previous doctor had added more medications to his regimen a few months ago to try to lower his blood pressure. He was on four different blood pressure medications — a beta blocker, a vasodilator, a calcium channel blocker, and an angiotensin receptor blocker.

We created a plan based on Manuel's risk profile to gradually taper and eventually discontinue two of the hypertension drugs he was on. Once he stopped taking these drugs, his symptoms of lightheadedness and fatigue stopped completely. His blood pressure also remained stable over the following year.

(*not patient's real name)

Fragmented System of Care

Lastly, our fragmented health care system, with its multiplicity of health care professionals in a variety of settings, leads to more — and more inappropriate — prescribing. Too often, no single clinician or team is coordinating care and keeping track of all of a patient's prescriptions. Moreover, individual clinicians often have inadequate time to sort through medications and remove those that are burdening the patient.

Lack of teamwork

With health care delivery in the U.S. increasingly specialized, primary care clinicians struggle to serve as the single provider keeping watch over the whole patient.[62] Rather, each specialist treats each condition a patient has separately, often without knowing or considering what other conditions the patient has or what medications they are already taking. This problem particularly affects older adults, who are more likely to have multiple chronic illnesses and see multiple clinicians.[63, 64]

Care transitions

Inappropriate prescribing is made even worse during transitions to and from hospitals, rehabilitation centers, or nursing homes.[35] In the hospital, patients are often given drugs to treat an acute, temporary condition. Even if these prescriptions are meant to be short-term, they are frequently continued after patients are released from the hospital.[65]

During transitions to residential care settings (e.g., nursing homes), understaffing, lack of familiarity with the patient's medical history, and lack of coordination among clinicians may lead to medication increases. For older adults with cognitive issues, the transition from hospital to long-term care can be destabilizing and upsetting, prompting the use of antipsychotics — one of the most commonly misused class of drugs in nursing homes — to calm the resident.[55] Despite campaigns to improve nursing home care, such as the CMS National Partnership to Improve Dementia Care in Nursing Homes *(see U.S. public policies related to medication overload, p. 34)*, these drugs continue to be used to sedate patients who are troublesome or disruptive.[66]

Poor EMR design

The lack of communication among health care professionals is exacerbated by inadequate and poorly designed technology. Electronic medical records (EMRs) have been in place in the health care system for several decades but are still frustratingly clunky and difficult to use for clinical purposes (as opposed to billing purposes, for which they were designed). EMRs lack "interoperability" — i.e., different EMR systems don't communicate with each other — making it difficult for clinicians to see what medications others have prescribed for their patients, and for what conditions.[67, 68]

Prescribing cascade

As a consequence of specialization and fragmentation, many patients have no single health care provider who knows all of the drugs the patient is on, or why they were prescribed. This makes it difficult for any clinician to take into account the cumulative effect of multiple prescriptions and the potential harm that adding one more may cause. Often, clinicians prescribe drugs to treat what appears to be a new condition or the exacerbation of an existing one, when in reality they are treating a side effect of a drug. When the newest drug causes a new side effect, another clinician may write yet another prescription, causing what's known as a "prescribing cascade," which can be more dangerous than the disease itself *(see Patient story: Killed by a prescribing cascade, p. 11)*.

Source: www.goneintorapture.com
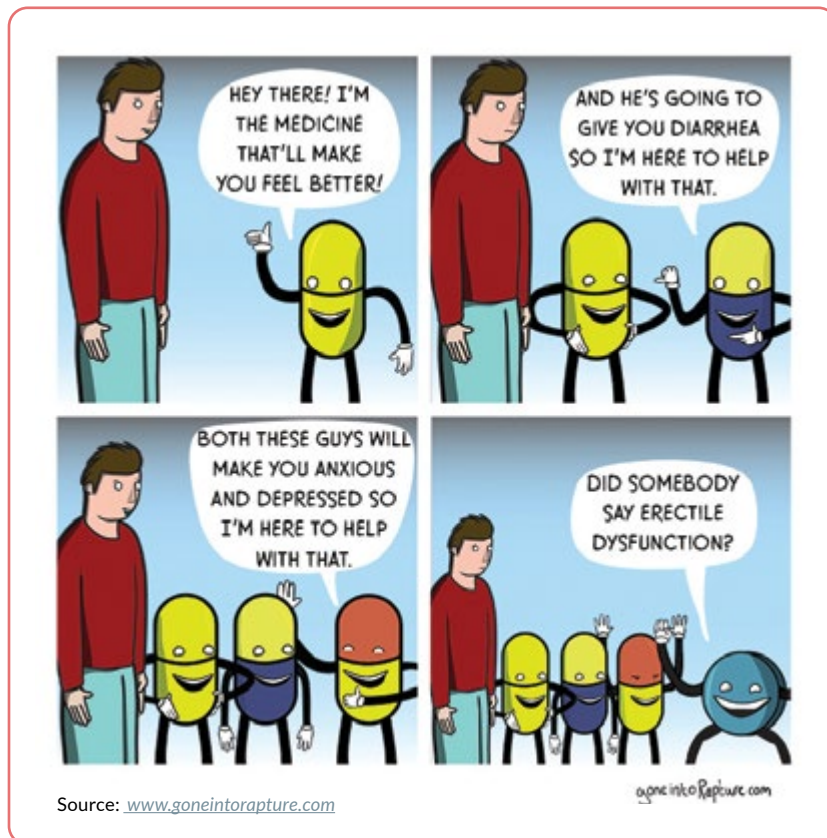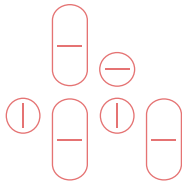
"She was now on 9 drugs.
'Not very many,' we were told."

— **Johanna Trimble,**
Patient Champion, Patients for Patient Safety Canada
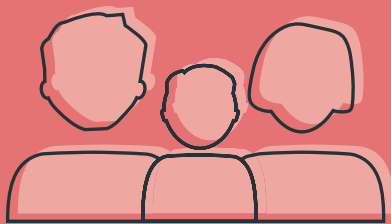
Family Story

A Failure to Communicate

Except for minor forgetfulness, our mom had no signs of mental decline and was living independently in a senior's complex. At age 87, she was admitted to the attached "Care Facility" to recuperate after an episode of dehydration, flu and weakness.

However, her mental health unexpectedly worsened. She was confused, sometimes unable to recognize us or was often "sleeping" and difficult to rouse. She was now on 9 drugs. "Not very many!" we were told. She had been put on several new ones.

After researching what we saw and heard from her about her condition, we concluded that harmful side effects of drugs were probably the problem (most likely, serotonin syndrome from citalopram and tramadol, which can be fatal). A psychiatrist had meanwhile made a diagnosis of vascular dementia and suggested another drug. The family did not believe the diagnosis and refused to add yet another drug.

Research in hand, we finally got her medical team to meet with us, presented what we'd found and they agreed to a "drug holiday." Mom recovered completely, cognitively, but loss of mobility and function meant the end of independent living. She had been bedridden too long.

She lived another four years with wisdom and grace and this was her legacy to us. If she had died four years earlier, she would have died not even recognizing us. As a family, watch carefully and act fast if suspecting a drug problem.

Barriers to discontinuing or pausing medications

Many of the factors in health care that foster excessive prescribing also hinder efforts to "deprescribe," or discontinue medications that are no longer necessary or potentially harmful. Experts generally agree that older adults who take one or more drugs on a long-term basis should have an annual review of their medications, or prescription checkup.

A prescription checkup involves (a) reviewing a patient's list of medications and the reasons they were prescribed and (b) reducing the dose, or stopping or pausing those that are ineffective or harmful. In practice, prescription checkups and efforts to deprescribe have been extraordinarily difficult to implement, often because the factors that promote excessive prescribing also serve as barriers to discontinuing medications. For example:

Lack of awareness

The most significant barrier to prescription checkups and addressing medication overload is many health care professionals are simply unaware of the prevalence of the problem.[33, 34] They anticipate benefits and miss side effects, even serious side effects such as delirium and dizziness, which can masquerade as symptoms of underlying medical conditions.

Lack of time and information

Primary care clinicians are often reluctant to review patients' medications because it takes time, for which they are often inadequately compensated, especially for patients with multiple chronic illnesses, multiple physicians, and numerous prescriptions.[55, 64] Clinicians who do take the time are hindered by inadequate information. When patients bring their medications in for review (sometimes called a "brown bag" session), the health care professional often does not know when the patient started taking the medication or for what condition, because this information is not printed on the medication label and is not readily available in the EMR.[69]

Fear of causing harm or discomfort

Many clinicians fear that discontinuing medications will cause harm. They know that some drugs, such as opioids and benzodiazepines, need to be tapered, but they may be unfamiliar with the process. In addition, primary care clinicians are often reluctant to discontinue a drug previously prescribed by a specialist. They also worry that discontinuing a medication can be misinterpreted by patients as "giving up."[34, 64, 70]

Interventions to address medication overload

The medication overload afflicting millions of older adults is a complex problem, with many causes and agents and no easy fix.

As such, we need a holistic, multi-pronged set of policies, regulations, and payment models, as well as changes in both the training and practice habits of health care professionals. All payers, but particularly Medicare, Medicaid, private insurers, and the Veterans Administration, have a role to play in tackling this problem. A comprehensive set of solutions must include interventions to help prevent excessive prescribing as well as interventions to promote judicious discontinuation of medications that are inappropriate, potentially harmful, or no longer necessary.

Solutions must address the three main drivers described previously: the culture of prescribing, information and knowledge gaps, and our fragmented health care system. In this section, we discuss current efforts and potential interventions to reduce the number of people put at risk by taking too many prescription medications.

Impact and Feasibility of Interventions

Culture of Prescribing	Impact	Feasibility
Launch public service campaigns for both health professionals and non-professionals to increase awareness of medication overload	👤👤	▬▬
Empower patients and families by promoting the use of patient decision aids and shared decision making	👤👤👤	▬▬
Reduce pharmaceutical industry influence by limiting industry marketing to health professionals and direct-to-consumer advertising	👤👤👤	▬

Information and Knowledge Gaps	Impact	Feasibility
Ensure that clinical guidelines take into account patient age and comorbidities, and whenever possible, include recommendations for stopping medications	👤👤👤	▬▬
Further develop & disseminate deprescribing guidelines to help clinicians and pharmacists know how to deprescribe safely	👤👤	▬▬
Include training on appropriate prescribing and deprescribing for all students/trainees, as well as continuing medical education training for health professionals	👤👤👤	▬
Continue research on medication overload and deprescribing to fill research gaps	👤	▬▬▬

Fragmentation of Care	Impact	Feasibility
Implement team-based care models in hospitals and clinics, incorporating pharmacists into care teams when possible	👤👤	▬
Give primary care providers adequate time and information to do prescription checkups	👤👤👤	▬
Make electronic medical records more user-friendly and fully interoperable, so patients and providers can easily access a full list of patients' medications	👤👤	▬
Implement patient-centered prescription checkups periodically and during care transitions	👤👤👤	▬▬

Address the Culture of Prescribing

Transforming the culture of prescribing — where clinicians and patients reach for a pill as the easiest solution — is no easy task. Ultimately, we need to bring this crisis into the open by raising public and professional awareness, countering the influence of the pharmaceutical industry, and changing the way patients and their clinicians make decisions regarding treatment choices.

Public health campaigns aimed at increasing awareness of the dangers of excessive prescribing are needed to foster conversations among health care professionals and with their patients and families. Both the Centers for Disease Control and Prevention, the nation's premier public health institute, and the Centers for Medicare and Medicaid Services (CMS), as the nation's biggest payer, have a role to play in campaigns directed at the public, patients, families, and at health care professionals. Health systems and private insurers could also create awareness campaigns for their patients. The overprescribing of medications and the harms arising from it is a public health problem on the scale of the harms of tobacco smoking and considerable resources and time will be needed to address it.

Several groups and institutions have conducted campaigns to increase patient awareness of the risks associated with taking multiple medications and encourage conversations about deprescribing. The EMPOWER campaign, conducted by researchers at the University of Montreal and the Canadian Deprescribing Network, mailed informational brochures to older patients taking a benzodiazepine to encourage them to ask their doctor about tapering. The campaign led to a 22 percent greater reduction in benzodiazepine use among older adults after six months, compared to a control group.[74]

Public health campaigns will be more successful in changing prescribing behaviors if they also engage pharmacists and clinicians.[74, 76] In the EMPOWER study, 33 percent of patients who did not taper their medications reported being discouraged in doing so by their doctor or pharmacist.[74, 77] Teaching young prescribers some basic principles for conservative prescribing could also reduce medication overload.[96]

What is Shared Decision Making?

In recent years, clinicians and patients have embraced shared decision making as a critical element of a trusting clinician-patient relationship. In this process, clinicians ask patients about their goals and values rather than assume them, inform patients of the potential harms and benefits of their various treatment options, and invite patients to be active participants in their health care decisions.[71] Often, patients are able to learn about their treatment choices from "patient decision aids," which are cards, brochures, videos and other means of conveying in simple, clear terms the essential information they need to be able to make an informed decision.

Despite its power to improve care, shared decision making has been difficult to implement in practice. Few clinicians elicit patient concerns before making treatment decisions, and clinicians who do ask patients about their goals often interrupt patients within a matter of seconds.[72] Other studies show that clinicians fail to include an adequate explanation of the potential harms and benefits when presenting treatment options.

Thus, while the shared decision-making movement is increasingly recognized as important, medical practices have a long way to go to integrate shared decision making into decisions about medications.

Empower patients and families

Patients and families are the ones most directly affected by prescribing decisions, yet too often health care professionals make treatment decisions unilaterally, without exploring the patient's goals, values, or preferences, or explaining the harms and benefits.[72] Similarly, patients and families are often the first to recognize a side effect that affects a patient's ability to function, but their observations may be dismissed or minimized by health care professionals.

Patients must be empowered to share questions and concerns regarding medications with their clinicians. Questions such as "When will we know the drug works?" and "How will we know when to stop it?" should be routine. Clinicians, in turn, should welcome such discussions. This practice, known as shared decision making *(see What is shared decision making?)*, must be integrated into health care practices through medical training and continuing education. In addition, decision aids for both patients and clinicians should be created, validated, and made widely available.[78]

Reduce pharmaceutical industry influence

The pharmaceutical and biotech industries strongly influence available evidence, research priorities, clinical guidelines, FDA regulation, and health care professionals' prescribing practices. They also influence patient and family perceptions of medications and drive demand for drugs that may not be appropriate. Many of the interventions that are needed to combat medication overload and promote prescription checkups would be more effective if they were coupled with efforts to counterbalance industry's influence. For example, in order to improve information at the point of care, medical societies creating clinical guidelines need to seek out sources of unbiased clinical evidence, preferably based on studies not funded by industry.

Short of banning direct-to-consumer advertising, there are ways to better inform consumers. For example, the FDA, which regulates drug advertising and testing, could require drug ads to explicitly state that medications have not been tested in those over the age of 65. The agency could also require pharmaceutical advertisements to include data on the absolute, as opposed to relative, benefit of the drug. Finally, the FDA could mandate that Phase III drugs trials include testing in older adult populations.

> "Some of the medications being advertised on television are weapons-grade drugs, with so many serious side effects they should only be rarely prescribed. No patient should be 'asking their doctor' about them."
>
> — **Alan Cassels**
> Journalist and author, Therapeutics Initiative,
> University of British Columbia

Fill Information and Knowledge Gaps

Improve information at the point of care

Physicians and other clinicians need better, more evidence-based clinical practice guidelines, both for prescribing and for conducting prescription checkups and discontinuing medications. Currently, most guidelines are developed by medical specialty societies and professional associations without input from primary care physicians, who are often under pressure to follow them. Involving primary care physicians in the development and writing process would help to improve the utility of these guidelines.

Guidelines need to provide clinicians with a clear and credible synopsis of the best available evidence, presented in a way that allows them to discuss risks, benefits, and harms of potential treatments with patients. (The Choosing Wisely initiative is one such example of balanced, evidence-based guidelines.) Prescribing guidelines should incorporate information on appropriate doses for older patients and stronger cautions against increasing medications prescribed for these patients.

International institutions, such as the National Health Service of Scotland and the Bruyére Research Institute in Ottawa, Ontario, have begun developing guidelines for deprescribing.[51, 79] These guidelines should be widely distributed, along with yet-to-be-developed deprescribing guidelines for all drug classes that are commonly overprescribed or implicated in ADEs. Those publishing deprescribing guidelines must also recognize and address the pervasive influence of drug manufacturers on clinician beliefs and the scientific evidence.
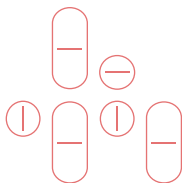
Changes to clinical practice guidelines?

Several key changes to clinical practice guidelines could help to eliminate bias toward the "average patient" and allow prescribers to better weigh the harms and benefits of medications for older patients. These include:

- Warnings of side effects for prescribing for older adults or those with specific chronic conditions
- Warnings regarding adverse drug reactions common for those taking multiple medications
- Information about when doctors should taper or stop medications

Educate and train health care professionals to avoid medication overload

With an aging population, all medical, nursing, and pharmacy students need greater competency in geriatric care. Especially important is understanding the risks of multiple medications for older adults with chronic conditions. This should be a priority for medical schools and health care accrediting bodies.

Additionally, medical, nursing, and pharmacy curricula need to incorporate explicit instruction in judicious prescribing, including using lower doses for older patients. Curricula must also help students learn to stop or pause medications safely by introducing them to evidence-based tools and methods of deprescribing *(see Appendix B for a list of evidence-based prescribing & deprescribing tools, p. 44)*. Post-graduate continuing education should also introduce and reinforce these skills.

Some universities are making these changes. For example, the University of British Columbia in Vancouver, Canada, includes prescription risks and deprescribing in the curriculum for first-year medical students and second-year pharmacy doctoral students.[48]

Fill research gaps

Many aspects of medication overload are poorly understood and require more research. A research agenda should include the financial impact of overmedication, the rates of harm associated with medication overload separate from the harm from multiple chronic conditions, the risks and benefits of deprescribing specific drugs in older adults, and evaluations of best practices *(see Gaps in the research: Unanswered questions)*. To avoid conflicts of interest, this research needs public support, including funding through public/private partnerships that do not involve the pharmaceutical industry.

Gaps in the research: Unanswered questions

- What proportion of adverse events and mortality is caused by polypharmacy, given that polypharmacy correlates with age and comorbidity? What are the harms of polypharmacy when we adjust for patient risk?
- How should prescribers adjust doses for medications used by older adults and for the subpopulation of older adults with frailty and multimorbidity?[51]
- What are the risks and benefits of deprescribing certain drugs? Does deprescribing reduce the rate of adverse events in older adults? What are the potential negative consequences of deprescribing?[51]
- For what drugs and in what populations does deprescribing work best?
- What are the most effective interventions for changing clinician behavior and facilitating prescription checkups?
- How can we successfully engage multiple stakeholders (doctors, nurses, pharmacists, patients, and families) in deprescribing initiatives simultaneously?
- What are the potential financial savings of deprescribing — for the patient and for the health system as a whole?
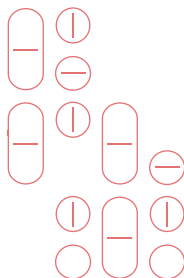
Reduce Fragmentation of Care

Foster communication and coordination of care

Innovations in health care delivery, such as integrated health systems and team-based models of care, are becoming more common and offer tremendous potential for improving care coordination and reducing excess prescribing. For example:

- The *Program of All-Inclusive Care for the Elderly* (PACE) provides an interdisciplinary team of health professionals for frail elders, to help them remain in the community rather than in the nursing home. Evaluations show that PACE participants take fewer medications overall and fewer anticholinergic medications than patients not in the program.[80]

- The Institute for Healthcare Improvement, in partnership with the John A. Hartford Foundation, has a *new initiative* called "age-friendly health systems," built around improving care for older adults by using evidence-based models across the care continuum. The program's "4M" bundle, which comprises "What Matters, Medication, Mentation, and Mobility," provides a guide for avoiding excess prescriptions and for deprescribing. The bundle is being tested by health systems around the country.

- The Kaiser Permanente (KP) health system integrates hospitals, physicians, and health insurance under the same systemwide EMR and global budget. With medical care integrated across care sites and medical records available to all clinicians, the KP system has emerged as a leader in addressing medication overload.[81]

Empower Primary Care Physicians

For integrated care teams to be effective, the primary care clinician (for a medication evaluation team, this also could be a pharmacist) must be the hub of a wheel, receiving all the necessary information and empowered to conduct regular prescription checkups and reduce dosages or discontinue medications as needed. To do this well, primary care clinicians or pharmacists need:

- Access to information about all the medications a patient is taking. EMRs have the potential to solve this problem but they must be fully interoperable and include not only patient's medications, but when the patient began taking the medications and the conditions for which they have been prescribed.

- Time to review the patient's goals and symptoms, and time to begin the process of tapering or discontinuing drugs that both patient and clinician agree are superfluous or potentially harmful.

- The ability to readily access support for non-pharmacological therapies. Sleeplessness, for example, can be treated using sleep hygiene techniques, such as avoiding stimulants close to bedtime and establishing a regular bedtime routine. EMR systems must be able to facilitate "prescribing" of these non-pharmacological therapies.

Implement routine prescription checkups

At several points along the patient journey, whether it's during or after a stay in the hospital, during a stay in rehabilitation facility or nursing home, or during a primary care visit, health care professionals need to periodically review all the medications a patient is taking and consider whether or not to stop one or more current prescriptions. A prescription checkup can be done not only in hospitals and clinics, but at retail pharmacies as well. For example, in some Canadian provinces, pharmacists are paid $80–$100 by their provincial governments to conduct 30–40-minute meaningful medication reviews in older adults, though a 2016 evaluation found little evidence that pharmacists were deprescribing through this program yet.[82]

Health care professionals have developed several approaches to prescription checkups, such as the CEASE Protocol, the Medication Appropriateness Index and the 10-step discontinuation guide *(see Appendix B for a longer list of deprescribing tools, p.44)*.[51, 83] These approaches are not as black and white as explicit "bad drug" lists (e.g., Beers Criteria), allowing clinicians and patients to take clinical circumstances and patient preferences into consideration during the decision-making process. These models show promise in reducing adverse drug events and the number of medications prescribed for older adults with multiple chronic conditions. However, they require a greater time commitment and more knowledge from practitioners than do lists of drugs to avoid.[51]
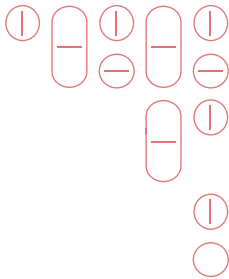
U.S. public policies related to medication overload

Accountable Care Organizations (ACOs)
As a result of the Affordable Care Act, nearly 500 ACOs are now serving 10 million Medicare and Medicaid patients. Clinicians, hospitals, and other health care professionals in an ACO are jointly responsible for their patients' health and are rewarded for meeting quality targets and avoiding unnecessary tests and procedures. ACOs provide many elements necessary for deprescribing, including electronic prescription transmissions and integrated pharmacy and medical records, and some ACOs that incorporate pharmacists have been successful at reducing inappropriate medications.[84, 85] However, most currently operating ACOs do not include pharmacists, and thus far, evidence does not indicate that ACOs as a whole are reducing excessive prescribing.[85–87]

Medication therapy management
Since 2006, the Center for Medicare and Medicaid Services (CMS) has required that all Part D plans include Medication Therapy Management (MTM) programs. MTMs are designed with the laudable goal of helping "improve medication use, reduce the risk of adverse events, and improve medication adherence."[87] However, these reviews are not designed specifically to reduce unnecessary medications, which may limit their effectiveness for deprescribing.[89]

Reducing Anti-Psychotic Use in Nursing Homes
In 2012, CMS launched an effort to reduce unnecessary antipsychotic use among nursing home residents with dementia. This multi-pronged initiative, including a national partnership of stakeholders and requirements to include antipsychotic use in public reporting, reduced antipsychotic use by 34 percent nationwide over five years. However, some research indicates that some nursing homes have replaced antipsychotics with other mind-altering medications. Changes in health outcomes such as falls and hospitalizations from the initiative have not been studied.[83]

> "I never realized how much medication management could make a difference in my life until someone fixed it."
>
> — **Michael Manganiello**
>   Partner at HCM Strategists

Patient Story

Living with HIV, Managing Medications

I never realized how much medication management could make a difference in my life until someone fixed it. I am a very active 60-year-old, and I am HIV positive so I have a cocktail of about 13 different medications I need to take each month. When my local community health center moved into a new building with an in-house pharmacy, my meds became impossible to manage. The prescribing times for my meds were out of sync, so I found myself having to go to the pharmacy every four days to refill one, spending nearly two hours a week in line.

One of my very effective antiviral medications was running out and it took me almost a week to be able to get it refilled. At that point I was practically in tears, begging the pharmacist to figure out the preauthorizations and refill the medication. The stress was starting to hurt my health and I was seriously considering leaving the health center.

Then the pharmacy created a new system, in which "high-utilizers" like myself were given one pharmacist to manage the group. Soon after, my medication refill times were perfectly synced up, so I only have to go to the pharmacy once a month. This new system has changed my life. I'm not stressed out anymore and I got so many hours back. People shouldn't have to think about their meds all day. It's hard enough every morning and night swallowing a zillion pills. It makes all the difference that I don't have to worry about my meds.

A National Strategy for Addressing Medication Overload

The U.S. has had limited success with a handful of policies related to medication overload *(see U.S. public policies related to medication overload, p. 34)*, but we continue to lag behind other high-income countries that are doing much more to directly address medication overload. Canada and Australia, for example, have established "deprescribing networks" made up of researchers, clinicians, pharmacists, and patient advocates who have come together to share information, draft strategies, and disseminate proven interventions to help clinicians stop or pause potentially dangerous or unnecessary medications.[90] The European Union's Health Program created a consortium of stakeholders from across the EU called Project SIMPATHY, to address the issue of excessive prescribing and medication non-adherence.[79] The two-year project produced a systematic review of EU polypharmacy policies, analyses of potential actions, case studies, and a website/app with tools for conducting medication reviews.[79, 91]

While our country has woken up to the severity of the opioid crisis, medication overload has not yet been fully recognized as another drug epidemic in need of a national response. To catalyze action on this critical issue, the Lown Institute and a working group of expert clinicians, pharmacists, researchers, health policy advocates, and patients have undertaken a year-long effort to draft a National Action Plan for Addressing Medication Overload. This plan will focus on the most urgent actions needed to combat this epidemic and the paths to implementing them. The plan's recommendations will include both upstream interventions intended to prevent excessive prescribing, and downstream interventions aimed at promoting regular prescription checkups and helping patients and families as well as health care professionals pause or stop harmful or unnecessary medications.

The National Institutes of Health (NIH) is reviewing applications for a multidisciplinary research network on deprescribing, which will be launched in 2019. This research is necessary and should be complemented by the establishment of a network of health care professionals, including clinicians, pharmacists and researchers, as well as patient and health reform advocates, who are committed to working together to drive rapid change. Such change is needed in current practices in acute care settings such as hospitals, doctors' offices, clinics, and long-term care settings such as care homes and skilled nursing facilities. Many health care professionals, patients, and advocates have expressed interest in establishing a North American medication overload network, but without funding and a means of collaborating, progress will be slow.

Conclusion

If nothing is done to change current practices, medication overload will lead to the premature deaths of at least 150,000 older people in the U.S. over the next decade, and it will reduce the quality of life for millions more.

Strong, coordinated, and immediate action is needed to stem the tide of this epidemic, which harms people of all ages, but especially older generations. We must address the pervasive culture of "more is better" in medicine, conduct needed research to provide better information at the point of care, and light a path to minimizing the number of unnecessary and potential harmful drugs patients are taking.

This report should serve as a clarion call to policymakers, regulators and legislators, along with health care professionals and patient advocates, to come together to create, adopt, and implement a national strategy for addressing this crisis. Such a strategy can build on the recommendations in the National Action Plan for Addressing Medication Overload, which will be released early next year, to create a thoughtful and inclusive framework for systemic change that will produce measurable and meaningful results.

Focusing on reducing inappropriate or unnecessary medications could save at least $60 billion over the next decade in unnecessary hospitalization for older adults alone. As a nation, we would also save billions more on the cost of unnecessary drugs and visits to the emergency room and outpatient clinics. More important even than the associated costs, successfully tackling the problem of medication overload holds the promise of lessening disability, cognitive decline, and time in the hospital for patients. That translates into better lives for millions of older people.

Appendices and References

Appendix A:
Calculating the harm from medication overload

To calculate estimates of harm from adverse drug events, we relied primarily on two sources:

- Shehab N, Lovegrove MC, Geller A. US Emergency Department Visits for Outpatient Adverse Drug Events, 2013–2014. *JAMA* 2016; 316(20): 2115–25.

- Bourgeois FT, Shannon MW, Valim C, Mandl KD. Adverse drug events in the outpatient setting: an 11-year national analysis. *Pharmacoepidemiology and drug safety 2010; 19(9): 901-10.*

These studies provide estimated rates of harm from ADEs for older adults in the U.S. The study by *Shehab et al.* includes estimated rates of emergency department (ED) visits and hospitalizations from ADE for older adults from 2005–2014. The study by *Bourgeois et al.* includes estimated rates of outpatient visits for ADE for older adults from 1995–2005. We acknowledge that the latter study relies on older data and may not be exactly representative of current practice. However, this was the best source we found that included the most recent estimate of outpatient visits caused by ADEs.

We chose these studies because they both use measurements of ADE that seek to capture *harm caused by medications* that were prescribed to patients, rather than simply hospital or outpatient visits with any ADE code present on admission. In the study by *Shehab et al.*, the rate of adverse events was determined through a search of clinical records of every ED visit to find any "clinician-diagnosed adverse drug events that are the reason for the ED visit." In the study by *Bourgeois et al.*, the authors measured the rate of "all ADE-related visits" using the surveys. The survey data for each visit include up to three reasons for patient visit, up to three physician diagnoses for visit, and "whether the visit is related to adverse effects of medical treatment, including adverse drug events." Both studies omitted ADEs caused by intentional overdose or use of illicit substances.

Table 1 below shows the estimated rates of harm from ADEs using data from *Shehab et al* and *Bourgeois et al.* 95% confidence intervals are provided.

Table 1: Current Estimates of Harm from ADEs

Year	Estimated number of older Americans	Estimated average rate of outpatient visits for ADE, per 1000 people	Estimated number of outpatient visits for ADE	Estimated average rate of hospitalization for ADE, per 1000 people	Estimated number of hospitalizations for ADE	Estimated average rate of ED visits for ADE per 1000 people	Estimated number of ED visits for ADE
2000	35,000,000	32.7 (CI 26.9-38.6)	1,144,500 (CI 941,500- 1,351,000)				
2005	36,800,000	48.8 (CI 39.1-58.5)	1,795,840 (CI 1,438,880- 2,152,800)				
2006	37,300,000			2.3 (CI 1.4-3.2)	85,790 (CI 52,220-119,360)	5.2 (CI 3.2-7.2)	193,960 (CI 119,360-268,560)
2008	38,900,000			3 (CI 2.1-3.9)	116,700 (CI 81,690-151,710)	6.8 (CI 4.7-8.9)	264,520 (CI 182,830-346,210)
2010	40,500,000			3.4 (CI 2.4-4.6)	137,700 (CI 97,200-186,300)	7.9 (CI 5.5-10.4)	319,950 (CI 222,750-421,200)
2012	43,200,000			4.1 (CI 3.0-5.4)	177,120 (CI 129,600-233,280)	9.5 (CI 6.8-12.2)	410,400 (CI 293,760-527,040)
2014	46,200,000			4.2 (CI 2.9-5.7)	194,040 (CI 133,980-263,340)	9.7 (CI 6.6-12.9)	448,140 (CI 304,920-595,980)

In Table 2 *(p. 43)*, we use the estimated rates of harm from the previously described sources to calculated estimated rates of harm in the future. Making these predictions required us to make a few assumptions. The rate of ED visits for ADE greatly increased between 2006 and 2012, but slowed suddenly between 2012 and 2014, the two most recent years we have data. We do not know whether this is an anomaly within a larger pattern of increasing harm from drug use, or whether it is the beginning of a slowdown in harm due to better safety procedures. To that end we provide two projections, one in which the pattern from 2006–2014 continues and ADEs increase at a greater rate (the "high estimate" in the chart), and one which shows a slower rate of increase commensurate with the last two years of available data (the "low" estimate in the chart).

For ED visits and hospitalizations, we ran two different regressions, one using all data points provided from 2006–2014, and one using just the final two data points provided. For outpatient visits, we ran one regression using the most recent data points provided in *Bourgeois et al*. For the x–values, we used the last one or two digits of the year (2012 became 12, for example). The trendline equations are included in the chart as well as 95% confidence intervals where applicable.

For estimates of U.S. population and population over the age 65, we used Census projections and estimates, and reports from the Health and Human Services (HHS) Administration on aging.[92-95] There were no estimates available for years between 2020 and 2030 except for 2025.

For estimates of cost and mortality from ADE hospitalizations, we used an analysis of adverse drug events in U.S. hospitals from the Hospital Cost and Utilization Project (Weiss AJ, Freeman WJ, Heslin KC, Barrett ML. Adverse Drug Events in U.S. Hospitals, 2010 Versus 2014. HCUP Statistical Brief #234. Rockville, MD: Agency for Healthcare Research and Quality; 2018.)

Weiss et al. found that the rate of mortality for adverse drug events present on admission was 3.2 percent in 2014 (for all ages). We applied this mortality rate to estimate the number of deaths from ADE–related hospitalizations (this is for all ages, so may underestimate mortality from ADE for older Americans). The average cost per hospitalization with ADE was $13,308. We acknowledge that the definition of ADE in *Weiss et al.* is different from that in the sources previously used; however, this was the only source we found that provided cost and mortality estimates from adverse drug event hospitalizations.

We believe that the "high estimate" scenario is more likely given that multiple medication use among older Americans has continued to increase over the past decade, which is why we have cited these estimates in the report. However, it is worth noting that our "low" estimate still predicts a serious 3 million hospitalizations from 2020–2030 at a cost of 100,000 lives and more than $40 billion.

We believe that more research needs to be done on projecting the rate of harm from ADEs and hope this preliminary analysis can help inform that future work.

Table 2: Projected estimates of harm from ADEs

Year	Estimated number of older Americans	Projected rate of outpatient visits for ADE	Projected number of outpatient visits for ADE	Projected average rate of hospitalization for ADE per 1000 people		Projected number of hospitalizations for ADE		Projected average rate of ED visits for ADE per 1000 people		Projected number of ED visits for ADE	
				Low Estimate	High Estimate	Low Estimate	High estimate	Low estimate	High estimate	Low estimate	High estimate
2006	37,300,000	52.0	1,939,600								
2008	38,900,000	58.5	2,275,650								
2010	40,500,000	64.9	2,628,450								
2012	43,200,000	71.3	3,080,160								
2014	46,200,000	77.8	3,594,360								
2016	49,300,000	84.2	4,151,060	4.3	4.9	211,990	241,570	9.9	11.3	488,070	557,090
2018	53,100,000	90.7	4,816,170	4.4	5.4	233,640	286,740	10.1	12.5	536,310	663,750
2020	56,051,000	97.1	5,442,552	4.5	5.9	252,230	330,701	10.3	13.7	577,325	767,899
2025	65,226,000	113.2	7,383,583	4.8	7.1	313,085	463,105	10.8	16.6	704,441	1,082,752
2030	73,138,000	129.3	9,456,743	5.0	8.3	365,690	607,045	11.3	19.5	826,459	1,426,191
Total (2008-2018)			36,540,400			1,908,980	2,074,340			4,405,740	4,798,660
Total (2020-2030)			74,276,262			3,103,348	4,669,503			7,027,418	10,922,804
Mortality (2020-2030)						99,307	149,424				
Cost (2020-2030)						$41,299,350,748	$62,141,745,924				
Trendline equation		$y=3.22x + 32.7$		$y=0.05x + 3.5$	$y=0.245x + 0.95$ (Slope CI 0.15-0.34)			$y=0.1x + 8.3$	$y=0.585x + 1.97$ Slope CI 0.36-0.81)		
r^2		1		1	0.96			1	0.96		

Appendix B: Evidence-based prescribing & deprescribing tools

Tools for careful prescribing

- **10-step framework for minimizing inappropriate medications** A conceptual framework for quality use of medicine, to reduce inappropriate prescribing. Developed in 2012 by clinicians at the Princess Alexandra Hospital in Brisbane, Australia.

- **The Absolute CVD Risk/Benefit Calculator** A tool to assess patient risk of cardiovascular disease, developed by James McCormack and a group of family physicians called the PEER team.

- **Beers Criteria** Criteria developed by a 13-member expert panel from the American Geriatric Society. Contains a list of drugs to avoid, drug-disease combinations to avoid, drugs to use with caution in renal impairment, and drugs with strong anticholinergic properties; does not contain information on alternative medications.

- **Best Science Medicine Podcast** A podcast created by Dr. James McCormack and Dr. Michael Allan, to promote healthy skepticism and critical thinking, with a case-based approach.

- **Choosing Wisely guidelines** Recommendations developed by the American Board of Internal Medicine Foundation with medical specialty societies to identify and reduce commonly overused tests and procedures.

- **The C-TOP Tool** A tool for comparing treatment options for pain, developed by the **PEER team** along with the **Physician Learning Program** and the **Alberta College of Family Physicians**.

- **Medication Appropriateness Index** An implicit prescribing quality measure developed in 1992 by Dr. Joseph Hanlon and colleagues at the Center for the Study of Aging and Human Development, Duke University Medical Center.

- **The NNT** Quick evaluations of the costs and benefits of common medications and therapies in an easy-to-understand format, by a group of independent physicians.

- **PADIS Guidelines** Evidence-based, patient-centered guidelines developed to prevent and manage pain, agitation, delirium, immobility, and sleep disruption in the ICU, developed by the Society of Critical Care Medicine.

- **Principles for more conservative prescribing** Evidence-based, patient-centered prescribing principles that can avoid medication overload.

- **Primary Health Tazmania Medicine Use Guides** A clinical tool with short guides to the use of medicines in older people for antidepressants, antipsychotics, and benzodiazepines.

- **Simplified lipid guidelines** A guideline for for lipid management and prevention of cardiovascular disease, written by physicians with no industry support.

- **The SPARC Tool** A great tool for going over the risks and benefits of preventive treatments for stroke, developed by **Dr. Peter Loewen**.

- **START and STOPP criteria for potentially inappropriate prescribing** If/then indicators for starting medication or stopping medication, developed by Dr. Denis O'Mahony and colleagues from the University of Cork, Ireland.

Tools for deprescribing

- **Canadian Deprescribing guidelines**
Evidence-based guidelines for deprescribing for five classes of medications: Proton pump inhibitors, Antihyperglycemic, Antipsychotic, Benzodiazepine Receptor Agonist, and Cholinesterase Inhibitors (ChEIs) and Memantine. Each guideline is accompanied by a **decision-support algorithm, patient pamphlet, infographic** and for some, a **whiteboard video** on how to use the algorithm. These guidelines were developed by researchers at the Bruyère Research Institute Deprescribing Guidelines Research Team and the Université de Montréal.

- **CEASE protocol**
Developed by members of the Australian Deprescribing Network.

- **Good Palliative-Geriatric Practice Algorithm**
Developed by Dr. Doron Garfinkel and Dr. Dee Mangin, for deprescribing in elderly nursing home patients and community-dwelling older adults.

- **MedSafer**
An electronic deprescribing tool that could help physicians and pharmacists through the process of safe and successful medication deprescription in older adults. Cross-references lists of patient conditions with home medication lists to provide electronically generated deprescribing reports based on Beers' criteria, STOPP rules, and Choosing Wisely recommendations. Available to link with EMRs and for use in nursing homes or long-term care facilities. Developed by independent Canadian researchers. Contact for different formats: emily.mcdonald@medsafer.org.

- **MedStopper**
An online tool to help clinicians and patients make decisions about reducing or stopping medications, based on their potential to improve symptoms, reduce the risk of future illness, and likelihood of causing harm. This tool is funded by a Knowledge Translation grant from the Canadian Institute of Health Information and is administered through the University of British Columbia.

- **PPI patient decision aid**
A tool to help patients decide whether they should keep taking their proton pump inhibitor (acid reflux medication), based on the Bruyère Research Institute Deprescribing Guideline.

- **Practical guide to stopping medicines in older people**
An article published in Best Practice Journal that contains specific guidance on safe tapering methods for specific drug classes

- **Primary Health Tazmania Deprescribing guides**
Short deprescribing tools for clinicians for 10+ drug classes, written by pharmacist Dr. Peter Tenni and geriatrician Dr. David Dunbabin, in consultation with a deprescribing clinical reference group for Primary Health Tazmania.

- **SIMPATHY Project**
A website containing resources from the European Union's SIMPATHY Project, a two-year project studying polypharmacy, led by the Scottish government.

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