Article

Patient-Oriented Policies To Reduce The Harmful Effects Of Medication On Seniors' Brain Function

Lori A. Daiello, PharmD, ScM^{1,2,*}, and Cara Tannenbaum, MD, MSc^{3,4}

¹Department of Neurology, Alpert Medical School of Brown University, Providence, RI. ²Alzheimer's Disease and Memory Disorders Center, Rhode Island Hospital, Providence, RI. ³Faculté de Pharmacie, Université de Montréal, Montreal, Canada.

⁴Canadian Deprescribing Network, Centre de Recherche, Institut Universitaire de Gériatrie de Montréal, Montréal, Canada.

*Address correspondence to Lori A. Daiello, PharmD, ScM, Alzheimer's Disease and Memory Disorders Center, Rhode Island Hospital, 593 Eddy Street, Providence, RI 02903. E-mail: lori_daiello@brown.edu

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Background

Memory loss and Alzheimer's Disease are widely cited as leading health-related worries among older adults, many of whom fear cognitive decline more than any other age-related condition (Cutler, 2015). These fears are non-trivial. Decline in cognitive function, which occurs on a continuum spanning normal age-related memory impairment to dementia, is associated with a host of well-documented negative implications for health, well-being, independence, and life expectancy. Medication side effects also rank high on older men and women's lists of concerns about healthy aging (Tannenbaum, 2012; Tannenbaum, Mayo, & Ducharme, 2005). There is a clear connection between the two: medication side effects can masquerade as memory loss and other symptoms of Alzheimer's disease (Gray, Lai, & Larson, 1999; Tannenbaum, Paquette, Hilmer, Holroyd-Leduc, & Carnahan, 2012).

For many seniors, a comprehensive evaluation of the contents of their medicine cabinet may identify commonly-utilized prescription and over-the-counter medications (Figure 1) that have been linked with varying degrees of cognitive toxicity. Psychoactive polypharmacy, the concurrent use of multiple medications that affect brain function, incurs an even greater risk of falls, cognitive decline, delirium, and death. Although medication-induced cognitive impairment can occur at any age, the risk is substantially higher in aging populations because of their diminished

brain and physiological reserves, increased prevalence of neurodegenerative diseases, greater burden of chronic illness, and high rates of polypharmacy.

Many strategies aimed at reducing cognition-threatening prescriptions have been developed (Motter, Fritzen, Hilmer, Paniz, & Paniz, 2018). The majority of these initiatives target either care processes (e.g., medication reviews); education of healthcare providers, primarily via dissemination of lists of "potentially inappropriate" medications; or a combination of these approaches. Broadly defined, medications or classes of medications designated as potentially inappropriate are those for which therapeutic benefits are outweighed by the likelihood of harm, especially if safer alternatives are available (Motter et al., 2018). Not surprisingly, psychoactive medications are prominently represented.

Have these approaches impacted the quality of prescribing? To date, longitudinal studies of psychoactive medication utilization among older adult populations provide no evidence for declining trends (Maust, Blow, Wiechers, Kales, & Marcus, 2017). Anticholinergics, benzodiazepines, sedative-hypnotics, tricyclic antidepressants, and opioid analgesics are increasingly prescribed for older adults. Moreover, the most recent U.S. study of psychoactive polypharmacy found that the number of outpatient physician visits involving older adults taking three or more psychoactive medications doubled between 2004 and 2013 (Gerlach, Olfson, Kales, & Maust, 2017).

Motivating Change: Cognition-Sparing Medication Management

The 2015 Institute of Medicine publication urges older Americans to take a proactive role in optimizing brain health through increased physical activity, improved cardiovascular health, and eliminating medications with side effects that impair brain functioning. This guidance regarding medication is notable, because it suggests a leadership role for patients, not prescribers, as initiators of cognition-sparing medication management.

Medication side effects are among the most modifiable risk factors for cognitive decline. The rapid growth of global aging, coupled with rising psychoactive medication utilization, indicates a need for innovative public health strategies aimed at effectively addressing this important barrier to healthy cognitive aging. In the following sections, we describe four patient-oriented strategies with potential to reduce the burden of medication-induced cognitive impairment among older adults.

Medication side effects are among the most modifiable risk factors for cognitive decline.

Launch a Screening Program for Seniors

Many governments offer national health screening programs to at-risk populations. The Danish government organizes preventive home visits for adults aged 75 years and older to mitigate social and functional decline. Canadian women aged 50–69 years are invited bi-annually for free mammography screening to detect breast cancer. Why shouldn't a national deprescribing program exist for seniors at risk of medication-induced cognitive impairment?

A national deprescribing program would consist of bi-annually mailing educational information to community-dwelling seniors that invites them to initiate a conversation with their healthcare provider about discontinuing prescriptions that increase the risk of memory deficits and falls. Individuals consuming medications known to cause cognitive impairment (Figure 1) would be identified through drug insurance claims or national healthcare coverage. The invitations could be personalized, and highlight the culprit drug(s) taken by each individual.

Implementation of a national deprescribing screening program aligns with an individual's basic rights and freedoms to provide informed consent prior to receiving potentially dangerous medical therapies. Deprescribing, defined as the cessation or dose reduction of medications that may cause more harm than benefit and for which safer alternate therapies exist, should only occur after shared decision-making with the patient. The goal of the screening program would be to encourage seniors to initiate a deprescribing

<i>Anticholinergic</i>	
<i>Antihistamines</i>	<ul style="list-style-type: none"> · Chlorpheniramine · Diphenhydramine · Hydroxyzine · Meclizine
<i>Antiparkinsonian</i>	<ul style="list-style-type: none"> · Benztropine · Trihexyphenidyl
<i>Antispasmodic</i>	<ul style="list-style-type: none"> · Dicyclomine · Hyoscyamine · Propantheline · Scopolamine
<i>Central Nervous System</i>	
<i>Antidepressants</i>	<ul style="list-style-type: none"> · Amitriptyline · Clomipramine · Doxepin · Paroxetine
<i>Benzodiazepines (Antianxiety and Sedative-Hypnotic)</i>	<ul style="list-style-type: none"> · Lorazepam · Alprazolam · Clonazepam · Diazepam · Flurazepam · Triazolam
<i>Nonbenzodiazepine Sedative-Hypnotics</i>	<ul style="list-style-type: none"> · Zolpidem · Zaleplon · Zopiclone
<i>Muscle Relaxants</i>	<ul style="list-style-type: none"> · Carisoprodol · Cyclobenzaprine · Methocarbamol
<i>Opioid Analgesics</i>	<ul style="list-style-type: none"> · Oxycodone · Hydrocodone · Morphine · Codeine
<i>Anticonvulsants</i>	<ul style="list-style-type: none"> · Phenytoin · Carbamazepine

Figure 1. Selected medications associated with cognitive adverse effects.

conversation with their healthcare provider. The program would not make deprescribing mandatory, as freedom of choice lies at the core of all screening programs.

Would consumer-directed screening work to reduce the risk of drug-induced cognitive impairment? Research indicates that at least 1-in-4 sedative-hypnotic users who receive a mailed brochure describing the negative impact of medication use on memory, attention, and falls will discontinue their sleeping pill within six months (Eriksen & Bjerrum, 2015; Tannenbaum, Martin, Tamblyn, Benedetti, & Ahmed, 2014). The Eliminating Medications Through Patient Ownership of End Results (EMPOWER) brochure

(available at www.deprescribingnetwork.ca) outlines in lay terms the age-related risks associated with sedative-hypnotic use, the availability of alternative therapies, and how to taper off the drugs over 3–4 months to lessen withdrawal symptoms. Receipt of the brochure drives two-thirds of older sedative-hypnotic users to discuss deprescribing with a healthcare provider. The information can be processed and acted upon even by individuals who already suffer from reduced cognition (Martin & Tannenbaum, 2017).

The cost of a national deprescribing program would depend on the number of seniors targeted for screening. Data from Canada suggest that 42% of women and 31% of men outside of the hospital setting fill at least one potentially inappropriate prescription per year (Morgan et al., 2016). Benzodiazepines and other sedative-hypnotics are the most frequent, consumed by 27% of females and 16% of males aged 65 and older that are enrolled in the national drug reimbursement system. The estimated annual average per capita cost of lorazepam, amitriptyline, quetiapine, clonazepam, zopiclone, oxazepam, temazepam, and alprazolam totals \$25 Canadian. Printing and mailing the EMPOWER brochure (approximately \$3 per person) to all consumers is expected to be cost-neutral if implemented bi-annually, assuming a 1-in-4 discontinuation rate within the first six months.

A regional deprescribing program is being trialed in the province of Manitoba, Canada, for prescription opioid drugs among all adults aged 18 years and older with chronic non-cancer pain. Individuals were easily identified using provincial administrative drug claims data. The brochures were printed and mailed out en masse in July 2018, illustrating the feasibility of this strategy in the real-world setting.

Link Polypharmacy Reduction to Driving Safety Programs

Medication that compromises cognitive skills invariably affects driving performance. Concentration, attention, dual-tasking, reaction time, and coordination are all mediated by neurotransmitter systems in the brain that are sensitive to sedating drugs. Large epidemiologic studies reveal a clear link between consumption of brain-altering medication and higher rates of motor vehicle accidents (Hansen, Boudreau, Ebel, Grossman, & Sullivan, 2015). Any public safety driving program aiming to reduce car crashes should inform seniors that driving under the influence applies not only to alcohol but to other substances, such as prescription medication that could cloud driving skills and performance.

On January 1, 2008, Denmark implemented a driving license restriction on benzodiazepine users, regardless of age (Eriksen & Bjerrum, 2015). The policy was framed within the context of new public safety legislation that targeted prescription medication together with illicit substances that can impair driving. Sedative-hypnotic users

were invited to relinquish their driving license or their consumption of car accident-incurring medication. Within five years, the policy curbed the use of long-acting benzodiazepines by 54% and short-acting benzodiazepines by 32%.

This policy option addresses the nefarious outcomes associated with driving under the influence and affords freedom of choice to the individual to trade off one privilege for another. Many jurisdictions take health-related impairments related to vision and cognition into consideration during driving license renewal processes. Explaining why the use of prescription or over-the-counter drugs that cause sedation should not be consumed within hours of driving a motor vehicle fits squarely within the remit of enforcing safe driving practices. No one wants their children, grandchildren, or loved ones to be driven by a person who is not in full control of their faculties.

Unlike other drug monitoring programs that elicit unintended consequences for the patient (Fisher, Sanyal, Frail, & Sketris, 2012), the driving license policy seems to be relatively innocuous, as the restriction is a matter of choice. Some have expressed concern that implementation of the policy could be seen as ageist, especially if applicable only to individuals over a certain age. Others question privacy rights and whether the responsibility to report medication use should reside with the government, the prescriber, or the patient. If left up to the driver, it is unclear how the policy would be enforced in the absence of roadside drug testing. These quandaries compare favorably to the challenges experienced with other policy interventions, such as drug delisting schemes. The latter incur out-of-pocket expenses to patients for persisting on drug therapy and frequently lead to substitution with equally-inappropriate medication.

Increase Access to Non-Drug Therapies

The phenomenon of inappropriate prescribing is not ill intentioned; most drugs are prescribed to alleviate patient symptoms. Prescribers may be unaware that certain medications can affect brain function, or that patients become more susceptible to cognitive side effects with age. Patients have come to expect a pill for every ill as part of our increasingly rampant prescribing culture. Writing a prescription is easier than explaining how symptoms can be relieved through the use of non-drug therapies. Even if prescribers take the time to describe the benefits of non-pharmacological treatment, sparse or unaffordable access to supervised interventions pose a barrier to widespread uptake.

Non-pharmacological approaches such as cognitive behavioral therapy are just as, if not more, effective than sedative-hypnotics for the management of anxiety or insomnia (Markota, Rummans, Bostwick, & Lapid, 2016). Evidence-based alternatives to analgesics for chronic neck and low back pain include pain self-management, physiotherapy, mindfulness-based stress reduction, and yoga. Age-related dry and itchy skin can be palliated with skin

creams, humidifiers, and the avoidance of abrasive soaps and detergents, instead of first-generation antihistamines.

A common assumption is that non-drug therapy will cost more than drug therapy. This belief proves false if drug-related consequences on cognition and quality of life are considered. Economic models comparing sedative-hypnotic use to cognitive behavioral therapy for insomnia indicate that cognitive behavioral therapy will save up to \$13,000 U. S. dollars per senior annually when expenditures associated with drug-induced falls and hospitalizations are accounted for (Tannenbaum et al., 2015). Furthermore, the additional cost of covering mindfulness-based stress reduction, yoga, and tai chi to treat chronic low back pain and neck pain would amount to \$0.23 per member per month for a health insurance plan covering 1 million members, or approximately 5% of the estimated costs of pain and inflammation medications (Institute for Clinical and Economic Review, 2017). Some might argue that it is indefensible not to cover alternative non-drug treatments given the rise in deaths among seniors due to co-prescription of opioids and benzodiazepines.

Lack of reimbursement of non-pharmacological therapies drives a vicious cycle of low demand and low supply. The result is continued reliance on inappropriate prescriptions for symptom relief of common ailments. To resolve this conundrum, senior-friendly policies that promote coverage and accessibility of physiotherapy, cognitive behavioral therapy, and other mindfulness-based stress reduction techniques could significantly alter prescribing patterns for older adults.

Fund a National Deprescribing Network

Although this paper focuses on patient-oriented policies, reducing the burden of drug-induced cognitive impairment needs to be a team effort. Concerted approaches targeting prescribers—physicians, nurses, and pharmacists—will enhance the effectiveness of patient-oriented strategies and maintain overall trust in the system (Zhang, Turner, Martin, & Tannenbaum, 2018).

The Canadian Deprescribing Network represents one example of a pan-national repository that simultaneously curates and delivers evidence-based deprescribing information to patients, healthcare providers, and policymakers. The goal of the network is to reduce drug-induced harm and increase access to safer non-pharmacological treatments (Tannenbaum et al., 2017). Deprescribing networks exist in Australia and are currently being considered in France and the United States. The sustainability of such entities requires long-term government funding and coordination in order to scale up successful initiatives across healthcare jurisdictions, monitor deprescribing rates, and nimbly respond to emerging medication threats on cognition.

Patients, seniors' organizations, caregivers, and public advocates should have a strong decision-making voice in any government-funded deprescribing network. A seniors' advocate sits on the executive committee of the Canadian Deprescribing Network and chairs the public awareness, education, and engagement sub-committee. Webinars are held monthly with seniors' organizations across the country to elicit information on priorities and brainstorm innovative ways of reaching older adult consumers and their caregivers. EMPOWER brochures are freely available, as is a slide deck supporting presentations on deprescribing by recognized local community champions from organizations such as the National Pensioners Federation and Retired Teachers Associations. The patient awareness sub-committee drafts articles for local newspapers and newsletters, engages with the media, and attends stakeholder council meetings to help inform future directions of the network and resource allocation.

Conclusions

Policymakers who are motivated to reduce medication-induced cognitive impairment have a suite of patient-centered options to choose from. Educating patients about the negative effects of medication on brain function will challenge the status quo of filling prescriptions that counteract patient priorities about brain health. Simultaneously increasing access and coverage for non-drug treatments, situating restriction policies in the context of driving safety legislation, and supporting vanguards of pharmaceutical appropriateness for seniors comprise complementary elements of a winning formula. Patients have the right to make informed choices about the drugs they take, especially if there is a risk to cognition. It is our responsibility to ensure access to this timely information and promote the availability of safer treatments that do not compromise brain health for our aging population.

Educating patients about the negative effects of medication on brain function will challenge the status quo of filling prescriptions that counteract patient priorities about brain health.

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Conflicts of Interest

The authors declare no competing interests.

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