

## Screening for Inappropriate Medications in the Elderly

**Canadian seniors account for 44% of adverse drug reactions causing death even though they make up just 13% of the population, according to Health Canada reports.**

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**A**s we age, our bodies undergo physiologic changes that affect how medications are absorbed, distributed, metabolized, and eliminated. These changes often make elderly patients more sensitive to the effects of medications. In fact, several studies have demonstrated

that the vulnerability of elderly patients to preventable Adverse Drug Events (ADEs) may be due to these physiologic changes.

One U.S. study showed that 30% of hospital admissions of elderly patients may be linked to drug-related problems including toxic

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effects. A 1997 study of ADEs found that 35% of ambulatory older adults experienced an ADE and 29% required health-care services (physician, emergency department, or hospitalization) for the ADE. These vulnerabilities may be due to the following physiologic changes of aging:

### Total body water decreases relative to body fat

Changes in total body water and percentage of body fat affect how some drugs are distributed in the body. The decrease in total body water can lead to higher blood concentrations of some watersoluble drugs. The relative increase in body fat may increase the total amount of lipid-soluble drug stored in the body and lengthen the time to eliminate the drug from the body.

Some drugs bind to albumin in the blood stream, but with age, serum albumin levels decrease. This may enhance a drug's effect by increasing serum concentrations of unbound drug.

### Hepatic function decreases

Many medications are metabolized by the liver. With increased age, decreased hepatic mass and hepatic blood flow can slow the rate of hepatic elimination. In addition, hepatic clearance carried out by the cytochrome P-450 system often diminishes with age. Overall, the clearance of drugs metabolized by the liver is typically decreased 30 to 40% in the elderly.

### Renal function decreases

Kidney mass and renal blood flow also decrease significantly with age. However, serum creatinine levels may remain within normal limits because the elderly have less lean body mass and produce less creatinine. These "normal" serum creatinine levels may mislead practitioners to believe that adjustments for renally excreted drugs are not necessary. However, this is often not the case as these physiologic changes to the kidneys actually decrease renal clearance of drugs necessitating a dose adjustment.

Many drugs produce clinically significant metabolites. Examples include some benzodiazepines, tertiary amine antidepressants, antipsychotics, and opioid analgesics. Age-related decreases in renal clearance, particularly in patients with comorbid renal disease, can increase accumulation of these metabolites, elevating the risk of toxicity.

In 1991, 13 recognized U.S. experts in clinical geriatric pharmacology, psychopharmacology, general clinical geriatrics and long-term care reached a consensus on explicit criteria for certain medications that may lead to ADEs and were considered to be inappropriate for use in nursing home patients. These criteria were originally developed by Dr. Mark Beers and are commonly referred to as the "Beers criteria."

The criteria, most recently updated in 2002, are based on the risk-benefit definition of appropriateness, meaning that the use of a medication is considered to

be appropriate if its use has benefits that outweigh potential risks.

The Beers criteria define three categories of drug selection that are deemed inappropriate for elderly patients (those older than 65 years of age). The categories, along with some examples are:

### Inappropriate drug choice

The following are medications generally to be avoided in the elderly population:

#### Anticholinergics and antihistamines

These drugs, including diphenhydramine, hydroxyzine and promethazine, have potent anticholinergic effects and cause confusion and sedation. Diphenhydramine may be used in the lowest effective dose and only for emergency treatment of allergic reactions.

#### Long-acting benzodiazepines

Drugs such as diazepam and flurazepam have long half-lives and can accumulate to high levels. As a result, patients may develop excessive sedation, increasing the risk of falls and fractures.

#### Meperidine

Decreases in renal function may lead to accumulation of the metabolite normeperidine placing elderly patients at increased risk of seizure. This narcotic can also cause confusion.

#### Digoxin

Digoxin doses should generally not exceed 0.125 mg/day except when treating atrial arrhythmias.

Diminished renal clearance of this medication increases the risk of toxicity.

#### Short-acting benzodiazepines

Elderly patients are more sensitive to the effects of these medications; therefore, suggested maximum daily doses should not be exceeded.

For example, the total daily dose of lorazepam should generally not exceed 3 mg.



### Drug-disease interaction

The following are medications to be avoided for patients with specific comorbid conditions:

#### Cognitive impairment

Medications such as barbiturates, anticholinergics and muscle relaxants can worsen cognitive impairment and performance.

#### Syncope or falls

Medications such as short - or intermediate-acting benzodiazepines and tricyclic antidepressants may exacerbate syncope, impair psychomotor function, and increase falls.

You can employ the Beers criteria to identify drugs that may place your elderly patients, regardless of their level

of frailty, at a higher risk of an ADE. By using the severity ratings included with the criteria (available at: <http://archinte.amaassn.org/cgi/content/full/163/22/2716>), you can develop and prioritize strategies to minimize drug-related problems with the listed medications.

For more information about ADEs, please consult the Institute for Safe Medication Practices websites:

[www.ismp-canada.org/](http://www.ismp-canada.org/)

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### IN THE NEXT ISSUE

Additional safety issues, as well as specific recommendations to avoid the use of inappropriate medications in the elderly, will be presented in Part 2 of this article.