Psychoactive Medications and Falls

James W. Cooper, RPh, PhD, BCPS, CGP, FASCP, FASHP, Emeritus Professor and Consultant Pharmacist, College of Pharmacy, University of Georgia, Athens, and Assistant Clinical Professor of Family Medicine, Medical College of Georgia, Augusta, GA, USA.

Allison H. Burfield, RN, PhD, Assistant Professor, School of Nursing, College of Health and Human Services, University of North Carolina-Charlotte, Charlotte, NC, USA.

The high incidence of falls among older adults leads to increased health care costs and decrements in functional status. Psychoactive medications consumed by older adults are often implicated in falls. This article briefly reviews the associations between falls and psychoactive medications, with a focus on the long-term care setting, and offers an assessment method and strategies to reduce the risk of certain classes of medications known to contribute to fall risk.

Key words: falls, medications, psychoactive load, interventions, older adults

Introduction

Falls in the older adult lead to increased health care utilization and decreased functional status. A fall risk index has been advocated based on an individual’s number of chronic disabilities. Studies on falls, incidence, and morbidity found that those who sustained falls are more likely to have dementia, are prescribed more sedating drugs, and have abnormal balance and gait when compared with age- and sex-matched control subjects. In addition, orthostasis, arthritides, incontinence, and strokes are more prevalent among these individuals. A fall risk assessment that incorporates psychotropic as well as other psychoactive medications has been developed, and lists of medications implicated in falls have been published. A multifactorial intervention to reduce the risk of falling among older adults living in the community has also been developed. The use of psychotropic drugs as pharmacologic restraints among older adults living in long-term care (LTC) facilities has also been documented.

Definitions

Psychoactives or central nervous system (CNS)-active agents are considered psychotropics plus the prokinetic agent metoclopramide, narcotic or opioid analgesics, anti-parkinson agents, anticonvulsants, muscle relaxants, antihistamines, and centrally acting antihypertensives. Psychoactives include anxiolytics, hypnotics, antipsychotics, and antidepressants.

An individual’s “total psychoactive drug load” may be defined as the total number of psychotropic and psychoactive medications given on a regular (i.e., at least weekly) basis. As-needed (p.r.n.) medications given on less than a weekly basis may be considered relevant if their usage occurred within one week of a fall and the drugs involved were antipsychotics or longer-acting benzodiazepines.

Falls are defined as an individual found on the floor with no other explanation for position or unintentionally coming to the ground or some lower level and other than as a consequence of sustaining a violent blow, loss of consciousness, sudden onset of paralysis as in stroke or an epileptic seizure and may be noted by the home caregiver or from the charts and periodic reports of the quality assurance department of the facility. A multifactorial fall risk assessment instrument helps to quantify the risk of falls (Figure 1).

Evidence for Psychoactive Medication Association with Falls and Fractures

A study of physical and pharmacologic restraint of 307 LTC residents with dementia showed that 43–45% of were given pharmacologic restraints. Residents with physically abusive behaviour, infrequent family visits, and severe cognitive impairment were more likely to receive pharmacologic restraints. An earlier 1-year study of 33,351 Illinois LTC residents found that 60% received at least one psychotropic medication during that year. In 4,501 cases of hip fracture among ambulatory patients 65 years of age or older, longer half-life benzodiazepines (BZD) were associated with a greater risk of falls and hip fracture when compared with shorter half-life BZD.

All BZD markedly increase the risk of falls. Serum diazepam blood levels have been directly correlated with the incidence of falls. Shorter-acting BZD (e.g., triazolam and oxazepam) given more often than three times per week have been associated with increased fall risk. A study of the sensitivity of older individuals to triazolam found that pharmacokinetic, rather than pharmacodynamic, differences between older and younger people explained the greater sensitivity to the drug. Peak-serum triazolam concentration was approximately 50% higher, and triazolam clearance 50% lower among older adults versus younger individuals. Both antipsychotics and antidepressants have also been shown to increase fall risk. An association between antihistamines, narcotic analgesics, anticonvulsants, metoclopramide, antihypertensives, and falls in those taking other psychoactive medications has also been reported.
Figure 1: Fall Risk Assessment Instrument

Patient ________________________________________________________________

Dates ________________________________________________________________

Admission Date _______________________________________________________

Dr. _________________________________________________________________

Circle appropriate numbers and repeat this assessment every six months or after each fall. If total is more than seven, state interventions planned and med change(s).

History of falls:
Ambulation status: circle: up, bed, walker, wheelchair
One to two falls in a month/quarter 2
More than two falls in a month/quarter 8
Fall-related fracture (date) ______________ 5

Conditions:
Postural hypotension (orthostasis) 2
Syncope/dizziness 1
Sensory deficits: decreased hearing (1), vision (1), aphasia (1) SUBTOTAL = ______________
Unsteady or shuffling gait 2
Confusion/delirium/disorientation/impaired cognition 2
Agitation/increased anxiety 2
Chronic pain state 3 SUBTOTAL = ______________

Medications:
cardiac (1); antihypertensives (1); diuretic (1); antipsychotics or metoclopramide (2); hypnotics (2); antidepressant or antihistamine (H-1 or H-2 blockers) (2); antianxiety except buspirone (2); NSAID (1); narcotic analgesic mild (1); moderate (2); anticonvulsant (1); muscle relaxants (1) SUBTOTAL = ______________

Diagnoses:
Incontinence: bowel (2), bladder (2), anemia (2) SUBTOTAL = ______________
Cardiac diseases: arrhythmia (1), CHF (1) SUBTOTAL = ______________
Neurologic/psychiatric diseases: dementia (1), parkinsonism (1), seizures (1), stroke (1) SUBTOTAL = ______________
Musculoskeletal disease: arthritis (1), casts/splints/slings (1), prosthesis (1) SUBTOTAL = ______________

Risk ranges: minimal: 0–3, moderate: 4–7, high: 8 or more

Signature of assessor: __________________________________________________________

Date: ___________________________________________________________________

Describe interventions below and reassess every quarter if above score of 7 or more

Medication changes: ____________________________________________________________

Fracture sites: __________________________________________________________________

Hospitalization date(s) and reasons: _______________________________________________________________________________________

Abbreviations: CHF = congestive heart failure; NSAID = non-steroidal anti-inflammatory drug.
Source: Cooper JW, 1994. (Original work, not copyrighted. Please copy and use in your practice.)
Psychoactive Medications and Falls

The effects of the psychotropics and other psychoactive agents on agitation\textsuperscript{17} and the multidisciplinary interventions of nurses, consultant pharmacists, and attending clinicians to reduce falls, injuries, and costs\textsuperscript{18–37} have also been documented. The provisions of the 1987 and 1990 Omnibus Budget Reconciliation Acts (OBRA) on appropriate use of psychotropic drugs in the U.S. mandate at least two to three tapering attempts of anxiolytics (except buspirone) and antipsychotic psychotropics within the first 6 to 12 months of placement within an LTC facility. Effective October 1, 2008, Medicare no longer reimburses for falls occurring in acute care settings as a hospital-acquired condition (HAC).\textsuperscript{38}

The newest Centers for Medicare and Medicaid Services (CMS) guidelines stress the need for gradual dose reductions (GDR) of all psychotropic medications unless there is a history of a patient’s dementia or other neuropsychiatric diagnosis worsening following attempts at tapering.

A meta-analysis of 57 studies on the contribution of psychotropic drugs to falls in older persons concluded that there is a small but consistent association between the use of most classes of drugs and falls. This analysis did not consider nor define inappropriate polypharmacy.\textsuperscript{21} Falls were second only to NSAID adverse drug reactions (ADRs), as causes for ADR hospitalizations from the long-term care facility.\textsuperscript{22} A 1966–1999 review of psychotropics and falls suggested that all psychotropics may increase the risk of falls and that each additional agent may increase the overall risk by a factor of 2.0 per psychotropic.\textsuperscript{23} A community-based 6-month study of 305 male veterans (age 70 to 104) using psychoactive CNS-active medications screened them at study entry for mobility, cognition, and depression. The CNS-active medications were categorized as BZD, other sedative-hypnotics, neuroleptics, tricyclic antidepressants, and opioid analgesics. Participants were prospective-ly followed for 6 months to monitor falls; at the end of this time period, subjects were classified as fallers (at least one fall) or nonfallers. The relationship between CNS-active drug use and falls was examined using multivariable analyses. The risk of falls was significantly greater among CNS-active medication users as compared with nonusers. Adjusted odds ratio for one CNS-active drug was 1.54 (95% CI 1.07–2.22) and 2.37 (95% CI 1.14–4.94) for two or more agents. Among community-dwelling older adults, the use of multiple CNS-active medications is associated with enhanced falls liability over and above the use of one CNS-active drug alone.\textsuperscript{24}

### Inappropriate Use of Medications

The presence of multiple psychotropic and psychoactive drugs should be taken into account when fall interventions are evaluated, and reduction in total psychotropic and psychoactive drug load may reduce fall occurrence and recurrence.\textsuperscript{25–37} Simply put, each additional

<table>
<thead>
<tr>
<th>Drug(s)</th>
<th>Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polypharmacy</td>
<td>Carefully evaluate need and taper to discontinuance as possible by 10–25% of dose per week. Goal is to minimize total psychoactive load by stepwise tapering for each drug</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>Change to buspirone or selective serotonin reuptake inhibitor (SSRI) and taper benzodiazepine</td>
</tr>
<tr>
<td>Antidepressants</td>
<td>Avoid older agents, e.g., tricyclics and use lower doses of newer SSRIs</td>
</tr>
<tr>
<td>Antipsychotics</td>
<td>Taper to discontinuance as above and use for shortest period 1–10 days</td>
</tr>
<tr>
<td>Narcotic/opioid analgesics</td>
<td>Use topical route and consider topical nonsteroidal anti-inflammatories (NSAIDs), e.g., ketoprofen 5% gel for localized pain. Be sure that patient has acetaminophen/paracetamol up to 3 g/d and is not suffering if in terminal pain</td>
</tr>
<tr>
<td>Antihistamines</td>
<td>Use relatively nonsedating agents if chronic need. Avoid older more sedating and anticholinergic agents</td>
</tr>
<tr>
<td>Anticonvulsants</td>
<td>Titrate carefully to appropriate serum levels, if for seizures or pain management based on renal and hepatic function</td>
</tr>
<tr>
<td>Antiparkinson agents</td>
<td>Ensure that drug-induced extrapyramidal side effects (EPS), e.g., metoclopramide, are not the cause of EPS; careful addition of any antiparkinson agent with neurologic evaluation documentation of benefit/risk</td>
</tr>
<tr>
<td>Antihypertensives</td>
<td>Avoid centrally acting sympatholytics (e.g., clonidine, methyldopa) and prefer angiotensin-converting enzyme inhibitors (ACEIs) and angiotensin II receptor blocker (ARBs). Watch for orthostasis, e.g., dizziness on change in position and dehydration due to incontinence</td>
</tr>
</tbody>
</table>

### Table 1: Intervention Approaches for Medications Implicated in Falls

<table>
<thead>
<tr>
<th>Drug(s)</th>
<th>Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polypharmacy</td>
<td>Carefully evaluate need and taper to discontinuance as possible by 10–25% of dose per week. Goal is to minimize total psychoactive load by stepwise tapering for each drug</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>Change to buspirone or selective serotonin reuptake inhibitor (SSRI) and taper benzodiazepine</td>
</tr>
<tr>
<td>Antidepressants</td>
<td>Avoid older agents, e.g., tricyclics and use lower doses of newer SSRIs</td>
</tr>
<tr>
<td>Antipsychotics</td>
<td>Taper to discontinuance as above and use for shortest period 1–10 days</td>
</tr>
<tr>
<td>Narcotic/opioid analgesics</td>
<td>Use topical route and consider topical nonsteroidal anti-inflammatories (NSAIDs), e.g., ketoprofen 5% gel for localized pain. Be sure that patient has acetaminophen/paracetamol up to 3 g/d and is not suffering if in terminal pain</td>
</tr>
<tr>
<td>Antihistamines</td>
<td>Use relatively nonsedating agents if chronic need. Avoid older more sedating and anticholinergic agents</td>
</tr>
<tr>
<td>Anticonvulsants</td>
<td>Titrate carefully to appropriate serum levels, if for seizures or pain management based on renal and hepatic function</td>
</tr>
<tr>
<td>Antiparkinson agents</td>
<td>Ensure that drug-induced extrapyramidal side effects (EPS), e.g., metoclopramide, are not the cause of EPS; careful addition of any antiparkinson agent with neurologic evaluation documentation of benefit/risk</td>
</tr>
<tr>
<td>Antihypertensives</td>
<td>Avoid centrally acting sympatholytics (e.g., clonidine, methyldopa) and prefer angiotensin-converting enzyme inhibitors (ACEIs) and angiotensin II receptor blocker (ARBs). Watch for orthostasis, e.g., dizziness on change in position and dehydration due to incontinence</td>
</tr>
<tr>
<td>Generic Name (Brand Name)</td>
<td>Generic Name (Brand Name)</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Alprazolam (Xanax)</td>
<td>Fentanyl (Duragesic)</td>
</tr>
<tr>
<td>Amitriptyline (Elavil)</td>
<td>Fluoxetine (Prozac)</td>
</tr>
<tr>
<td>Amobarbital (Amytal)</td>
<td>Fluphenazine (Permitil, Prolixin)</td>
</tr>
<tr>
<td>Amoxapine (Asendin)</td>
<td>Flurazepam (Dalmane)</td>
</tr>
<tr>
<td>Aripiprazole (Abilify)</td>
<td>Fluvoxamine (Luvox)</td>
</tr>
<tr>
<td>Baclofen (Lioresal)</td>
<td>Gabapentin (Neurontin)</td>
</tr>
<tr>
<td>Bupropion (Wellbutrin, Wellbutrin SR)</td>
<td>Halazepam (Paxipam)</td>
</tr>
<tr>
<td>Buspirone (Buspar)</td>
<td>Haloperidol (Haldol)</td>
</tr>
<tr>
<td>Butabarbital</td>
<td>Hydrocodone (Vicodin)</td>
</tr>
<tr>
<td>Carbamazepine (Tegretol, Tegretol XR, Carbretrol)</td>
<td>Hydromorphone (Dilaudid)</td>
</tr>
<tr>
<td>Chlordiazepoxide (Librium, Libitrol, Librax)</td>
<td>Imipramine (Tofranil)</td>
</tr>
<tr>
<td>Chlorzepate (Tranxene)</td>
<td>Isocarboxazid (Marplan)</td>
</tr>
<tr>
<td>Clonazepam (Klonopin)</td>
<td>Levetiracetam (Keppra)</td>
</tr>
<tr>
<td>Clozapine (Clozaril)</td>
<td>Levorphanol (Levo-Dromoran)</td>
</tr>
<tr>
<td>Codeine (Tylenol with Codeine)</td>
<td>Lorazepam (Ativan)</td>
</tr>
<tr>
<td>Desipramine (Norpramin)</td>
<td>Loroxetine (Loritox)</td>
</tr>
<tr>
<td>Diazepam (Valium)</td>
<td>Maprotiline (Ludionil)</td>
</tr>
<tr>
<td>Digoxin (Lanoxin)</td>
<td>Mirtazapine (Remeron)</td>
</tr>
<tr>
<td>Disopyramide (Norpace)</td>
<td>Molindone (Moban)</td>
</tr>
<tr>
<td>Divalproex sodium (Depakote, Depakote ER)</td>
<td>Morphine (MS Contin)</td>
</tr>
<tr>
<td>Doxepin (Sinequan, Zonalon, Prudoxin)</td>
<td>Nefazodone (Serzone)</td>
</tr>
<tr>
<td>Duloxetine (Cymbalta)</td>
<td>Olanzapine (Zyprexa, Zyprexa Zydis)</td>
</tr>
<tr>
<td>Escitalopram (Lexapro)</td>
<td>Oxazepam (Serax)</td>
</tr>
<tr>
<td>Estazolam (Prosom)</td>
<td>Oxycodone (Percocet)</td>
</tr>
<tr>
<td>Ethosuximide (Zarontin)</td>
<td>Oxymorphone (Numorphan)</td>
</tr>
</tbody>
</table>

psychotropic doubled the rate of falls, as suggested by an earlier review. An earlier study in this long-term care population did indicate that there were fewer falls and injuries and less cognitive decline over 1 year in those who had psychotropic drugs tapered, changed to other agents, and/or discontinued. There was also a difference in the mean Reisberg global deterioration scale (GDS) among those with a diagnosis of dementia between users of psychotropic drugs (5.8 on 7 scale) and those tapered to nonuse (4.7 on 7 scale) of psychotropic drugs in the groups at the beginning of this study. The most recent finding is that all causes of hospitalization of the older adult from long-term care are directly proportional to the psychoactive drug load. The recent “black box warning” relabelling of all antipsychotics stat-

Key Points

- Multifactorial risk assessment is a helpful tool to evaluate fall risk.
- Psychoactive polypharmacy greatly increases fall risk; carefully inventory and reduce, taper, and/or discontinue medications, especially if there are multiple psychoactive medications or high “load.”
- DO NOT abruptly stop most medications, tapering of doses is recommended, at 10–25% of the daily dose per week, to avoid adverse withdrawal reactions.
- Consider PRN medications as a possible cause, if a fall occurred within 1 week of use AND the medications were longer-acting BZD or antipsychotics.
- OBRA mandates 2 or 3 tapering attempts of anxiolytics and antipsychotics within the first 6–12 months of long-term care facility placement in the US.

Falls may be reduced by 70% or more by medication interventions.

Intervention Strategies

Table 1 lists some alternatives and approaches to medication intervention both to prevent falls and when a fall occurs.

Some Psychoactive Medications Associated with Falls

Some psychoactive medications associated with falls are listed in Table 2. Antihistamines, all anticonvulsants, opioids, and CNS-acting sympatholytic antihypertensives are not included. The list in Table 2 can be downloaded from http://www.uncnews.unc.edu/images/stories/news/health/2008/druglist.pdf.

Discussion and Limitations

Further studies have been done looking at multifactorial interventions in falls, and guidelines for fall prevention have been published. The limitations of psychoactive drug medications interventions are the lack of as well as difficulty in validation of the current assessment instrument (Figure 1) and that most falls are due to multiple risk factors that should also be taken into account but are not covered in this review (e.g., gait assessment, strength training, environmental assessment, and changes).

Conclusion

This article has briefly reviewed the effects of medications on falls and offers suggestions to minimize fall risk by assessment of all medications.

No competing financial interests declared.

References


25. Cooper JW. Drugs may have reduced effect of falls intervention. BMJ 2001;322:675.


