

Louisiana Drug Utilization Review (LADUR) Education

Inappropriate Prescribing in the Elderly

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Issues:

- Inappropriate prescribing in the elderly has become a growing clinical dilemma.
 - Seventeen percent (17%) of hospitalizations in elderly patients are due to adverse drug reactions.
- The Beers criteria have been the most widely used for assessing inappropriate prescribing in the elderly.

Introduction

As the elderly population continues to rise, inappropriate prescribing in the elderly has become a growing clinical dilemma. Although patients over the age of 65 constitute only 12.5% of the entire U.S. population, nearly 30% of the nation's health care expenditures are generated from this age group.[1] Seventeen percent (17%) of hospitalizations in elderly patients are due to adverse drug reactions (ADRs).[2] The increased risk of ADRs in this age group is due to a number of factors, including poor health status, increased number of medical conditions, increased number of prescriptions, and inappropriate prescribing.[1] Approximately one-fifth of the elderly are given medications considered inappropriate for their age.[2] Potentially inappropriate medications are those for which the risk to the patient outweighs the benefit.[3] For example, a medication would be considered inappropriate if a proven, more effective alternative is available, or if it has a serious potential for an adverse drug reaction which could possibly lead to hospitalization or death.[4]

Beers et al identified a need for established guidelines on inappropriate medication use in the elderly, and made the first attempt to establish these guidelines in an effort to improve physician prescribing patterns.[5] The guidelines were developed in 1991 in the form of explicit criteria, and then updated in 1997 to include additional patient settings, diagnosis-specific criteria, and severity ratings.[5, 6] Other criteria were also developed, but most resulted in a variation of the original Beers list. One of these studies conducted by Stuck et al focused on community-dwelling elderly. Their results consisted of a modified list very similar to the original, with the exception of methyldopa and

propranolol.[7] The Beers criteria have definitely been the most widely used for assessing inappropriate prescribing in the elderly, and will be the focus of this article. Risk factors, prevalence, and examples of inappropriate medications will also be discussed.

Beers Studies

In 1991, Beers et al developed the first set of criteria for determining inappropriate medication use in nursing home residents over the age of 65. After conducting a comprehensive literature review, a survey instrument was developed containing the guidelines found on inappropriate medication use. A two-round survey based on Delphi methods was used. This survey was given to a panel of experts in psychopharmacology, pharmacoepidemiology, clinical geriatric pharmacology, general clinical geriatrics, and long-term care. A total of 13 experts completed the process. The group reached consensus on 30 factors defining inappropriate use. Nineteen of these described medications that should generally be avoided in the nursing home population, and 11 described doses, frequencies, or durations of medications that should generally not be exceeded.[5]

Since the 1991 Beers study was developed using the opinions and information available at that time, it was obvious that a revision would be necessary as new medications and updated information became available. Also, expansion was required to include clinical variables, such as diagnosis and disease severity. Since the original criteria did not consider these clinical aspects, they were limited in their application. Furthermore, despite the fact that the original criteria were developed for nursing home residents, they were being applied to elderly people in the community setting. This demonstrated a need to expand the criteria to include the elderly in settings outside the nursing home.[5, 6]

The original criteria were updated in 1997 by Beers. Focusing only on articles published after the original study in 1991, a literature review was conducted to locate relevant articles on medication use in the elderly. Using the original criteria and the results of the literature search, Beers developed statements on the inappropriate use of medication in the elderly. There were 3 types of statements:

- Medications that should be avoided in the elderly because they are either ineffective or pose unnecessarily high risks.
- Doses, frequencies, or durations of therapies of certain medications that govern the appropriate use in elderly patients.
- Medications that should not be used in elderly patients with certain medical conditions.

Six nationally recognized experts in geriatric care and pharmacology were asked

to evaluate the statements. Reviewers rated the validity of each statement and also rated the severity of any problems that may arise associated with the medication.[6]

There were several differences between the original criteria and the updated criteria. Unlike the original criteria, which were developed for nursing home patients, the new guidelines were meant to be applied to a population of patients over age 65 years, regardless of their place of residence. Another distinguishing factor was that the new criteria assigned a relative rating of severity to each criterion and provided guidelines concerning the usage of certain medications in elderly patients with specific diagnoses. Also, they included new products and updated information about existing medications.[6]

Table 1, which summarizes the results of both the 1991 and 1997 Beers studies, outlines the medications to avoid or use within specified doses or durations in elderly patients.[5, 6, 8] The medications that should be avoided in elderly patients with specific disease states are listed in Table 2.[6, 8]

Risk Factors

Several studies have been conducted using the Beers criteria to examine inappropriate medication use by the elderly in a number of different settings. These studies have shown that there are several risk factors for receiving inappropriate medications.[1] Patients with the following characteristics were shown to be at greater risk:

- Increased number of prescriptions
- Prescriptions for certain medications (such as antianxiety agents, sedatives, antidepressants, or analgesics)
- Poor health status
- Certain demographics (female, ages 65 - 84, residing in a rural area)

An increased number of prescriptions is probably the most significant predictor of inappropriate medication use.[7, 9-11] With each additional prescription, the odds of an elderly person being prescribed an inappropriate medication increase by 22%.[10] Studies have shown that patients are six times more likely to be prescribed an inappropriate medication if they are in poor health or if they have prescriptions from certain drug classes such as antianxiety agents, sedatives, antidepressants, or analgesics.[10, 11]

Demographics of the elderly population are also a factor to consider. Surprisingly, a study conducted in nursing home patients found that residents ages 65 -84 were prescribed inappropriate medications more frequently than those ages 85 and older. This could possibly be due to the fact that physicians are more cautious when prescribing to patients in this age group.[12] Females

and patients living in rural areas also have a greater risk of receiving an inappropriate medication.[10-12]

Table 1. Medications to avoid or use within specific doses/duration in elderly patients

Medication(s)	Prescribing Concern	Severity
Psychotropic Medications Amiripityline, alone or in combination products	Strong anticholinergic and sedating properties	High
Barbiturates (other than Phenobarbital)	More side effects and highly addictive properties	High
Chlordiazepoxide (alone or in combination) Diazepam	Long half-lives, risk of sedation and increased falls	High
Doxepin	Strong anticholinergic and sedating properties	High
Efgot mesylates Cyclospasmol	Not proven effective at doses studied	Low
Flurazepam	Long half-life; risk of sedation and increased falls	High
Haloperidol *	Doses > 3mg/day should be avoided; residents with psychotic disorders may require higher doses	...
Lorazepam 3mg Oxazepam 60mg Alprazolam 2mg Temazepam 15mg Zolpidem 5mg Triazolam 0.25mg	Total daily doses should rarely exceed these amounts.	Low
Meperidine	Not effective orally and has disadvantages compared with other narcotic analgesics	High
Meprobamate	Highly addictive and sedating. Avoid unless patient is already addicted.	High
Pentazocine	Has more CNS side effects, including confusion and hallucinations; is a mixed agonist-antagonist	High
Propoxyphene	Few analgesic advantages over acetaminophen	Low
Thioridazine *	Avoid doses > 30mg/day; residents with known psychotic disorders may require higher doses.	...
EBNT Agents Antihistamines (alone or in combination, including chlorpheniramine, diphenhydramine, hydroxyzine, cyproheptadine, promethazine, and dexchlorpheniramine)	Strong anticholinergic activity	Low
Decongestants (oxymetazoline, phenylephrine, pseudoephedrine)	Avoid daily use for > two weeks	...
Diphenhydramine	Potent anticholinergic properties; should not be used a hypnotic. For allergies, use the lowest possible dose.	Low
Gastrointestinal Agents Cimetidine *	Avoid doses > 900mg/day and therapy for > 12 weeks	...
Dicyclomine Hyoscyamine Propantheline Belladonna alkaloids Clidinium Chlordiazepoxide	Strong anticholinergic activity and questionable efficacy	High
Ranitidine *	Avoid doses > 300mg/day and therapy for > 12 weeks	...
Trimethoprim	One of the least effective antiemetic agents; produces extraxonal side effects	Low

Trimethoprimamide	One of the least effective antiemetic agents; produces extrapyramidal side effects	Low
Endocrine Agents		
	Has a prolonged half-life; can cause prolonged and serious hypoglycemia and can cause SIADH.	High
Chlorpropamide		
Cardiac Agents		
	Except for treatment of atrial arrhythmias, doses should rarely exceed 0.125mg daily	High
Digoxin		
Disopyramide	May induce heart failure because of strong negative inotropic activity. Also has strong anticholinergic activity	High
Vascular Agents		
	Causes orthostatic hypotension. Beneficial only in patients with artificial heart valves.	Low
Dipyridamol		
Hydrochlorothiazide*	Avoid doses > 50mg/day	...
Mefloquine (alone or in combination)	Causes bradycardia and exacerbates depression	High
Propranolol*	Avoid except when used to treat violent behaviors; other beta blockers offer less CNS penetration or more beta-receptor selectivity	...
Reserpine (alone or in combination)	Causes depression, impotence, sedation, and orthostatic hypotension	Low
Ticlopidine	More toxic than aspirin, yet no more effective	High
Musculoskeletal Agents		
	Most CNS side effects of any NSAIDS	Low
Indomethacin		
Methocarbamol		
Carisoprodol		
Cyclobutazim		
Chlorzoxazone	Poorly tolerated by the elderly; cause anticholinergic side effects, sedation, and weakness. Effectiveness at tolerated doses questionable	Low
Metaxalone		
Cyclobenzaprine		
Orphenadrine		
Hematopoietic Agents		
	Higher doses no more effective but cause constipation	Low
Iron supplements exceeding 325 mg of ferrous sulfate daily		
Anti-infective Agents		
	Avoid therapy for > four weeks except when treating osteomyelitis, prostatitis, tuberculosis, or endocarditis	...
Oral antibiotics*		
*These criteria were developed specifically for nursing home residents [5, 6, 8]		

Prevalence

The prevalence of inappropriate prescribing seems to be highest in the elderly nursing home population. In a 1992 study conducted in nursing home residents, 40.3% of the participants were receiving at least one inappropriate medication.[12] The next highest percentage was found in patients residing in assisted living facilities with 28.8% of them using one or more medications considered inappropriate.[13] The studies conducted in community-residing elderly resulted in a range of 14% to 27% of the participants receiving inappropriate meds.[7, 9, 11] The difference in the prevalence of inappropriate prescribing in the community elderly could be due to a number of factors, such as the version of the criteria used, time period of the study, and method of data collection.

Some of the most commonly prescribed inappropriate medications identified in the studies were the long-acting benzodiazepines, propoxyphene, and amitriptyline.[7, 9-11, 14]

Outcomes

With the large prevalence of inappropriate prescribing in elderly patients, one could assume that this would lead to poor health outcomes. However, in a study conducted by Hanlon et al that evaluated the relationship between the use of inappropriate drugs according to the Beers criteria and mortality and functional status, the use of inappropriate medications was not significantly associated with mortality or decline in functional status.[15] Another study examining the impact of inappropriate prescribing in nursing home patients also found that there was no association between inappropriate prescribing and mortality rates. However, this study did identify a positive relationship between the cost of pharmaceutical services and the number of inappropriate medications prescribed.[16]

Most of the studies conducted on inappropriate prescribing do not address the outcomes associated with prescribing inappropriate medication to elderly patients.[1] Without addressing this important aspect, it cannot be determined whether or not an adverse outcome actually occurred as a result of the medication. The seriousness of the outcome could also vary widely. Adverse reactions could range from serious events such as falls, fractures, or death to less severe outcomes such as sedation, dry mouth, constipation, or urinary incontinence. While the latter are not as serious, they could impact the patient's quality of life and lead to further complications.[12]

Disease	Medication(s)	Problem	Severity
Epilepsy	Clozapine Chlorpromazine Thioridazine Chlorprothixene	Agents lower seizure threshold	Low
	Metoclopramide	May worsen peripheral arterial blood flow and precipitate claudication	High
Insomnia	Decongestants Theophylline Desipramine SSRIs Methylphenidate MAOIs Beta agonists	May cause or worsen insomnia	Low
Constipation	Anticholinergics Narcotics	Will worsen constipation	Low
	Tricyclic antidepressants	Will worsen constipation	High
Ulcers	NSAIDs	May exacerbate ulcer disease, gastritis, GERD	High
	Aspirin (>325mg/day)	May exacerbate ulcer disease, gastritis, GERD	Low
	Potassium supplements	May cause gastric irritation	Low
Diabetes	Beta blockers	In people being treated with insulin or oral agents, may block hypoglycemic symptoms	Low
	Corticosteroids (started recently)	May worsen diabetic control	Low
Asthma	Beta blockers	May worsen respiratory function	High
Chronic obstructive pulmonary disease	Beta blockers	May worsen respiratory function	High
	Sedative-hypnotics	May slow respirations and increase carbon dioxide retention	High
Arrhythmias	Tricyclic antidepressants	May induce arrhythmias	High if started recently
Heart failure	Disopyramide	May worsen heart failure because of negative inotropic action	High
	Drugs with high sodium content	Large sodium load may lead to fluid retention and thereby worsen heart failure	Low
Blood-clotting disorders being treated with anticoagulants	Aspirin NSAIDs Dipyridimole Ticlopidine	May cause bleeding	High
Hypertension	Amphetamines and other weight-control agents	May increase blood pressure	High
Peripheral vascular disease	Beta blockers	May worsen peripheral arterial blood flow and precipitate claudication	High
Syncope	Beta blockers	Negative chronotropic and inotropic activity	Low
	Long-acting Benzodiazepines	May contribute to falls	High

Benign prostatic hypertrophy	Anticholinergic Antihistamines Gastrointestinal Antispasmodics	May impair micturition and cause obstruction	High
	Muscle relaxants Narcotic drugs (including propoxyphene)	May impair micturition and cause obstruction	Low
	Flavocaine Oxybutynin Bethanechol	May cause obstruction	Low
	Anticholinergic Antidepressants	May impair micturition and cause obstruction	High
Incontinence	Alpha blockers	Relaxes the external bladder sphincter	Low

[6, 8]

Limitations of the Criteria

Although accepted by the medical community, these widely-used criteria have limitations, one of which is the fact that they do not address the individual needs

of the patient. They should not be a substitute for careful clinical consideration since the criteria may not apply to every situation.[6] Also, during the development of these guidelines, the panel of experts had differences of opinion on several issues which may demonstrate a need for further study of those specific medications in elderly patients.[5] Furthermore, when using the guidelines to make clinical decisions, the most current studies on elderly medication use should also be consulted since research is an ongoing process.

Role of the Health Care Professional

Reducing drug related problems in the elderly is a difficult task, but can be accomplished with the participation of health care professionals. Although the Beers criteria address only one portion of these problems in the elderly, they have become a valuable mechanism for assessing inappropriate prescribing. Through provider education and intervention programs, such as online DURs, providers can utilize these guidelines to improve prescribing patterns in their elderly patients.[3]

Pharmacists also have a role. In July 1999, the Health Care Financing Administration implemented changes to their nursing home survey process to include drug therapy guidelines based on the 1997 Beers criteria.[13] Consultant pharmacists use these guidelines to notify physicians of potentially inappropriate medications. In the retail and hospital settings, pharmacists can alert physicians to inappropriate prescribing during the drug distribution process. By working together, health care professionals can have a positive impact on medication use in the elderly.

It is important to remember that these guidelines are simply a tool used to alert practitioners to the fact that an elderly patient is receiving a potentially inappropriate medication. The practitioner must then use professional judgment and clinical knowledge to determine the most effective drug therapy for the patient.

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