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**Polypharmacy and Potentially Inappropriate Medication in the Elderly Across the Practice-Setting Spectrum**

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Pharmacists and other clinicians who care for seniors across all practice settings have an important role in managing medications.1 In the United States, medication-related problems (MRPs) are a public health threat that costs 200,000 lives and $200 billion a year.2-4 Futhermore, half of the illness, disability, and premature death caused by MRPs is preventable.5 In elderly individuals, 30% of hospital admissions may be linked to MRPs and approximately $20 billion is spent annually on hospitalizations related to inappropriate prescribing. 6,7 MRPs are associated with several contributing factors, including polypharmacy and inappropriate medication use, a major patient safety concern, especially for the elderly.8 Suboptimal medication selection **(Table 1)** is fairly common and is associated with worse patient-reported health-related quality of life.9 It has been shown that criteria for assessing inappropriate medications for elderly patients can be applied to population-based surveys to identify opportunities to improve quality of care and patient safety.8 Focusing on reducing inappropriate prescribing, decreasing polypharmacy, avoiding adverse events, and maintaining function provides the pharmacist with an opportunity to improve outcomes for this elderly population.1

**Polypharmacy**

Polypharmacy, or the concurrent use of many drugs, has been associated with increased rates of potentially inappropriate medication (PIM) use **(Table 1)** and dangerous drug interactions;10 however, appropriateness of medication therapy is not gauged by polypharmacy alone.11 For instance, complex and multiple drug treatment often is required in the elderly, as they may have comorbidities (e.g., congestive heart failure, diabetes mellitus). Additionally, some conditions are actually undertreated in the geriatric population.



Problems with polypharmacy arise when more medications are prescribed than are clinically warranted. The key to appropriate therapy is individually tailored medication regimens that include the use of assessments (e.g., pain scales, Geriatric Depression Scale, Mini-Mental State Examination), appropriate dosing (e.g., geriatric dosing based on age, renal dosing based on creatinine clearance), efficacy and safety monitoring, drug interaction monitoring, and the process of identifying, resolving, and preventing MRPs.

Studies of nursing home residents have elucidated that adverse drug events (ADEs) are associated with modifiable and nonmodifiable risk factors **(Table 2).**12 When a senior patient experiences an ADE, a medication may be added to the existing drug regimen to address symptomatology secondary to the ADE. This intervention adds to the total number of medications in the regimen and increases the risk of drug interactions. Another frequently encountered scenario is an elderly individual who uses an OTC or prescription medication to treat minor complaints or symptoms that may be best managed nonpharmacologically.11 In this classic example of polypharmacy, an unnecessary drug increases the cost of care and may ultimately result in avoidable problems directly related to medication therapy (e.g., toxicity).11



**MRPs Across Practice Settings**

Ambulatory Care: In the ambulatory setting, MRPs lead to an annual cost of approximately $177.4 billion, encompassing hospital admissions ($121.5 billion/69%), long-term care admissions ($32.8 billion/18%), physician visits ($13.8 billion/8%), emergency department (ED) visits ($5.8 billion/3%), and additional treatments ($3.5 billion/2%).4 The issue of quality of care for elderly patients in the ambulatory care setting is a concern with respect to the prescribing of inappropriate medications by office-based physicians.13 The prevalence of PIM use among ambulatory patients 65 or older is high, particularly among those with the greatest medication needs.14,15 Responsibility for improving patient care in this setting lies with the physician-pharmacist collaborative effort.13

Caterino et al. aimed to determine the national rate and trends in inappropriate medication administration to elderly ED patients.16 Secondarily, they wanted to identify risk factors for receiving an inappropriate medication and to determine whether the administration of such an agent is at times justified based on the patient's diagnosis.16 A retrospective analysis, using Beers' 1997 explicit criteria and ED visits of patients 65 and older, found inappropriate medications were administered on roughly 16.1 million occasions (12.6% of visits) from 1992 to 2000.17,18 The rate of inappropriate administration was unchanged throughout the study period. The top six drugs involved in inappropriate administration (accounting for 70.8% of all cases) were promethazine (22.2%), meperidine (18.0%), propoxyphene (17.2%), hydroxyzine (10.3%), diphenhydramine (7.1%), and diazepam (6.0%).16 In multivariate analysis, the number of ED medications was the strongest predictor, with an odds ratio (estimated relative risk) of 6 for two to three medications (95% confidence interval [CI], 5.3 to 6.7) and 8.1 for four to six medications (95% CI, 7.2 to 9.2). The researchers noted that diagnoses indicating potentially appropriate uses of these medications were rarely present. For example, they state that only 42.4% of the patients receiving diphenhydramine and 7.4% receiving hydroxyzine were diagnosed with an allergic process. Caterino et al. noted that elderly ED patients frequently receive inappropriate medications, and potentially appropriate uses of generally inappropriate drugs cannot account for such administrations.16 Furthermore, the rates of inappropriate medication administration remained unchanged despite the 1997 publication of explicit criteria.16

Another research group, Chin et al., sought to determine the frequency of PIM selection for older persons presenting to the ED. They also sought to identify the most common problematic drugs, risk factors for suboptimal medication selection, and whether the use of these medications was associated with worse outcomes.9 They designed a prospective cohort study of almost 900 patients 65 or older who presented to an urban academic ED in 1995 and 1996. They used the 1997 Beers' explicit criteria for seniors to identify PIMs and adverse drug-disease interactions. The researchers analyzed revisits to the ED or hospital, death, and changes in health-related quality of life during the three months after the initial visit. They found that 10.6% of the patients were taking a PIM, 3.6% were given one in the ED, and 5.6% had one prescribed for them upon discharge from the ED.9 They found the most frequently prescribed PIMs in the ED were diphenhydramine, indomethacin, meperidine, and cyclobenzaprine.9

In this study, PIMs were most often prescribed by emergency physicians for patients with discharge diagnoses of musculoskeletal disorder, back pain, gout, and allergy or urticaria.9 The researchers found that potentially adverse drug-disease interactions were relatively uncommon at presentation (5.2%), in the ED (0.6%), and on discharge from the ED (1.2%). PIMs and adverse drug-disease interactions due to medications prescribed in the ED were not associated with higher rates of revisit to the ED, hospitalization, or death; however, they were correlated with worse physical function and pain.9 The researchers concluded that suboptimal medication selection not only was a fairly common practice but also was associated with worse patient-reported health-related quality of life. 9

Long-Term Care: Approximately $4 billion is spent on MRPs in nursing facilities.3 Gurwitz et al. studied 3,000 nursing home residents and found that more than half of ADEs were considered preventable; fatal, life-threatening, or serious events were more likely to be preventable than were less severe ADEs.5 It is no wonder that Gurwitz has previously suggested that any symptom in an elderly patient be considered a side effect of a medication until proved otherwise. 19

Home Health Care:A recent study reviewed medication use in elderly patients receiving home health care to identify the prevalence of PIM use, dangerous drug interactions, and other patterns of medication use.20 Researchers used data compiled from the charts of Medicare recipients 65 or older, while pharmacists compiled medication profiles based on admissions data and identified PIMs using the Beers' criteria, dangerous drug interactions, and polypharmacy in patients receiving at least nine medications. Results included data from almost 800 patients with a median age of 78 (range, 65 to 100) receiving a mean of eight medications, with 39% receiving polypharmacy. PIM use occurred in 31% of patients, and dangerous drug interactions were found in 10% of patients, with a significantly higher prevalence in men. Higher rates of PIM use (37%) and dangerous drug interactions (20%) were found in patients receiving polypharmacy.20 Thus, the researchers concluded that polypharmacy was associated with increased rates of PIM use and dangerous drug interactions. 20

**Improving Care with Pharmacists' Interventions**

Interventions to improve inappropriate prescribing in seniors encompass a variety of modalities. These include clinical/consultant pharmacist medication-regimen reviews, physician-focused efforts, the use of multidisciplinary teams, and a self-administered medication risk questionnaire.7,21,22 The role of a pharmacist as a transition coordinator and member of multidisciplinary case conferences to improve care and appropriate prescribing is described below.

Pharmacist Transition Coordinator: When transfers of geriatric patients from hospitals to long-term care facilities are poorly executed, they carry the risk of fragmentation of care, poor clinical outcomes, inappropriate use of ED services, and hospital readmission.23 A recent study by Crotty et al. sought to assess the impact of adding a pharmacist transition coordinator on evidence-based medication management and health outcomes in older adults undergoing first-time transfer from a hospital to a long-term care facility.23 In this randomized, single-blind, controlled trial, hospitalized older adults who awaited transfer to a long-term residential care facility for the first time were randomized to receive the services of the pharmacist transition coordinator (intervention group) or to undergo the usual hospital discharge process (control group).23 The study interventions included medication-management transfer summaries from hospitals, timely coordinated medication reviews by accredited community pharmacists, and case conferences with physicians and pharmacists.23 The primary outcome was quality of prescribing (measured using the Medication Appropriateness Index [MAI]), and the secondary outcomes were ED visits, hospital readmissions, ADEs, falls, worsening mobility, worsening behaviors, increased confusion, and worsening pain.23 Results of the study indicated that older people transferring from a hospital to a long-term care facility were vulnerable to fragmentation of care and adverse events.23 Using a pharmacist transition coordinator improved aspects of inappropriate use of medicines across health sectors.23

Case Conferencing with Pharmacist: A different study by Crotty et al. involved residents with medication problems and/or challenging behaviors selected for a case conference intervention involving a multidisciplinary team of health professionals.24 The impact of multidisciplinary case conferences on the appropriateness of medications and on patient behaviors in high-level residential senior care facilities was evaluated.24 This cluster-randomized controlled trial involved 10 high-level aged-care facilities, with two multidisciplinary case conferences involving the resident's general practitioner, a geriatrician, a pharmacist, and residential care staff held at the nursing home for each resident.24 Outcomes were assessed at baseline and three months. The primary outcome was rating on the MAI, and the behavior of each resident was assessed via the Nursing Home Behaviour Problem Scale.24 Results indicated a significant reduction in the MAI rating for benzodiazepines. Resident behaviors were noted to be unchanged after the intervention, and the improved medication appropriateness did not extend to other residents in the facility. The researchers concluded that multidisciplinary case conferences in nursing homes can improve care, and outreach specialist services can be delivered without direct patient contact and achieve improvements in prescribing.24

Medication-Risk Questionnaire (Self-Administered): Levy attempted to prevent MRPs in the community-dwelling elderly. The researcher used a patient questionnaire--without involving health care professionals or reviewing a patient's medical or pharmacy records--to determine whether a patient was at risk of having an MRP.22 The researcher indicated that while the study population was small, and future research should enhance its usefulness, this validated self-administered medication questionnaire provided ambulatory-care clinicians with a tool to streamline medication reviews.22 The results identified five questions that might be key predictors of who is at risk of having an MRP. According to Levy, patients identified at high risk with the use of this screening tool would then be well positioned for an in-depth, focused medication review with a pharmacist.

**Conclusion**

In seniors, MRPs can cause or exacerbate common and costly geriatric problems. Polypharmacy has been associated with increased rates of PIM use and dangerous drug interactions. PIMs and adverse drug-disease interactions have been found to correlate with worse physical function and pain in elderly patients. Pharmacists and other health care professionals and providers have an opportunity to improve health-related outcomes for seniors by focusing on reducing inappropriate prescribing, decreasing polypharmacy, avoiding adverse events, and maintaining function in this population.

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