

A Retrospective Evaluation of Potentially Inappropriate Medication Use in Hospitalized Elderly Patients

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ABSTRACT

Background: An estimated 30% of hospitalizations in the elderly may be drug-related. The Beers criteria are a list of potentially inappropriate medications (PIMs) generally considered unsafe in the elderly. These criteria are useful for assessing quality and safety of prescribing in the elderly population. **Purpose:** Evaluate PIM use, as defined by the Beers criteria, in elderly hospitalized patients. **Methods:** This cross-sectional study evaluated hospitalized patients ≥ 65 years old, consecutively admitted to general medical floors, starting 4/1/06 until 100 patients were enrolled. Each patient's home, discharge, and inpatient medication profiles were screened for PIMs. Actual usage and duration of therapy, source of prescription, potential justification for use, and pharmacy interventions were also collected. **Results:** Based on home medication lists, 32% of patients were taking ≥ 1 PIM prior to admission; rising to 56% during hospitalization; and declining to 36% at discharge. Of the 93 active hospital PIM orders, 62% were new orders and 38% were continued from home; 85% were categorized as "high" risk; 8.6% were potentially justified; and pharmacists intervened on three of the PIM orders. **Conclusion:** The percentage of patients prescribed PIMs increased significantly during hospitalization, but returned to baseline at dismissal. Healthcare provider education regarding safe medication prescribing in elderly hospitalized patients, formulary changes, and alterations to preprinted orders may be needed.

1. INTRODUCTION

As one ages, the likelihood for the use of multiple medications and the probability for adverse drug reactions (ADRs) increases. The elderly comprise approximately 1/5 of the population in the U.S., yet account for 1/3 of all medications prescribed and used.[1] An estimated 30% of hospitalizations in persons ≥ 65 years old may be linked to drug toxicity or other drug related problems.[2] This disproportionate risk for ADRs is partly attributed to the physiological changes of aging resulting in variations in pharmacokinetics and pharmacodynamics as compared to younger adults including: slowed drug clearance, increased risk of accumulation and toxicity, a more permeable blood brain barrier, increased risk of

central nervous system side effects, slowed orthostatic response, and others.[3] Multiple comorbid diseases may increase the likelihood for polypharmacy, subsequently increasing the risk of drug interactions and obscuring the risk/benefit ratio.[4]

The Beers criteria is a list of potentially inappropriate medications (PIMs) generally considered unsafe to prescribe in the elderly.[5] It was first created in 1991 by 13 medical specialists with extensive pharmaceutical and geriatric backgrounds. Initially the criteria pertained to only the frail elderly, but have since been revised and updated to include 30 criteria with severity ratings and is applicable to all persons ≥ 65 years old, not just the frail elderly.[4,6] The Beers criteria have been utilized in a variety of studies in assessing the quality and safety of prescribing for the elderly population in a variety of outpatient settings.[7] However, the authors know of no studies utilizing these criteria in hospitalized elderly.

The purpose of this study is to evaluate PIM usage, as defined by the Beers Criteria, in hospitalized patients ≥ 65 years of age. This study may help identify a need for further education regarding Beers criteria and safe prescribing in the elderly population.

2. METHODS, RESULTS, SIGNIFICANCE

Methods: This study was a retrospective cross-sectional evaluation conducted at a 760-bed tertiary care, teaching hospital. Patients were consecutively selected via a computer-generated list of all patients ≥ 65 years old, admitted to a general medical floor beginning April 1, 2006 until 100 patients were enrolled. Patients with a length of stay < 3 days were excluded. All of the data for this study were

collected from the hospital's integrated computerized patient medication, laboratory, diagnostic and dictated medical records. Each patient's home, discharge, and inpatient medication profiles were screened for potentially inappropriate medications (PIMs). Actual usage and duration of therapy, source of prescription (i.e. continued home medication vs. new medication; pre-printed hospital order vs. handwritten order; prescriber), whether the patient was discharged on it, indication for use, potential justification, and pharmacy interventions regarding PIMs were also collected. This project was approved by both the Wichita State University and Wesley Medical Center Institutional Review Boards.

Results: A total of 100 patients were enrolled and evaluated. Mean age was 78 ± 7 years with 56% females. A majority of patients were admitted from home (82%); while 18% were admitted from a nursing home, assisted living facility or another hospital, indicating an additional level of frailty. The mean length of hospital stay was 6.9 ± 4.9 days (range 3 to 37). The mean number of medications per patient increased from 9.2 ± 5.5 to 10.5 ± 5.0 , a mean increase of 1.3 ± 2.9 medications per patient (range -8 to +9). Based on home medication lists, 32% of patients were taking at least one PIM prior to admission. This increased to 56% during hospitalization and declined to 36% at discharge, indicating that not all of the home medications were continued during hospitalization and likewise, not all PIMs ordered during hospitalization were continued upon discharge. Prescribers self-discontinued nine PIMs upon admission; however, two of these medications were restarted when the patient was later discharged from the hospital.

Table 1: Frequency of PIM Prescribing

Percentage of Patients Prescribed:	Home Med List	Hospital Med List	Discharge Med List
≥ 1 PIM	32%	56%	36%
≥ 2 PIM	11%	25%	10%
≥ 3 PIM	1%	7%	0%

A total of 93 PIMs were identified as active orders during hospitalization. Of these, 38% were continuations of home medications and 62% were newly ordered; 45% being individually written orders and 17% being initiated as part of pre-printed, standing orders. Eighty-five percent of the PIM orders were categorized as "high" risk according to the Beers criteria and 15% categorized as "low" risk. Pharmacists intervened on three of the 93 PIM orders; the prescribers accepted all three recommendations. Of the 93 PIMs identified, eight (8.6%) were deemed potentially justified. The mean number of PIMs per patient, including all 100 patients, was 0.9 ± 1.13 (range 0 to 5). The mean

number of PIMs per patient, including only those with at least one PIM was 1.6 ± 1.03 (range 1 to 5). The most commonly prescribed PIMs were the antihistamines (promethazine and diphenhydramine) and the cardiac drug, amiodarone. The most commonly prescribed PIMs by drug class were antihistamines and cardiovascular drugs.

Significance: The medications included in the Beers criteria are considered potentially inappropriate in the elderly because safer alternatives exist. In this study, the percent of patients receiving PIMs increased during hospitalization. Literature demonstrates that PIM usage puts elderly at increased risk of ADRs; therefore, strategies to intercept and prevent PIM prescribing should be implemented whenever possible. Possible reduction strategies identified in this study include: alterations to pre-printed hospital orders, changes to the hospital's formulary (listing of medications available at the hospital), prescriber education, and targeted pharmacy interventions. More than half of the PIM orders for diphenhydramine and promethazine originated from pre-printed orders. Removing these PIMs from pre-printed orders or requiring a lower dose alternative for elderly patients may have reduced these orders. Hospitals may consider removing specific high risk drugs from the hospital's formulary such as the opioid pain medications, meperidine and propoxyphene. This would restrict their use to situations or settings where these medications were absolutely necessary; for example in persons with allergies to other opioids. Had each of these reduction strategies been implemented, PIM usage would have been reduced from 56% to 50%, $p=0.23$. This is helpful, but not a statistically significant reduction. Pharmacists intervened on only three of the PIM orders and 45% of the PIM orders were individually written, new orders. Therefore, other reduction strategies must also occur such as prescriber education regarding the Beers criteria and pharmacist education regarding identification of PIM orders and interception / interventions to alter prescribing patterns.

3. CONCLUSION

The percentage of patients prescribed PIMs increased significantly during hospitalization, but returned to baseline at dismissal. Healthcare provider education regarding safe medication prescribing in elderly hospitalized patients, formulary changes, and/or alterations to preprinted orders may be needed.

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