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## An Assessment of Potentially Inappropriate Medications Among the Elderly and the Effect of an Educational Intervention on Provider Knowledge of These Medications

Amanda Brown  
[amanda.mueller66@gmail.com](mailto:amanda.mueller66@gmail.com)

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Amanda Brown, Student  
Dr. Julianne Ossege, Advisor

Running head: AN ASSESSMENT OF POTENTIALLY INAPPROPRIATE MEDICATIONS

Final DNP Project Report

An Assessment of Potentially Inappropriate Medications Among the Elderly and the Effect of an  
Educational Intervention on Provider Knowledge of These Medications

Amanda M. Brown, BSN, RN

University of Kentucky

College of Nursing

Fall 2018

Julianne Ossege, PhD, FNP-BC, FNAP, FAANP– Committee Chair

Kathy Wheeler, PhD, APRN, NP-C, FNAP, FAANP– Committee Member

Amanda Parker, DNP, NP-C– Clinical Mentor

# AN ASSESSMENT OF POTENTIALLY INAPPROPRIATE MEDICATIONS

## Dedication

I dedicate this work to all my future patients whose healthcare can be improved by this project and all other DNP projects. As the result of this work, I recognize that providers have a duty to prescribe medications responsibly. I will use what I have learned throughout this process to advocate for medication safety and evidence-based practice within my profession.

# AN ASSESSMENT OF POTENTIALLY INAPPROPRIATE MEDICATIONS

## Acknowledgements

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# AN ASSESSMENT OF POTENTIALLY INAPPROPRIATE MEDICATIONS

## Abstract

**Objectives:** The aims of this study were to assess potentially inappropriate medications (PIMs) or Beers medications among outpatient older adults within one Midwestern healthcare system, to determine rates of patient education on Beers medications, and to pilot an educational intervention for providers.

**Methods:** This study involved two parts. For part 1 of the study, a randomized retrospective chart review of 493 older adult patients seen in 2017 from four practices was conducted to assess Beers medication prescriptions and rates of patient education. Following the chart review, for part 2 of the study, an educational intervention was delivered to two providers at one practice site on the Beers Criteria and chart review results. A post-test only design was used to determine intervention success.

**Results:** Of the patients included, 64.2% ( $n = 316$ ) were prescribed a Beers medication during 2017. There were no statistically significant differences for age, gender, or race. A total of 50 different Beers medications were prescribed. The most frequently prescribed drug categories included Proton-pump inhibitors (25.1%), Non-steroidal anti-inflammatory drugs or NSAIDS (18.2%), Benzodiazepines (16%), Anticholinergics (13.6%), and Skeletal muscle relaxants (8.2%). The rate of documented patient education on the risks of the Beers medication(s) was 11.4% ( $n = 36$ ). Both of the providers who participated in the educational session demonstrated 100% proficiency on the post-test.

**Conclusion:** This study not only demonstrated potentially inappropriate medication prescription trends but also identified a gap in these prescriptions and patient education on the risks associated with the medications. An educational session for providers demonstrated great

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potential for refreshing memories and/or providing new information on the Beers Criteria and the importance of patient education.

*Keywords:* older adults, potentially inappropriate medications, Beers Criteria, provider education

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## An Assessment of Potentially Inappropriate Medications Among the Elderly and the Effect of an Educational Intervention on Provider Knowledge of These Medications

### **Introduction**

The elderly or “older adult” population in the United States is predicted to increase dramatically over the next several years, reaching an estimated 83.7 million by 2050 (Ortman, Velkoff, & Hogan, 2014). Just as this special population is growing, so is the concern for providing appropriate evidence-based care. Due to having more than one disease process, older adults are complicated utilizers of the healthcare system and pharmacotherapy (Wooten, 2012). Pharmacokinetic changes that take place in these individuals can cause them to respond differently to medications than the younger population, placing them at risk for adverse drug reactions (Wooten, 2012). Such changes in the body include altered gastric pH and function, an increased percentage of fat along with a subsequent loss of muscle, and reduced hepatic and renal function (Wooten, 2012).

A cohort study among over 30,000 Medicare recipients examined the quantity, severity, and preventability of adverse drug events and identified a total of 1,523 of these events. (Gurwitz et al., 2003). Approximately 27.6% of adverse drug events were preventable and errors that correlated with preventable drug reactions occurred most commonly at the prescribing and monitoring phases of the pharmacotherapy process; therefore, Gurwitz et al. (2003) recommended interventions that target these specific phases. The Beers Criteria is a tool that when utilized, targets these exact phases.

The Beers Criteria include lists of potentially inappropriate medications (PIMs) for older adults over the age of 65 (American Geriatrics Society [AGS] 2015 Beers Criteria Update Expert Panel, 2015). These lists were originally developed by Dr. Mark Beer, a gerontologist, and have

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been in circulation since 1991 (AGS 2015 Beers Criteria Update Expert Panel, 2015). The American Geriatrics Society has updated these lists several times, including most recently in 2015. These lists were designed to serve as a guide for providers in promoting medication safety in the older adult population (AGS 2015 Beers Criteria Update Expert Panel, 2015).

Unfortunately, there is no current intervention within the principle investigator's healthcare system that utilizes the Beers Criteria to help providers make decisions when prescribing to the older adult population. Moreover, a chart review was conducted at one outpatient practice within the principle investigator's organization which identified a gap between Beers medication prescriptions and patient education. This chart review revealed that out of 101 patients on at least one Beers medication, 196 total Beers medications were prescribed within a one-year time frame (Parker, 2016). Additionally, only four charts out of the 101 charts reviewed contained documentation that education was provided to the patient regarding the potential side effects of the Beers medications (Parker, 2016). The purpose of this study was to expand the previous chart review done by Parker (2016) to assess Beers medication prescriptions within the larger healthcare system.

### **Background**

Potentially inappropriate medications or PIMs are medications that providers should completely refrain from prescribing to patients age 65 and older, prescribe with dosage adjustments, or prescribe with plans for close monitoring (AGS 2015 Beers Criteria Update Expert Panel, 2015). Fick, Mion, Beers, and Waller (2008) reported a significant prevalence of conditions associated with the use of PIMs, including change in consciousness, syncope, sleep problems, urinary retention and incontinence, dehydration, bradycardia, depression, falls, fractures, and delirium to name a few. Another study by Stockl, Le, Zhang, and Harada (2010)

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found that participants who received a high risk sedative hypnotic were 22% more likely to experience a fall or fracture. Stockl, Le, Zhang, and Harada (2010) also found that the use of PIMs poses a significant financial burden. As an example, the total medical costs were anywhere from \$2,000 to \$11,000 higher for individuals who received PIMs when compared to those who did not (Stockl, Le, Zhang, and Harada, 2010). A more recent study that looked at the long-term impact of PIMs, found a reduction in mental functioning in women 75 and older who used these medications (Koyama, 2014).

The Centers for Medicare and Medicaid Services (CMS) have been monitoring the prescribing trends of high-risk or potentially inappropriate medications among the older adult population since 2005 (Qato & Trivedi, 2012). In a national study examining Medicare data on over 6 million patients, it was determined that 21.5% of Medicare beneficiaries received at least one PIM and 4.8% received more than one PIM (Qato & Trivedi, 2012). Demographics that predicted the receipt of PIMs included being female, of low income, and Caucasian (Qato & Trivedi, 2012).

The Beers Criteria can assist providers in engaging patients in their treatment plans and enabling patients to understand the side effects associated with their medications. These concepts are supported by Nola Pender's Health Promotion Model (2011) which served as a framework for this study. This theory describes factors that influence health-related behaviors (Pender, 2011). The Health Promotion Model includes seven assumptions, one of which describes health professionals as having the ability to influence patient behavior (Pender, 2011). There are also 13 theoretical propositions, one of which states that patients are more likely to engage in health-promoting behavior when they are supported and enabled (Pender, 2011).

### **Study Goal and Objectives**

The goal of this study was to review Beers medication prescriptions at four practice sites within the principle investigator's organization and to develop and pilot an educational program for providers on the high-risk medications listed in the Beers Criteria and organizational trends. Specifically, provider knowledge of these high risk medications, as well as patient education were targeted. The aims of the study included: 1. To determine the rate and type of Beers medications prescribed to older adult patients from four primary care offices within a large Midwestern metropolitan healthcare system; 2. To determine the rate of patient education among those for whom Beers medications were prescribed; and 3. To assess provider knowledge of Beers medications following an educational session at one pilot site.

### **Methods**

#### **Study Permission**

Permission for this study was granted by both the organizational review board and the University of Kentucky Institutional Review Board. Permission was also granted by the American Geriatrics Society to distribute copies of "A Pocket Guide to the AGS 2015 Beers Criteria" to providers in attendance at the educational session.

#### **Design, Sample, and Setting**

This study consisted of two parts: Part 1: A randomized retrospective chart review of older adult patients, and Part 2: A post-test only design following an educational intervention. The retrospective chart review portion of the study included adult patients age 65 and older from four practice sites spread out geographically within the larger Midwestern metropolitan healthcare system. The organization is not-for-profit and at the time of the study included five hospitals, multiple immediate care centers and specialists, and 30 primary care practices. The

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estimated population of the metropolitan city during the time of the study was 621,349 with 13.8% of the population being age 65 and older (U.S. Census Bureau, 2017b). Just prior to the study, the healthcare system's primary care offices served a total of 45,473 elderly patients in 2016, which made up 26% of the population seen. The older adult population was the focus of the retrospective chart review as the Beers lists of potentially inappropriate medications only pertain to individuals age 65 and older.

For part 2 of the study, one of the practice sites included in the chart review also served as the pilot site for the educational intervention. Additionally, this practice site was selected for the educational intervention because it is the same site where a previous chart review was conducted by Parker (2016) on Beers medications. The practice site had four providers total, three physicians, and one nurse practitioner. Just prior to the study, the practice site saw a total of 737 elderly patients in a one-year time frame in 2016, and elderly patients made up 33.6% of all patients seen in the same year.

### **Subject Recruitment**

For part 1 of the study, retrospective data was obtained from the electronic medical records of patients from the four practice sites. The charts were randomly selected in collaboration with the healthcare system's data specialists based on the inclusion criteria. Inclusion criteria for the chart review were: a) patients age 65 and older, b) patients seen between January 1, 2017 and December 31, 2017, and c) patients prescribed at least one medication. A random sampling method was used with the goal of selecting 125 charts from each of the four facilities to review for a total of 500 charts.

Following the chart review, for part 2 of the study, an educational session on the Beers medications and current organizational prescribing trends took place at one of the practice sites



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included in the chart review. The session was open to all providers at the practice site. The providers participated on a voluntary basis with encouragement from the practice manager. The principle investigator delivered the education to the providers.

### **Study Procedures**

Following the random selection of charts by the healthcare system's data specialists, a crosswalk data table was used by the principle investigator to assign each medical record a unique identification number. This crosswalk table was then stored on a password protected H drive maintained by the organization. For each medical record, the principle investigator briefly analyzed the medication list from all visits in 2017 to determine the number and type of Beers medications prescribed. Only medications from Table 2 of the Beers Criteria, which are medications that should generally be avoided in all patients, were included. Medication classes such as Proton-pump inhibitors and Non-steroidal anti-inflammatory drugs (NSAIDS) were included if evidence of recurrent or long-term use existed as dictated by the Beers Criteria. Expired prescriptions were excluded. For those patients identified as having a Beers medication prescribed, the chart received a code of '1,' and the medication(s) was/were recorded. For patients identified as having no Beers medications prescribed, the chart received a code of '0.' Demographic variables were collected on all patients including: sex (male vs female), age (in categories), and race (ethnicity: American Indian/Alaska Native, Asian, Black, Hispanic, Native Hawaiian or Pacifica Islander, White, Other, Or Unknown). All data collected was de-identified through the use of the unique identification numbers established by the crosswalk table and transferred to an electronic spreadsheet for analysis. The electronic spreadsheet was stored on the secured H drive separately from the crosswalk table containing the medical record numbers.

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No further analysis was conducted on charts with a code of '0.' The principle investigator further analyzed the charts assigned a code of '1' and examined primary care provider progress notes and after visit summaries within the year 2017 for documentation of patient education on the side effects or risks of the Beers medication(s). These charts received another code of '1' if evidence of education was found, or '0' if no evidence of education was found. Any documentation on side effects or risks associated with the medications, even general statements, were accepted. The codes for education were transferred onto the electronic spreadsheet.

The educational session for part 2 of the study took place in September 2018 at the pilot site. Two providers voluntarily participated in the session. Signed informed consents were obtained from the providers prior to the session. The providers in attendance were given a copy of "A Pocket Guide to the AGS 2015 Beers Criteria" by the American Geriatrics Society for reference. The educational session lasted approximately 15 minutes. A written post-test was administered to the providers following the session to determine success of the program. The post-test consisted of five multiple choice questions pertaining to the Beers lists and chart review results and scored on a true/false scale. Success of the program was determined by a score of 80% or higher on the post-test. Two additional questions were collected on the post-test that were open-ended and prompted providers to report how familiar they were with the Beers Criteria prior to the educational session and explain whether or not the educational session was helpful in refreshing their memory and/or providing them with new information.

### **Data Analysis**

Data from the electronic spreadsheet was analyzed with the assistance of a statistician employed by the University of Kentucky College of Nursing. Frequency distributions were used to report categorical variables including age, gender, race, prescription of Beers medications, rate

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of patient education, rate of Beers medications prescribed per patient, and rate of Beers medications prescribed by drug category. Chi-square tests were used to determine differences in Beers medication prescriptions by gender and race. The Mann-Whitney U test was used to examine the association between Beers medication prescriptions and age. Chi-square tests were also used to determine whether there were differences in Beers medication prescriptions and patient education between the four practices, with post-hoc comparisons used to further analyze differences in patient education. Statistical significance was determined at a p-value of  $<0.05$ . SPSS software, version 24, was used for analysis.

### **Results**

#### **Part I**

##### **Sample characteristics.**

A total of 493 charts from the four primary care offices that met criteria were included in part 1 of the study. Of the patients included, 81% were between 65 and 79 years of age and 55.2% were female. The majority of the sample was white at 84.4% (see Table 1).

##### **Beers medications prescribed.**

Of the 493 patients included, 64.2% ( $n = 316$ ) were prescribed a Beers medication during 2017 from Table 2 of the American Geriatrics Society 2015 Beers Criteria (AGS 2015 Beers Criteria Update Expert Panel, 2015). A total of 50 different Beers medications were prescribed (see Appendix A for full list). The number of Beers medications prescribed per patient ranged from one to eight, with approximately 75% of patients being on one or two medications (see Table 2). The most frequently prescribed drug categories included Proton-pump inhibitors (25.1%), Non-steroidal anti-inflammatory drugs or NSAIDS (18.2%), Benzodiazepines (16%), Anticholinergics (13.6%), and Skeletal muscle relaxants (8.2%) (see Figure 1). There were no

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statistically significant differences for age, gender, or race between those who were prescribed at least one potentially inappropriate medication and those who were prescribed no potentially inappropriate medications. There were no statistically significant differences in the rate of Beers medications prescribed between the four practices.

### **Patient education.**

Of the 316 patients prescribed a Beers medication, 11.4% ( $n = 36$ ) had documentation within their medical record that education was provided on the risks of the medication(s). A statistically significant difference ( $p < 0.05$ ) was found in the rate of documented provider education from Practice #2 when compared to each of the other three practices (see Figure 2).

## **Part II**

### **Provider knowledge.**

Both of the providers who participated in the educational session demonstrated 100% proficiency on the post-test. On the first survey question, both providers stated that they were “very familiar” with the Beers Criteria prior to the educational session. Both providers also answered “yes” to the second survey question which asked if the educational session was helpful in refreshing their memory and/or providing them with new information. One provider further stated it is “helpful to document the risks and benefits of medications.”

Following the post-test, anecdotal comments were made by the providers that it would be beneficial for patients to receive education on the Beers Criteria because it is the patients who are often resistant to making changes in their medication regimens. Additionally, the providers mentioned that they have noticed that many patients new to the practice are already established on a Beers medication.

## **Discussion**

The study findings support the aims of the study by demonstrating which classes of potentially inappropriate medications are prescribed most frequently to older adult patients within the healthcare system. This study also found a significant gap between the prescription of Beers medications and patient education on the risks associated with these medications. Furthermore, the post-test demonstrated success of an educational program for providers on Beers medications, supporting the final aim of the study.

## **Key Findings**

The four practices within the study are located in three different counties surrounding the larger metropolitan city. According to the U.S. Census Bureau (2017a), these counties ranged from 72.3-96.2% White, 1.2-22% Black, and 48-51.6% Female. These findings are similar to the sample characteristics in this study.

It is difficult to compare the study findings on the rate of Beers medications prescribed (64.2%) to findings within the literature. This is due to the literature varying significantly with the number of Beers medications prescribed to elderly patients depending on the setting, the methods used, and the version of the Beers Criteria used. In a study by Qato & Trivedi (2012) the percentage of Medicare patients that received at least one high risk medication in Kentucky in 2009 was 25.5-30.8%. A more recent study of Beers Criteria medications among military hospital patients found that 73% of patients were on at least one of these medications on admission (Osei, Berry-Caban, Haley, & Rhodes-Pope, 2016). Another study on residential care facility patients found that around 81.4% of participants had been exposed to a PIM within a 1-year time frame (Harrison et al., 2018). In the current study, the majority of patients (75%) were on one or two Beers medications, which is consistent with the previous DNP student's findings

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within the same organization (Parker, 2016). Parker (2016) found that 76 out of 101 patients were on one or two Beers medications.

Similar to the rate of Beers medications prescribed, there are some differences among the classes of Beers medications most frequently prescribed in the literature. Several other studies have found Anticholinergics and Benzodiazepines to be among the top drug classes prescribed (Harrison et al., 2018; Osei et al., 2016; Parker, 2016). NSAIDS are also generally high on the list of most frequently prescribed PIMs (Osei et al., 2016; Parker, 2016) Furthermore, the study by Harrison et al. (2018) found Proton-pump inhibitors to be the most frequently prescribed drug class as well as the PIM class that was associated with the highest cost. This finding is likely a reflection of the version of Beers Criteria used, because proton-pump inhibitors were added to the 2015 Beers Criteria update (AGS 2015 Beers Criteria Update Expert Panel, 2015).

The literature supports differences in demographics among those who are on a high risk medication when compared to those who are not. According to Qato and Trivedi (2012), demographics that predicted the receipt of PIMs included being female, of low income, and Caucasian (Qato & Trivedi, 2012). This was not found in the current study as there were no statistically significant differences for age, gender, or race between those who were prescribed at least one PIM and those who were prescribed no PIMs. This study did not look at income.

The current study does reinforce Parker's (2016) findings that there is a gap within the organization when it comes to educating patients on the potential risks of their Beers medications. Only 11.4% of charts contained documentation of patient education. A post hoc analysis did find that Practice #2 had a higher rate of education than the other practices which was attributed to one provider. This rate was still only 24.7%. Parker (2016) found that less than 4% of patients were educated on the risks of their medications; however, her sample was much

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smaller and only from one practice within the organization.

There is little evidence available within the literature regarding educational interventions with providers on the Beers Criteria. According to the participating providers in the study however, the educational session was helpful in at least refreshing their memory on the Beers Criteria. Additionally, the educational session brought awareness to the providers on the most frequently prescribed Beers medication classes within the system. Ideally, this could lead to a reduction in the prescription of these medications in the future by these providers. Further studies are needed on this type of intervention.

### **Practice Implications**

One practice implication related to this study would be the development of an alert within the electronic medical record that notifies providers when they are prescribing a Beers medication to their elderly patients. Currently, no such alert exists for ambulatory patients in the healthcare system involved in the study despite such an alert being supported by the literature. A study by Peterson et al. (2014) on inpatients instituted a computerized dashboard within the electronic medical record that flagged individuals with at least one PIM or high anticholinergic score. A pharmacist reviewed the flagged records and communicated with the treating physician with outcomes demonstrating that clinicians acted on 31 out of 40 (78%) pharmacist recommendations (Peterson et al., 2014). A study by Alagiakrishnan et al. (2016) utilized a computerized decision support tool for primary care providers. Subjective findings included clinicians recognizing the appropriateness of such a tool despite a modest time burden that did not disrupt overall workflow (Alagiakrishnan et al., 2016). Approximately 25% of alerts were overridden with 15% of alerts prompting an evidence check by the provider (Alagiakrishnan et al., 2016).

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The incorporation of a “smart phrase” by providers describing how they educated their patient on their Beers medication(s) is another practice implication. The current electronic medical record system within the organization allows providers to create “smart phrases” or “dot phrases” which consist of phrases that they commonly utilize when documenting in the electronic chart. These phrases can be inserted into the providers’ notes so that education to patients on Beers medications is more efficiently captured.

Finally, standardization of patient education within the healthcare system on Beers medications is a very important practice implication. The providers who participated in the education session recognized that patient education is needed on the Beers Criteria. All patients within the healthcare system receive after visit summaries following office visits. Providers can select educational material on individual medications to include in these summaries; however, an option for general education on the Beers Criteria could also be incorporated to ensure that patients receive instruction on this topic.

### **Research Implications**

Some future research implications include system-wide expansion of the educational program followed by evaluation. Additionally, further medical record reviews are needed when updated versions of the Beers Criteria are published. This would allow for provider education to be updated to reflect changes in prescribing practices.

### **Limitations**

There were several limitations to this study. First, only those medications that are listed in the Beers Criteria as medications to avoid for all elderly patients (Table 2) were included in the medical record review. The tables involving potential drug-condition or drug-drug interactions were excluded. This may have affected the overall rate of Beers medications prescribed in this



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study. Additionally, the Beers Criteria encourages clinician judgement when prescribing PIMs based on their professional relationships with patients. This clinical judgement could not be accounted for in the chart review because medical records were not examined for specific medical conditions and the principle investigator had no professional relationship with the patients involved. Some of the medications prescribed therefore may have been appropriate for some of the patients.

This study also relied heavily on the accuracy of patient medication lists. Medications flagged by medical assistants or the providers as being taken by the patient were included in the study unless the medications were prescriptions that expired prior to the time period of the study. If medications lists were not reviewed and updated appropriately, this may have affected the results of the study.

Furthermore, education that was delivered to patients on their Beers medication(s) prior to the study period was not captured. Some patients are on Beers medications for many years, so it is possible that their providers educated them on the risks when these medications were first prescribed. This may have affected the overall rate of patient education in this study.

Finally, this study is limited by the small sample of providers who participated in the educational session. Only two out of the four providers at the pilot site volunteered to participate. This prohibits generalization of post-test findings to other providers and practices.

### **Conclusion**

Due to normal physiological changes, the growing older adult population poses challenges to the healthcare system and pharmacotherapy (Wooten, 2012). The Beers Criteria include lists of potentially inappropriate medications (PIMs) for individuals over 65 years of age and should be utilized by providers when prescribing to this vulnerable population (AGS 2015

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Beers Criteria Update Expert Panel, 2015). This study not only demonstrated inappropriate medication prescription trends among older adult patients within one large Midwestern healthcare system, but also identified a gap in Beers prescriptions and patient education on the risks associated with the medications. Further interventions are needed within the organization to assist providers and patients in better understanding and applying the Beers Criteria. A pilot educational program demonstrated great potential for refreshing providers' memories and/or providing new information to providers on the Beers Criteria and the importance of patient education. Further research is needed on the expansion of this type of educational program to more providers and practices.

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AN ASSESSMENT OF POTENTIALLY INAPPROPRIATE MEDICATIONS

Table 1. *Frequency Distributions for Selected Categorical Variables: Primary Care Patients Over 65 Years of Age (N=493).*

	<i>n (%)</i>
<b>Age</b>	
65-69	198 (40.2%)
70-79	201 (40.8%)
80-89	77 (15.6)
>90	17 (3.4%)
<b>Gender</b>	
Female	272 (55.2%)
Male	221 (44.8%)
<b>Race/ethnicity</b>	
White	416 (84.4%)
Black	58 (11.8%)
Other	19 (3.8%)
<b>Prescribed Beers Medication</b>	
Yes	316 (64.2%)
No	176 (35.8%)
<i>Note.</i> The “Other” racial category includes subjects in the following categories: American Indian/Alaskan Native, Asian, Hispanic, Other, and Unknown.	

## AN ASSESSMENT OF POTENTIALLY INAPPROPRIATE MEDICATIONS

Table 2. *Frequency Distributions for Additional Variables: Primary Care Patients Over 65 Years of Age Prescribed a Beers Medication (N=316)*

	<i>n (%)</i>
<b>Range of Medications</b>	
1-2	236 (74.7%)
3-5	77 (24.4%)
6-8	3 (0.9%)
<b>Evidence of Education</b>	
Yes	36 (11.4%)
No	280 (88.6%)

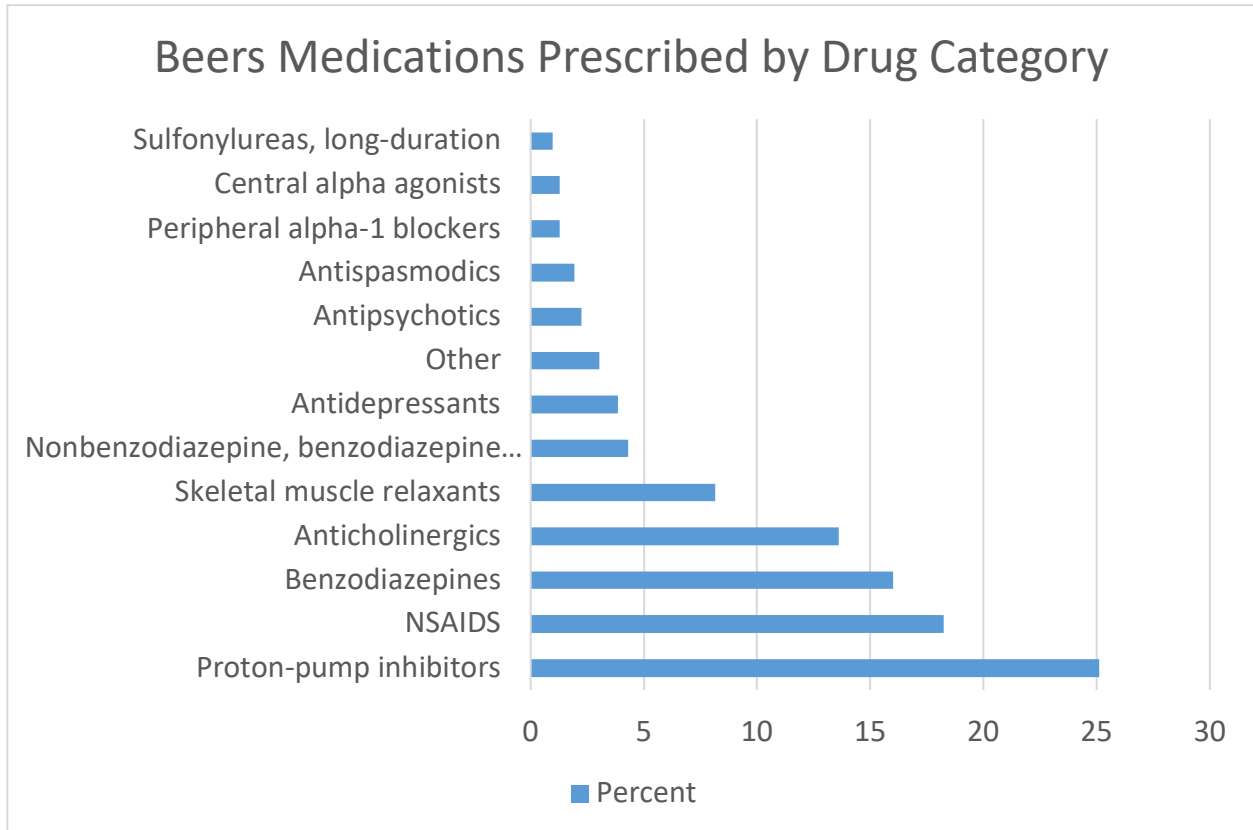


Figure 1. Frequency of Total Beers Medications Prescribed by Drug Category

(Note. The “Other” drug category includes the following medications/categories: Amiodarone, Digoxin, Androgens, Antiparkinsonian, Dronedarone, and Metoclopramide)



AN ASSESSMENT OF POTENTIALLY INAPPROPRIATE MEDICATIONS

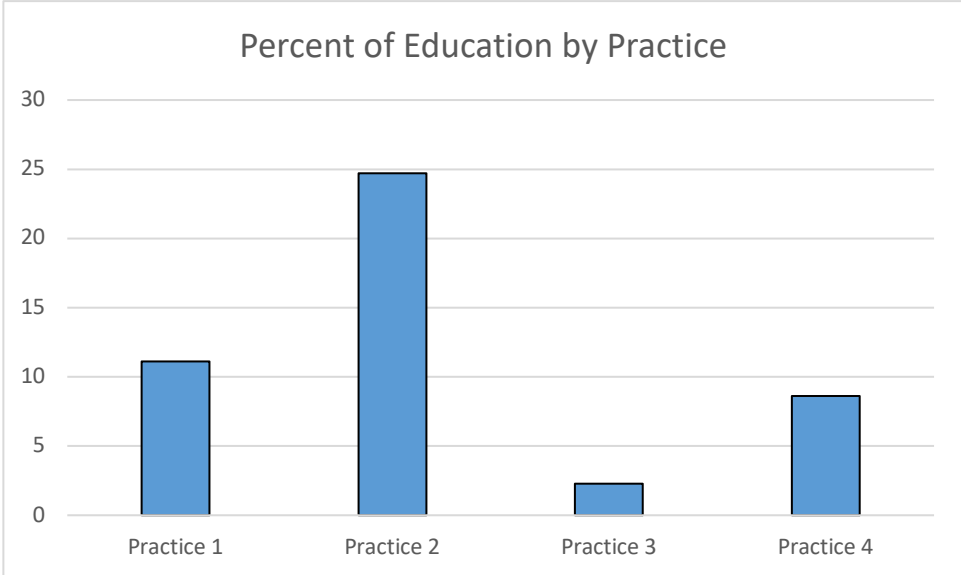


Figure 2. Frequency of Education Provided on Beers Medication(s) by Practice Site

AN ASSESSMENT OF POTENTIALLY INAPPROPRIATE MEDICATIONS

Appendix A

*Frequency of Beers Medications Prescribed (N = 625)*

<b>Medication</b>	<b>n (%)</b>
Omeprazole	84 (13.4%)
Meloxicam	43 (6.9%)
Promethazine	43 (6.9%)
Pantoprazole	41 (6.6%)
Cyclobenzaprine	39 (6.2%)
Alprazolam	39 (6.2%)
Zolpidem	27 (4.3%)
Esomeprazole	23 (3.7%)
Ibuprofen	23 (3.7%)
Hydroxyzine	21 (3.4%)
Naproxen	20 (3.2%)
Diclofenac	19 (3%)
Lorazepam	17 (2.7%)
Diazepam	15 (2.4%)
Clonazepam	15 (2.4%)
Amitriptyline	14 (2.2)
Dicyclomine	11 (1.8%)
Meclizine	10 (1.6%)
Paroxetine	10 (1.6%)
Temazepam	9 (1.4%)
Lansoprazole	9 (1.4%)
Clonidine	8 (1.3%)
Quetiapine	7 (1.1%)
Digoxin	6 (1%)
Amiodarone	6 (1%)
Doxazosin	6 (1%)
Glyburide	6 (1%)
Methocarbamol	5 (0.8%)
Brompheniramine	5 (0.8%)
Nabumetone	5 (0.8%)
Metaxalone	4 (0.6%)
Aripiprazole	4 (0.6%)
Testosterone	4 (0.6%)
Diphenhydramine	3 (0.5%)

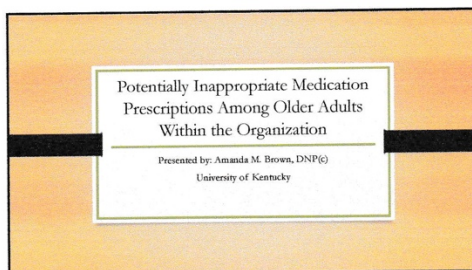
## AN ASSESSMENT OF POTENTIALLY INAPPROPRIATE MEDICATIONS

Chlomezepate	2 (0.3%)
Triazolam	2 (0.3%)
Ketoralac	2 (0.3%)
Chlorzoxazone	2 (0.3%)
Indomethacin	2 (0.3%)
Chlorpheniramine	2 (0.3%)
Terazosin	2 (0.3%)
Olanzapine	2 (0.3%)
Dronedarone	1 (0.2%)
Metaxalone	1 (0.2%)
Metoclopramide	1 (0.2%)
Trihexyphenidyl	1 (0.2%)
Oxazepam	1 (0.2%)
Cyproheptadine	1 (0.2%)
Hyoscyamine	1 (0.2%)
Prochlorperazine	1 (0.2%)

# AN ASSESSMENT OF POTENTIALLY INAPPROPRIATE MEDICATIONS

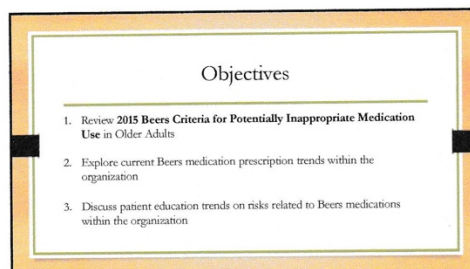
## Appendix B

### Educational Session Content



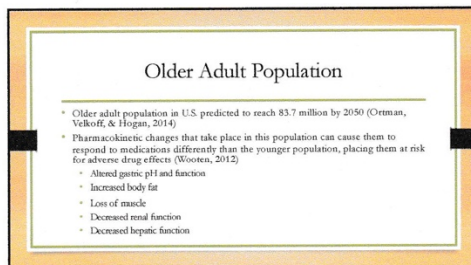
Potentially Inappropriate Medication Prescriptions Among Older Adults Within the Organization

Presented by: Amanda M. Brown, DNP(c)  
University of Kentucky



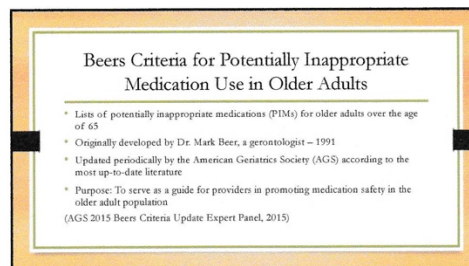
Objectives

1. Review 2015 Beers Criteria for Potentially Inappropriate Medication Use in Older Adults
2. Explore current Beers medication prescription trends within the organization
3. Discuss patient education trends on risks related to Beers medications within the organization



Older Adult Population

- \* Older adult population in U.S. predicted to reach 83.7 million by 2050 (Criman, Velloff, & Hogan, 2014)
- \* Pharmacokinetic changes that take place in this population can cause them to respond to medications differently than the younger population, placing them at risk for adverse drug effects (Wooten, 2012)
  - \* Altered gastric pH and function
  - \* Increased body fat
  - \* Loss of muscle
  - \* Decreased renal function
  - \* Decreased hepatic function



Beers Criteria for Potentially Inappropriate Medication Use in Older Adults

- \* Lists of potentially inappropriate medications (PIMs) for older adults over the age of 65
- \* Originally developed by Dr. Mark Beers, a gerontologist – 1991
- \* Updated periodically by the American Geriatrics Society (AGS) according to the most up-to-date literature
- \* Purpose: To serve as a guide for providers in promoting medication safety in the older adult population (AGS 2015 Beers Criteria Update Expert Panel, 2015)

# AN ASSESSMENT OF POTENTIALLY INAPPROPRIATE MEDICATIONS

## Examples of Beers Criteria Medication Classes

- \* Anticholinergics: confusion, dry mouth, constipation
  - \* Benzodiazepines: cognitive impairment, delirium, falls, fractures, motor vehicle crashes
  - \* NSAIDs (chronic use): GI bleeding, peptic ulcer disease
  - \* Proton-pump inhibitors (>8 week use unless high-risk patient): *C. diff*, bone loss, fractures
- \*New to the 2015 update

## 2015 Retrospective Chart Review Results

- \* At this practice, a retrospective chart review was conducted on patients seen in 2015
  - \* 101 charts of patients on at least one Beers medication were examined
  - \* Total of 196 Beers medications were prescribed
  - \* 4 charts out of 101 had evidence of patient education documentation
- (Parker, 2016)

## Current DNP Project

### Aims:

1. To determine the rate and type of Beers medications prescribed to elderly patients from four primary care offices within the organization
2. To determine the rate of patient education among those for whom Beers medications were prescribed
3. To assess provider knowledge of Beers medications following an educational session at one pilot site

Part 1: Retrospective chart review

Part 2: Post-test only design following educational session on chart review results

Table 1. Frequency Distributions for Selected Categorical Variables: Primary Care Patients Over 65 Years of Age (N=493)

	n (%)
<b>Age</b>	
65-69	198 (40.2%)
70-79	201 (40.8%)
80-89	77 (15.6)
>90	17 (3.4%)
<b>Gender</b>	
Female	272 (55.2%)
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Other	19 (3.8%)
<b>Prescribed Beers Medication</b>	
Yes	316 (64.2%)
No	176 (35.8%)

Note: The "Other" racial category includes subjects in the following categories: American Indian/Alaskan Native, Asian, Hispanic, Other, and Unknown

# AN ASSESSMENT OF POTENTIALLY INAPPROPRIATE MEDICATIONS

Table 2. Frequency Distributions for Additional Variables: Primary Care Patients Over 65 Years of Age Prescribed a Beers Medication (N=316)

	n (%)
<b>Range of Medications</b>	
1-2	236 (74.7%)
3-5	77 (24.4%)
6-8	3 (0.9%)
<b>Evidence of Education</b>	
Yes	36 (11.4%)
No	280 (88.6%)

Beers Medications Prescribed by Drug Category

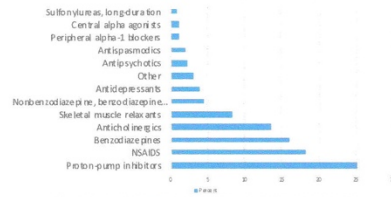
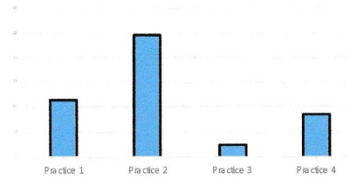


Figure 1. Frequency of Education Provided on Beers Medication(s) by Practice Site

Top 10 Most Common Beers Medications Prescribed

Medication	n (%)
Omeprazole	84 (13.4%)
Meloxicam	43 (6.9%)
Promethazine	43 (6.9%)
Pantoprazole	41 (6.6%)
Cyclobenzaprine	39 (6.2%)
Alprazolam	39 (6.2%)
Zolpidem	27 (4.3%)
Esomeprazole	23 (3.7%)
Ibuprofen	23 (3.7%)
Hydroxyzine	21 (3.4%)

Percent of Education by Practice



# AN ASSESSMENT OF POTENTIALLY INAPPROPRIATE MEDICATIONS

## Summary

- Beers Criteria are lists of inappropriate or potentially inappropriate medications for patients age 65 and older
- Most common drugs prescribed within the organization are PPIs with Omeprazole being #1
- There is a gap between patient education and Beers medication prescriptions within the organization

## References

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- Wooten, J. (2012). Pharmacotherapy considerations in elderly adults. *Southern Medical Journal*, 105(8), 437-445. doi: 10.1097/SMJ.0b013e31825bed90

## Questions?

- Please visit [www.geriatricscareonline.org](http://www.geriatricscareonline.org) for more information
- Full 2015 Beers Criteria document
  - 2 companion pieces:
    1. Information on how to best use the lists
    2. List of alternative medications

# AN ASSESSMENT OF POTENTIALLY INAPPROPRIATE MEDICATIONS

## Appendix C

### Educational Session Post-test

**Please answer the following questions based on the educational session content.**

1. The Beers Criteria are lists of inappropriate or potentially inappropriate medications for patients age 65 and older.

**True**

False

2. Some medication classes included in the Beers Criteria are:

A. Anticholinergics

B. Benzodiazepines

C. NSAIDS

**D. All of the above**

3. What is the most common Beers medication prescribed within the system?

**A. Omeprazole**

B. Amiodarone

C. Diphenhydramine

D. Glyburide

4. Benzodiazepine use in elderly patients is associated with cognitive impairment, delirium, falls, fractures, and motor vehicle crashes

**True**

False

5. There is a gap between patient education and Beers medication prescriptions within the system.

**True**

False



