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Inappropriate Medication Use Among Underserved Elderly African Americans

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Abstract

Objective—The goal of this study is to identify correlates and the prevalence of potentially inappropriate medication (PIM) use among underserved elderly African Americans.

Method—This cross-sectional study recruited 400 elderly African Americans living in South Los Angeles, and used structured, face-to-face surveys. These elicited data pertaining to the type, frequency, dosage, and indications of all medications used by participants.

Results—Seventy percent of participants engaged in PIM use and used at least one medication that was classified as “Avoid” (27%) and “Use Conditionally” (43%) through Beers Criteria. Significant correlations emerged between PIM use and the number of autonomic and central nervous system, neurological and psychotherapeutic medications, medication duplications, and drug–drug interactions.

Discussion—Our findings point to the need for multidisciplinary team programs of health care providers that include primary and specialist physicians, pharmacists, nurses, and social workers. Together, they can improve health outcomes, enhance the quality of life, and reduce morbidity and mortality due to inappropriate medication use.

Keywords

potentially inappropriate medication; PIM; Beers Criteria; African American; elderly

Introduction

The elderly population, aged 65 and older, comprise 13% of the U.S. population, and is expected to constitute almost 20% over the next 20 years (Resnick & Pacala, 2012; Vincent,

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Declaration of Conflicting Interests

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Velkoff, & U.S. Census Bureau, 2010). Although they currently comprise only 13% of the U.S. population, they account for 25% of drug expenditures and 30% of national health care expenditures overall (Barry, O'Keefe, O'Connor, & O'Mahony, 2006). This may be due to the many chronic medical conditions that elderly people often face, such as diabetes, hypertension, cancer, stroke, dementia, asthma, and coronary artery disease.

Managing multiple medical conditions often requires several different medications. This situation not only increases the likelihood of prescribing inappropriate medications but also increases the risk of adverse drug reactions that may require an unscheduled office or emergency room visit, or even hospital admission (Shetterly & Charney, 2011). The American Geriatrics Society (2012) reported that potentially inappropriate medications (PIMs) continue to be prescribed to older adults, despite evidence of danger specific to this segment of our population. Inappropriate medication use is therefore a significant challenge that should be routinely considered by all health care providers (Razzi, 2009).

The Beers Criteria (Beers et al., 1991) is a widely accepted guideline developed to help mitigate the risks of PIM use in the elderly population (Resnick & Pacala, 2012). Our study used the most recent, updated version of the Beers Criteria, released by the American Geriatrics Society (2012). The use of PIM is recognized as a global medical problem, and there are a number of studies of elderly populations in different countries, across several ethnicities, that use these criteria. The frequency in which PIM is utilized varies depending on where an elderly person lives. A meta-analysis of PIM utilization conducted in 2007 found that 40% of nursing home residents were receiving PIM (Aparasu & Mort, 2000). Among ambulatory community-dwelling residents usually seen by primary care workers, a 2001 U.S.-based study found the use of one or more PIMs to be 21% (Zhan et al., 2001). Another meta-analysis of 2012 U.S. PIM use in community-dwelling elderly Americans found the median rate to be 20%, with a range of 4.5% to 33%.

While there are several studies in the United States and other countries that examined the prevalence and correlates of PIM use among aged populations (Gallagher, Barry, Ryan, Hartigan, & O'Mahony, 2008; Locatelli, Lira, Torraga, & Paes, 2010; Monroe, Carter, & Parish, 2011; Niwata, Yamada, & Ikegami, 2006; Opondo et al., 2012; Singh, 2012; Skaar & O'Connor, 2012; van der Hooft et al., 2005; Vishwas, Harugeri, Parthasarathi, & Ramesh, 2012), to the best of our knowledge, there are no studies that specifically consider the elderly African American community (Vishwas et al., 2012), although African Americans comprise 12% of the U.S. population 65 and older (Vincent et al., 2010).

African Americans are affected by more chronic medical conditions than their White counterparts, and are at increased risk of morbidity and mortality from these conditions (Farley, Cline, & Gupta, 2006; Rosamond et al., 2008; Wang et al., 2007). They are also less likely to have regular medical care providers, are more likely to misidentify the purpose of medications, and are less likely to exhibit non-compliance in medication utilization (Bazargan & Barbre, 1992; Gellad, Haas, & Safran, 2007; Okoro, Strine, Young, Balluz, & Mokdad, 2005). Despite comprising a large portion of the U.S. elderly population, and the unique challenges faced by this group, there is little in terms of understanding PIM use

among this population, and even less on interventions designed to mitigate the use of PIM in elderly African Americans.

This study examines prescription (Rx) and over the counter (OTC) medication use in underserved communities of elderly African Americans, and identifies inappropriate medications through Beers Criteria. In addition, we examine correlations of inappropriate medication use, including demographic characteristics, medication duplication, number of medications, drug–drug interactions, drug–alcohol interaction, and drug–smoking interaction.

Method

This cross-sectional, faith-based study is funded by the Centers for Medicare and Medicaid Services (CMS). It was designed to identify prescribing trends and assess the feasibility of an interventional study to reduce inappropriate medication use in African American seniors who suffer from chronic health conditions. This study includes 400 African Americans, aged 65 and older, who were recruited from 16 predominantly African American churches located in South Los Angeles.

The study used structured, face-to-face survey interviews that examined type, frequency, dosage, indications, and perceived efficacy of all medications used by participants. Participants were asked to bring all of their medications, both Rx and OTC, for inspection by study staff. Drug use was ascertained through visual inspection of medication containers. Label information of each drug was recorded. All of these medications have been classified according to the 2013 Prescription Drug List of United Healthcare and Affiliated Companies. We also compared them against 2012 Beers Criteria. Any duplication of medications and various types of drug interactions were documented at the time of the survey interview, and were later evaluated by the research team pharmacist.

Measurement

The survey instrument was a collection of internally developed questions and validated instruments taken from various sources (Bazargan, Baker, & Bazargan, 1998; Bazargan, Bazargan-Hejazi, & Baker, 2005; Bazargan, Bazargan, Calderon, Husaini, & Baker, 2003; Bazargan, Norris, et al., 2005; Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963; Melzack, 1987; Odedosu, Schoenthaler, Vieira, Agyemang, & Ogedegbe, 2012; Sheikh & Yesavage, 1986; Ware, Kosinski, & Keller, 1996). The survey instrument was pilot tested with 12 elderly African Americans, and modifications were made based on the results and cognitive interviews.

PIM Use

Using the 2012 American Geriatrics Society revised Beers Criteria, we documented the number of PIM use for each participant. All of the inappropriately prescribed and OTC medications were divided in two categories: (a) “Use Conditionally” and (b) “Avoid.”

Adverse Drug–Drug Interaction

Each participant's medication(s) was/were entered into the drug interaction checker on healthline.com (http://www.healthline.com/druginteractions) and all drug–drug interactions, classified as mild, moderate, and severe, were recorded for each participant.

Independent Variables and Covariates

These consisted of the following:

- Socio-demographic information (age, gender, education, marital status, living arrangement);
- Health services coverage (access to care, primary care provider, multiple providers; Bazargan et al., 1998; Bazargan, Bazargan-Hejazi, & Baker, 2005; Bazargan et al., 2003; Bazargan, Norris, et al., 2005);
- Self-reported chronic medical conditions;
- Self-reported health status;
- Number of medications by category: Autonomic and central nervous system (CNS), Neurology, and Psychotherapeutic;
- Activities of daily living assessment using the index of Activities of Daily Living (ADL), a standardized measure of biological and psychosocial function (Katz et al., 1963);
- Pain severity as measured through the Short-Form McGill Pain Questionnaire (SF-MPQ; Melzack, 1987).

Statistical Analysis

Statistical analysis was performed using SPSS® statistical analysis software (SPSS 21.0 for Windows, SPSS Inc., Chicago, Illinois, the United States). In addition to a descriptive analysis of all variables, bivariate ANOVAs were conducted to determine the association between PIM use and independent variables. In addition, binary multiple logistic regressions were applied to examine the effect of independent variables on PIM use. Specifically, two sets of multiple logistic regression analysis were performed. The first examined the correlates of independent variables on PIM use. In addition, correlates of "Avoid" medications were assessed using the same independent variables. We utilized a p value < .05 to identify statistically significant differences. To avoid multicollinearity, a diagnostic test was performed in multivariate analysis to examine inter-correlation among independent variables.

Results

Characteristics of Sample

This sample included 400 African American individuals who were between the ages of 65 and 94 years (M 73.5 ± 7). More than 39% were 75 years of age or older. One out of four participants reported having no high school diploma. Almost 65% of the participants were

women. Only 20% of the sample was currently married or lived with a companion. More than 79% were enrolled in Medicare and 26% in Medicaid (Table 1, column 1).

With regard to health status, only 7% reported their present health as excellent, and more than one third described their health as fair (29%) or poor (5%). Table 2 reports the percentage of self-reported chronic conditions among our sample. In all, the number of reported chronic illnesses ranged from 0 to 17, with the average at just more than 5 (5.2 ± 3.01).

Key Findings

Key findings include the following:

- More than 85% reported that they have been diagnosed with hypertension.
- One out of four individuals who were diagnosed with hypertension was using at least three antihypertensive agents from different classes.
- Almost 37% of the participants were diagnosed with diabetes mellitus.
- Three out of four reported visiting more than one type of physician.
- Only 8% of the respondents did not have a regular or primary care provider.

Inappropriate Drug Usage

Table 3 reports the frequency of potentially inappropriate medication use among our sample of underserved elderly African Americans. This table lists both “Avoid” and “Use Conditionally” medications. Inappropriate drug use occurred among 70% of the participants. Whereas 36% were taking only one inappropriate medication, more than one third reported taking at least two types of inappropriate medications. Sixty-five percent and 72% of the inappropriate use of Rx and OTC medications occurred in male and female participants, respectively (Table 3).

The data showed that 27% and 43% of the participants used at least one medication that was classified as “Avoid” and “Use Conditionally” through Beers Criteria, respectively. The most common drugs among the “Use Conditionally” group were aspirin 42% (170), ibuprofen 10% (41), clonidine 7% (28), insulin (aspart, glargine) 6% (24), naproxen 5% (19), meloxicam 4% (18), terazosin 4% (17), and zolpidem tartrate 2% (10). The most common drugs in the “Avoid” group were nifedipine 6% (24), diphenhydramine 3% (13), glyburide 2% (8), lorazepam 2% (8), cyclobenzaprine 2% (7), diazepam 2% (7), and digoxin hydroxyzine 2% (7).

Drug–Drug Interactions and Drug Duplications

Table 1 reveals that almost 28% of the study population has one severe drug–drug interaction based on reported prescriptions and use. Twenty-five percent had two or more severe drug–drug interactions. Fifty-three percent is at risk of severe drug–drug interactions. In addition, 54% of our participants were using more than one medication from the same pharmaceutical subclass, with 37% and 17% of them having one and two or more medication duplications, respectively.

Bivariate Correlates of PIM

Table 1 reports bivariate correlates of PIM use with all other variables. As mentioned earlier, PIM was divided into two categories: (a) “Use conditionally” and (b) “Avoid.” Columns 2 to 4 of this table report bivariate correlates of all PIM use and independent variables. In addition, columns 5 to 7 show bivariate correlates of “Avoid” medications. Interestingly enough, age, education, marital status, and health care coverage (Medicare and Medi-Cal) showed no significant relationship with PIM usage. However, 9 out of 10 other independent variables reported in Table 1 (columns 2–4) were significantly associated with PIM use.

PIM was significantly higher among participants who also reported a higher number of chronic conditions, who had higher levels of pain, who reported visiting more than one type of physicians, who consumed a higher number of Rx and OTC medications, and who used a higher number of “autonomic and CNS, neurology and psychotherapeutic” (ACNP) medications. In addition, participants who were identified using duplication medication, and those who identified with drug–drug interactions, were also more likely to use PIM (Table 1, columns 2–4). In addition, eight independent variables reported in Table 1 were significantly associated with “Avoid” medications (columns 5–7). Similar relationships between PIM use and independent variables, and “Avoid” medications and independent variables, were detected. However, there was no significant association between “Avoid” medications and the number of OTC medications, and level of pain.

Multivariate Correlates of PIM

To document the independent association between PIM and independent variables, binary multiple logistic regression was used. PIM and “Avoid” medications used were categorized into two levels: (a) no use and (b) at least one use. Examining the bivariate association between independent variables, we noted a strong harmful multicollinearity among several independent variables, including number of non-ACNP medications, number of ACNP medications and number of medication duplications, and severe drug–drug interaction. We therefore performed two independent binary multiple logistic regression models.

Table 4 reports the result of multiple logistic regression adjusted odd ratios (OR) between independent variables and (a) total PIM use and (b) “Avoid” medications among our sample of underserved elderly African Americans. Table 4 includes age, gender, number of providers, level of pain, and number of chronic conditions. However, to avoid harmful multicollinearity, one model includes only the number of ACNP and non-ACNP medications, and the second includes medication interactions and duplications only.

Correlates of all PIM use—Table 4 (column 1 of Models 1 and 2) identifies five variables found significantly associated with PIM use. Participants who reported a higher level of pain were more likely (OR = 1.69) to be in the group of respondents who used at least one medication labeled through Beers Criteria as PIM, as opposed to the group that did not use any of these medications. The odds of being in the group of survey respondents who used at least one PIM is 1.69 times higher among individuals with pain, compared with those with no pain. Likewise, adjusting for age, gender, number of providers, and level of

pain, Table 4 (column 1 of both models) shows that a higher number of ACNP and non-ACNP medications are both associated with PIM use.

The odds of being in the group of survey respondents who used at least one PIM is 1.3 and 5.3 times higher among individuals with a higher number of non-ACNP and ACNP medications, respectively. Finally, adjusting for other variables, Table 4 (column 1 of Model 2) shows that when participants took higher numbers of medications proven to have severe interactions, or took higher numbers of medications from the same pharmaceutical subclasses (duplications), they are more likely to also use medications that are labeled through Beers Criteria as PIM. For example, using at least two medications with severe interactions leads to 4.6 times higher odds of being in the group of survey respondents who use medications that are labeled *PIM*, rather than "no use."

Correlates of "Avoid" medications—Table 4 (column 2 of Models 1 and 2) reports that only two variables are significantly associated with "Avoid" medications. These two models show that gender and the number of ACNP Rx are significantly associated with "Avoid" use. Adjusting for other variables, binary logistic regression analysis found that an increase in the utilization of ACNP drugs was associated with a significant increase in use of "Avoid" medications. Using at least one ACNP medication leads to 1.9 times higher odds of being in the group of survey respondents who use medications that are labeled through Beers Criteria as "Avoid" medications.

Discussion

Whereas other studies showed only differences in PIM use based on demographics, our study examined differences in PIM use associated with other independent variables. We confirmed several previously known issues that affect the geriatric community at large. However, for the underserved African American community, these issues are particularly grave and striking. In our sample of 400 elderly underserved community-dwelling African Americans, Table 1 reveals that 36% were using 1 PIM and 34% were using 2 or more PIMs. Sixty-nine percent of the participants were using at least one PIM. This is substantially higher than previously reported PIM use ranging from 4.45% to 27% (Aparasu & Mort, 2000; Chang et al., 2004; Goulding, 2004; Hanlon, Fillenbaum, Schmader, Kuchibhatla, & Horner, 2000; Qpfepi, 1994; Stuck et al., 1994; Viswanathan, Bharmal, & Thomas, 2005; Willcox, Himmelstein, & Woolhandler, 1994).

The high rate of overall PIM (70%) may reflect the high use of aspirin (n = 170), a drug that may be appropriately prescribed for persons with cardiovascular and cerebrovascular diseases. In addition, 37% of the sample had diabetes, which may require use of insulin. However, 27% of the sample used at least one medication that was classified as "Avoid" through Beers Criteria, and 14% were taking two or more "Avoid" medications. These findings highlight the necessity for immediate intervention to reduce PIM prescriptions by providing physicians. However, physicians are not their sole health care providers. As the use of mid-level agents (nurse practitioners and physician assistants) expands as a result of the Affordable Care Act (ACA), collaborative practice among all health care professionals, including pharmacists and social workers, may help mitigate PIM use.

Drug–Drug Interactions

Drug interactions frequently occur in older adults due to shared metabolic pathways between the drugs themselves (Steinman & Hanlon, 2010; Tatonetti et al., 2011). The prevalence of drug–drug interactions in our population is much higher than in previous studies, which showed drug–drug interactions among community-dwelling elderly to be in the range of 25% (Secoli, Figueras, Lebrao, de Lima, & Santos, 2010; Tulner et al., 2008). A 2012 study found major drug–drug interactions in a Brazilian population to be 12.1% (Teixeira, Crozatti, dos Santos, & Romano-Lieber, 2012). In addition, poly-pharmacy increases the risk of medication duplication. This in turn increases the risk of adverse outcomes (Tozawa et al., 2002). With regard to medication duplication, our findings are similar to those in previous reports, ranging from 11% to 61% (Long, Chang, Li, & Chiu, 2008). Moreover, our OR results reveal that taking even just one PIM is associated with significantly increased odds of having medication duplication.

Perception of Pain and Increased Use of ACNP Use

Another finding from this study was the identification of a statistically significant perception of pain among participants taking at least one PIM. Forty-one percent of our study population was found to have taken at least one medication considered an analgesic. Our data show that all four indices of the SF-MPQ (Melzack, 1987)—including (a) Continuous, (b) Intermittent, (c) Neuropathic, and (d) Affective pain—were significantly related to PIM used (table not presented here). Other studies have also shown that inappropriate analgesics are frequently prescribed for older adults. Skaar and O'Connor (2012) examined PIM among community-dwelling older dental patients using Beers Criteria. They found that 3 out of 10 older adults were prescribed a Beers Criteria drug including long-acting non-steroidal anti-inflammatory analgesics after dental visits (Skaar & O'Connor, 2012).

Our data show that one out of four participants (27%) used at least one medication that was classified as "Avoid" in Beers Criteria. Participants in our study used 17 medications that Beers Criteria recommended be avoided. Of these 17, 10 fell under the ACNP category. It is not surprising that our data show that an increase in the use of ACNP drugs was strongly associated with a significant increase in use of "Avoid" medications. This is consistent with other studies that demonstrate a high level of misuse of CNS medications among the elderly (Dellasega & Stricklin, 1996) and the increased risk of adverse side effects from these medications in this population (Closser, 1991). As many of the most dangerous PIM used in our study population were those affecting the nervous system, providers should be especially cautious when prescribing and recommending these drugs, and carefully weigh risk versus benefit to the patient.

Use of Outdated Medications

Certain agents identified as those to be avoided may eventually fall out of use due to the advent of replacements with greater efficacy and fewer adverse reactions. However, a good number of these older medications were still prescribed to our elderly African American participants.

Beers Criteria have identified chlorpropamide and glyburide as sulfonylureas (agents used in the management of Type 2 diabetes), which are agents to avoid. In the study group, no one was taking chlorpropamide, as it is a very old agent, and few were taking glyburide. It is likely that glyburide will eventually fall out of common use, however, as the standard of care for Type 2 diabetes. Newer agents such as metformin are more effective and exhibit a more favorable adverse drug reaction profile. Providers should therefore periodically review elderly patients' medication list and replace older and less safe medications for newer counterparts, as in the case of metformin *in lieu* of glyburide for type 2 diabetes. However, it seems that our sample of underserved African American elderly continued to receive older medications that were strongly recommended to be avoided.

In conclusion, the results of this study reveal that many participants are taking medications that are in contradiction to Beers Criteria. The situation warrants special attention. The updated Beers Criteria is not intended to be absolutely prohibitive, and there are cases where conditions in the aged are effectively managed with an agent categorized as "Avoid"; seven of our participants were taking digoxin, for example. Similarly, the use of agents identified as PIM should be evaluated on a case-by-case basis, considering indications, patient history, the individual's health status, and his or her entire medication regimen.

Providers should carefully weigh the risks and benefits of any new medication, especially when choosing to prescribe a PIM to an elderly person. It would be detrimental to the patient to abruptly discontinue such an agent if it were effectively managing a condition, simply because Beers Criteria indicate that it should be avoided. However, efforts should be made to avoid PIM use in newly diagnosed or previously untreated cases, so as to reduce the risk of adverse reactions and drug interactions.

Our study clearly reveals several trends: (a) a higher rate of PIM use among underserved elderly African Americans compared with their White counterparts; (b) the number of medications (particularly ACNP drugs), medication duplications, drug–drug interactions, and inappropriate medication use are all inter-related medication issues; and (c) pain, along with psychiatric and neurologic problems, place aged African Americans at high risk of all types of medication-related issues, particularly PIM use.

These findings indicate the need for multidisciplinary health care provider programs that involve primary and specialist physicians, pharmacists, nurses, and social workers to facilitate proper medication use resulting in better health outcomes. Each of the aforementioned health professionals has a specific role and emphasis in patient care. For example, a nurse may focus on the well-being of the patient overall and assess medication use as it pertains to the relieving of the patient's symptoms, particularly with regard to ACNPs. A pharmacist may instead focus on the frequency of refills or on therapeutic duplications. The patient will benefit from profession-specific expertise in a collaborative approach.

Our data show significant relationships between patients' medical characteristics and PIM use. However, the only provider-related variable that we included in our data analysis was "number of providers." It appears that future studies should focus more on specific provider

characteristics, for example, prescribing habits, and the type of site at which health care is accessed by elderly, underserved African Americans, for example, emergency room, public clinic, urgent care, or private office.

It is imperative to mention several limitations of this study. First, the sample sizes for subcategories of PIM were insufficient to determine the correlates of the subcategory of the PIM. Second, information regarding the participants' health services utilization prior to the survey was limited. Finally, the research team did not have access to the participants' medical records.

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Table 1

Characteristics of Study Sample and Bivariate Analysis (N = 400).

		Potentially inappropriate medications (Use Conditionally or Avoid)			Medications to avoid		
Characteristic of sample	**Total (N = 400)**	**No PIM (n = 122)**	**At least one PIM (n = 278)**	***p* value**	**No Rx to avoid (292)**	**At least one to avoid (108)**	***p* value**
Gender, *n* (%)							
Male	141 (35)	49 (34)	92 (65)	.175	**114 (81)**	**27 (19)**	**.010**
Female	259 (65)	73 (28)	186 (72)		**178 (69)**	**81 (31)**	
Age, *n* (%)							
< 75 years	242 (61)	71 (29)	171 (71)	.579	175 (72)	67 (28)	.731
≥75 years	158 (39)	51 (32)	107 (68)		117 (74)	41 (26)	
Education, *n* (%)							
No high school diploma	99 (25)	31 (31)	68 (69)	.923	72 (73)	27 (27)	.864
High school diploma	141 (35)	44 (31)	97 (69)		101 (72)	40 (28)	
Some college or more	160 (40)	47 (29)	113 (71)		119 (74)	41 (26)	
Marital status, *n* (%)							
Married or living with someone	78 (20)	29 (37)	49 (63)	.171	59 (76)	19 (24)	.670
Not married	322 (80)	93 (29)	229 (71)		233 (72)	89 (28)	
Medicare, *n* (%)							
Yes	316 (79)	94 (30)	222 (70)	.594	230 (73)	86 (27)	.891
No	84 (21)	28 (33)	56 (67)		62 (74)	22 (26)	
Medi-Cal, *n* (%)							
Yes	102 (26)	30 (29)	32 (71)	.805	74 (72)	28 (28)	.898
No	298 (74)	92 (31)	206 (69)		218 (73)	80 (27)	
Severe drug–drug interactions, *n* (%)							
At least two interactions	100 (25)	**9 (9)**	**91 (91)**	**.000**	**62 (62)**	**38 (38)**	**.014**
One interaction	111 (28)	**32 (29)**	**79 (71)**		**83 (75)**	**28 (25)**	
No	189 (47)	**81 (43)**	**108 (57)**		**147 (78)**	**42 (22)**	
Medication duplication, *n* (%)							
At least two duplications	67 (17)	**5 (8)**	**62 (92)**	**.000**	**41 (61)**	**26 (39)**	**.022**
One duplication	148 (37)	**41 (28)**	**107 (72)**		**106 (72)**	**42 (28)**	
No	185 (46)	**76 (41)**	**109 (59)**		**145 (78)**	**40 (22)**	

Characteristic of sample	Total (*N* = 400)	Potentially inappropriate medications (Use Conditionally or Avoid)			Medications to avoid		
		No PIM (*n* = 122)	At least one PIM (*n* = 278)	*p* value	No Rx to avoid (292)	At least one to avoid (108)	*p* value
More than one type of doctor, *n* (%)							
No	103 (26)	**41 (40)**	**62 (60)**	**.019**	77 (75)	26 (25)	.700
Yes	297 (74)	**81 (27)**	**216 (73)**		215 (72)	82 (28)	
No. of chronic conditions, *M* ± *SD*	5.23 ± 3.01	**4.51 ± 2.81**	**5.55 ± 3.05**	**.001**	**5.06 ± 2.98**	**5.71 ± 3.07**	**.050**
No. of OTC medications, *M* ± *SD*	1.25 ± 1.74	1.00 ± 1.86	1.36 ± 1.68	.066	1.22 ± 1.78	1.33 ± 1.66	.561
No. of non-ACNP Rx, *M* ± *SD*	4.95 ± 2.87	**3.93 ± 2.02**	**4.86 ± 2.64**	**.001**	**4.82 ± 2.76**	**5.31 ± 3.11**	**.001**
No. of ACNP Rx, *M* ± *SD*	1.48 ± 1.40	**0.43 ± 0.76**	**1.94 ± 1.37**	**.001**	**1.14 ± 1.13**	**2.38 ± 1.64**	**.001**
No. of pain medications, *M* ± *SD*	0.66 ±0.95	**0.23 ± 0.49**	**0.85 ± 1.04**	**.001**	**0.54 ± 0.88**	**0.97 ± 1.06**	**.001**
No. of medications, *M* ± *SD*	7.68 ± 4.02	**5.35 ± 2.86**	**8.70 ± 4.03**	**.001**	**7.18 ± 3.83**	**9.01 ± 4.21**	**.001**
Level of pain, *M* ± *SD*	0.87 ± 0.55	**0.75 ± 0.57**	**0.93 ± 0.52**	**.003**	0.85 ± 0.53	0.93 ± 0.59	.189
ADL, *M* ± *SD*	1.14 ± 0.63	1.10 ± 0.56	1.16 ± 0.67	.350	1.11 ± 0.59	1.22 ± 0.74	.115

Note. PIM = potentially inappropriate medication; OTC = over the counter; ACNP = autonomic and CNS, neurology, and psychotherapeutic; ADL = Activities of Daily Living; CNS = central nervous system.

Table 2

Percentage of Self-Reported Chronic Conditions (N = 400).

	Total (N = 400)	Male (n = 141)	Female (n = 259)
Comorbidities	**%**	**%**	**%**
Hypertension	85	83	86
Arthritis	63	46	72
Diabetes mellitus	37	33	39
Severe low back pain	36	30	39
Sleeping disorder	23	20	25
Gastrointestinal disease	22	19	23
Anxiety	17	14	18
Cancer	14	15	13
Depression	13	18	13
Stroke	13	15	12
Chronic kidney disease	12	16	9
Dementia	5	6	4

Table 3

Frequency of Potentially Inappropriate Medication Use Among African Americans.

Use Conditionally[a]		Avoid[b]	
Pain		Cardiovascular	
Non–COX-selective NSAIDs, oral		Nifedipine	24
Aspirin	170	Digoxin	7
Ibuprofen	41	Anticholinergic	
Naproxen	19		
Meloxicam	18	First-generation antihistamines	
Diclofenac Sodium	7	Diphenhydramine	13
Etodolac	3	Hydroxyzine	7
Nabumetone	3	Promethazine	4
Clinoril	1	Chlorpheniramine	1
Cardiovascular		Antiparkinson agents	
Antiarrhythmic drugs		Benztropine mesylate	3
Amiodarone	1	Endocrine	
Belladonna	1	Sulfonylureas, long duration	
Flecainide	1	Glyburide	8
Sotalol	1	Others	
Alpha1 blockers		Megestrol acetate	3
Terazosin	17	Pain	
Prazosin Hydrochloride	3		
Alpha agonists, central		Skeletal muscle relaxants	
Clonidine	28	Cyclobenzaprine	7
Others		Methocarbamol	5
Spironolactone	5	Carisoprodol	2
Doxazosin mesylate	5	Others	
Indomethacine	3		
Gastrointestinal		Ketorolac tromethamine	2
Metoclopramide	3	Central nervous system	
Anticholinergic		Benzodiazepines; Short and intermediate acting	
Antispasmodics		Lorazepam	8
Dicyclomine	2	Temazepam	6
Endocrine		Alprazolam	5
Insulin		Benzodiazepines; Long acting	
Novolog	8	Diazepam	7
Glargine	8	Clonazepam	1
Lantus	8	Tertiary TCAs	
Novolin	4	Amitriptyline	4
Other insulin	3	Imipramine	2
Humulin	3	Perphenazine	1

Use Conditionally[a]		Avoid[b]	
		Amitriptyline	
Levemir	3	Barbiturates	
NPH	1	Phenobarbital	3
Androgen		Others	
Testosterone	1	Thioridazine	1
Anti-infective		Antithrombotic	
Nitrofurantoin	1	Ticlopidine	1
Central nervous system		Dipyridamole	1
Nonbenzodiazepine hypnotics			
Zolpidem tartrate	10		
Eszopiclone	1		

Note. COX = Cyclooxygenase; NSAID = Non-steroidal anti-inflammatory drug; NPH = Neutral protamine hagedorn; TCA = tricyclic antidepressants.

[a] Medication that is recommended for use by elderly people conditionally based on Beers Criteria (2012).

[b] Medication that is recommended to be avoided for elderly people based on Beers Criteria (2012).

Table 4

Binary Multivariate Logistic Regression Adjusted ORs Between Independent Variables and (a) Potentially Inappropriate Medication Use and (b) Medication to Avoid Among Underserved Elderly African Americans (N = 400).

	Model 1		Model 2	
	PIM	Avoid	PIM	Avoid
Independent variables	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Gender				
Female	0.86 [0.5, 1.5]	1.53 [0.9, 2.6]	1.01 [0.6, 1.6]	1.77 [1.1, 2.9]*
Male	1.00	1.00	1.00	1.00
Age				
<75	0.78 [0.5, 1.3]	0.89 [0.54, 1.5]	0.88 [0.5, 1.4]	0.93 [0.6, 1.5]
≥75	1.00	1.00	1.00	1.00
Number of providers				
One	0.95 [0.5, 1.7]	0.76 [0.4, 1.34]	1.15 [0.7, 1.9]	0.92 [0.5, 1.6]
At least two	1.00	1.00	1.00	1.00
Level of pain: (SF-MPQ-2)	**1.69 [1.2, 2.6]***	0.79 [0.5, 1.3]	1.40 [0.9, 2.3]	1.06 [0.7, 1.7]
Number of chronic conditions	0.96 [0.9, 1.08]	1.01 [0.9, 1.1]	1.05 [0.9, 1.1]	1.04 [0.9, 1.3]
Number of non-ACNP Rx	**1.3 [1.1, 1.5]*****	1.0, [0.9, 1.1]	—	—
Number of ACNP Rx	**5.3 [3.6, 7.8]*****	**1.90 [1.6, 2.3]*****	—	—
Medications duplications				
At least two	—	—	**4.86 [1.8, 13.1]****	1.7 [0.9, 3.3]
One			1.41 [0.9, 2.3]	1.3 [0.8, 2.2]
None			**1.00**	1.00
Severe medication interactions				
At least two	—	—	**4.56 [2.1, 9.9]*****	0.61 [0.3, 1.1]
One			**1.6 [1.0, 2.8]**	0.66 [0.4, 1.2]
None			**1.00**	1.00
R^2 (Nagelkerke)	0.473	0.208	0.197	0.066
−2 log likelihood	327.8	401.4	430.0	444.2

Note. OR = Odd ratios; PIM = Potentially Inappropriate Medication; CI = Confidence interval; SF-MPQ = Short-Form McGill Pain Questionnaire; ACNP = Autonomic and CNS, neurology, and psychotherapeutic; Rx = Medical prescriptions; CNS = central nervous system.