



DEPARTMENT OF VETERANS AFFAIRS

Potentially Inappropriate Prescribing Practices in Rural Elder Veterans

Brian C. Lund, PharmD, MS, BCPP; Peter J. Kaboli, MD, MS

VA Office of Rural Health, Veterans Rural Health Resource Center—Central Region
Iowa City VA Medical Center, Iowa City, IA

Introduction

Medication safety is a critical public health issue, particularly in the elderly, who consume a disproportionate share of medications and suffer significant morbidity and mortality due to medication errors. Among the most important medication errors are preventable adverse drug events, which commonly result from inappropriate medication use.

The most commonly used approach to measure inappropriate medication use in the elderly is to examine the frequency of specific drugs that should be avoided in this population, as determined by expert consensus opinion. Several independently developed lists of such medications are available. The most widely used are known as the Beers criteria, which were originally published in 1991, with updates in 1997, 2001, and 2003.¹⁻⁴ Using the 2001 Beers criteria, the reported rate of inappropriate prescribing among elderly VA outpatients was 19.7% in fiscal year 2000 and 21.3% in fiscal year 2003.^{5,6}

While direct comparisons between VA and the private sector are difficult to make, inappropriate prescribing rates appear to be similar or slightly lower in VA.⁶ However, there are no data concerning potential discrepancies in inappropriate prescribing for rural dwelling individuals, either within or outside VA.

There are several reasons to suspect that rural veterans may be at higher risk for inappropriate prescribing, including access limitations to primary care

Key Findings

- Nationally, potentially inappropriate prescribing was more common among rural veterans, with an adjusted relative increased risk over urban veterans of 2-10%. This finding was consistent across four separate measurements of inappropriate prescribing.
- Regional findings, however, were highly variable. Rural veterans had an adjusted relative 22% *increased risk* for inappropriate prescribing in Southern Region VISNs, but had an 11% *decreased risk* in Western Region VISNs.
- Inappropriate prescribing frequency varied widely across regions, from 13.2% in the Northeast to 21.2% in the South, and across VISNs, from 11.0% in VISN 3 to 25.1% in VISN 16.

This study was funded by the Veterans Administration Office of Rural Health (ORH). For more information: Brian Lund at (319) 338-0581, Ext. 3848 or brian.lund@va.gov.

(e.g., drive time), higher rates of dual-utilization (i.e., VA and non-VA care), and restricted access to clinical pharmacy services in community based outpatient clinics.

Therefore, the goal of this analysis was to determine whether elderly rural veterans experienced significantly higher rates of potentially inappropriate prescribing.

Methods

This study sample included Veterans age 65 years and older who, during fiscal year 2007, had ≥ 1 VA outpatient primary care visit, regular VA medication use, and were not admitted to a VA nursing home.

Indicators of Potentially Inappropriate Medication Use

Zhan criteria: List of drugs to avoid in the elderly irrespective of dose, duration, or frequency of administration as published by Zhan *et al.*³ This indicator was considered present if the individual received any outpatient medication fill from the VA for one of these drugs.

Unique Fick criteria: List of drugs to avoid in the elderly as published by Fick *et al.*⁴ that are not included in the Zhan criteria. This indicator was considered present if the individual met any one of these criteria.

Therapeutic duplication: Defined as concurrent use of more than one medication from a modified VA drug class as published by Fitzgerald *et al.*⁷ and recently adapted by Chrischilles *et al.*⁸

Drug-drug interactions: Defined by concurrent use of two medications categorized by a leading reference as having the potential to produce clinically significant drug-drug interactions.⁹

Geography

Veterans Integrated Service Networks (VISNs) were grouped to coincide with US census areas. Rurality was defined by the VA U/R/H designation of urban, rural, and highly rural, where rural and highly rural were collapsed into one category.

Analysis

Frequency of the four indicators of inappropriate medication use were compared between rural and urban veterans using odds ratios (OR), where values greater than one indicated higher rates among rural veterans and values less than one indicated lower rates. Odds ratios were adjusted for age and sex using SAS version 9.2.

Results

The study sample included 1,549,824 elderly veterans with a mean age of 75.8 years (interquartile range 71-81), taking a mean of 5.5 medications (interquartile range of 3 to 7), and 98.2% were men. National rates of inappropriate prescribing among urban and rural veterans are shown in Table 1.

Table 1. Frequency of Inappropriate Prescribing Practices among Rural and Urban Veterans

Inappropriateness Indicator	Frequency			Rural vs. Urban	
	Overall	Rural	Urban	Unadjusted OR (95% CI)	Adjusted* OR (95% CI)
Drugs to avoid, Zhan criteria	17.9%	18.7%	17.2%	1.11 (1.10, 1.12)	1.10 (1.09, 1.11)
Drugs to avoid, Fick criteria**	16.5%	16.8%	16.3%	1.03 (1.02, 1.04)	1.04 (1.03, 1.05)
Therapeutic duplication	6.4%	6.7%	6.2%	1.08 (1.06, 1.09)	1.05 (1.04, 1.06)
Drug-drug interaction	3.75%	3.81%	3.71%	1.03 (1.01, 1.05)	1.02 (1.00, 1.04)

*Adjusted for age and sex

** Drugs to avoid according to the subset of criteria defined by Fick *et al.*⁴ that are not also included in the criteria established by Zhan *et al.*³ OR=odds ratio; CI=confidence interval

Table 2. Most Common Inappropriate Prescribing

Inappropriate Prescribing Indicator	n (%)
Most common drugs to avoid, Zhan criteria	
Oxybutynin	52,816 (3.4%)
Cyclobenzaprine	34,776 (2.2%)
Dipyridamole	34,588 (2.2%)
Amitriptyline	30,260 (2.0%)
Propoxyphene	28,935 (1.9%)
Most common therapeutic duplication, by class	
Antidepressants	31,192 (2.0%)
Antiulcer medications	17,563 (1.1%)
Short-acting beta-agonists (respiratory)	13,099 (0.8%)
Opioid analgesics	8,596 (0.6%)
Sedative-hypnotics	5,867 (0.4%)

Rural veterans were significantly more likely to experience inappropriate medication use across all four indicators. Adjusted odds-ratios demonstrated increased risks ranging from 10% (OR=1.10) for Zhan criteria, down to 2% (OR=1.02) for drug-drug interactions. The remaining results focused on the Zhan criteria and therapeutic duplication as examples, though the findings were similar across all measures.

The most frequent inappropriate prescribing practices for these two indicators are found in Table 2. However, this finding was not consistent across all US regions. As shown in Figure 1, rural veterans had a 22% (OR=1.22) increased risk for inappropriate medication use in the southern region, but had an 11% (OR=0.89) decreased risk in the western region.

Further refinement to individual VISNs revealed some regions with consistent VISN-level rates of inappropriate prescribing and others with highly variable rates (Table 3).

Western region VISNs had consistently lower rates of inappropriate medication use among rural veterans, both according to Zhan criteria and

therapeutic duplication indicators. Similarly, VISN-level findings were generally consistent within the southern region, but instead reflected increased risks for rural veterans. In contrast, rates of inappropriate medication use were highly variable across individual VISNs in the northeast and Midwest regions, with some demonstrating increased risk for rural veterans, some showing decreased risk and others showing no difference.

Figure 1. Regional Variation of Rural-Urban Differences in Inappropriate Prescribing (Zhan Criteria)

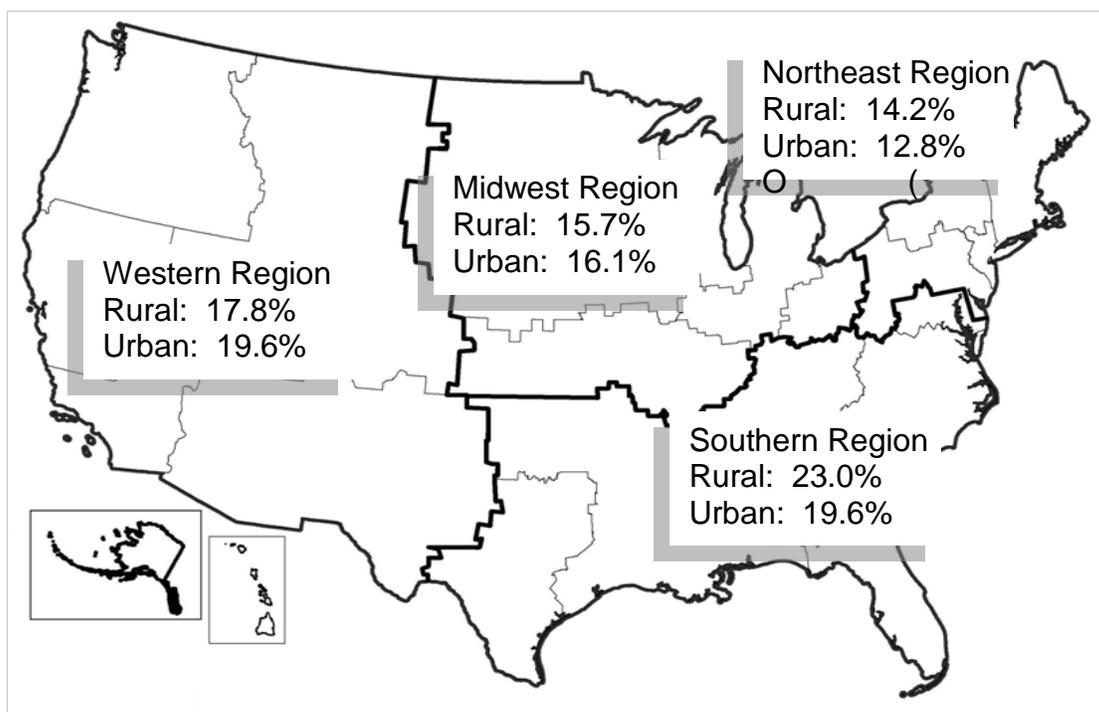


Table 3 also demonstrates the tremendous VISN-level variation in inappropriate prescribing practices. Zhan criteria frequency ranged widely from 11.0% in VISN 3 to 25.1% in VISN 16. It is also noteworthy that VISN-level findings were highly consistent across the four indicators of inappropriate medication use, even though these indicators tap into different aspects of prescribing. As illustrated in Table 3, VISNs demonstrating increased risk for rural veterans according to Zhan criteria also demonstrated increased risk according to therapeutic duplication.

Conclusions

On a national level, potentially inappropriate medication use was more common among rural veterans. This observation was consistent across four different indicators of inappropriate use, with increased risk ranging from 2% to 10%. The ultimate clinical impact of these differences in terms of morbidity and mortality burden from adverse drug events is hard to estimate. However, more detailed examination revealed important regional differences. Southern rural veterans had a 22% increased risk for inappropriate prescribing, a risk-difference twice as high as the national estimate.

Conversely, rural veterans in the western region were actually 11% *less likely* to experience inappropriate prescribing. Findings in other geographic regions were mixed. Our findings demonstrate that the impact

Impact

- Due to considerable variation across VISNs, rural residence alone is not inherently a risk factor for inappropriate prescribing, but is mediated by regional differences. Thus, policies and recommendations should consider local and regional contextual factors.
- The national VA Pharmacy Benefits Management (PBM) Office should review the findings to see if regional or national policies may be impacting the differential rates.
- VISN Formulary Committees should review the findings to determine whether VISN-level formulary policies may be impacting the results. If any are determined, then best practices can be disseminated.
- For VISNs with high inappropriate prescribing rates, especially for rural veterans, interventions should be considered to bring those rates closer to national benchmarks, or justify the regional variation.

of rurality on health care quality and outcomes may not be consistent across the United States and that relying solely on the overall national average may yield highly misleading conclusions.

References

1. Beers MH, Ouslander JG, Rollingher I, et al. Explicit criteria for determining inappropriate medication use in nursing home residents. *Arch Intern Med* 1991;151:1825-1832.
2. Beers MH. Explicit criteria for determining potentially inappropriate medication use by the elderly. An update. *Arch Intern Med* 1997;157:1531-1536.
3. Zhan C, Sangl J, Bierman AS, et al. Potentially inappropriate medication use in the community-dwelling elderly: findings from the 1996 Medical Expenditure Panel Survey. *JAMA* 2001;286:2823-2829.
4. Fick DM, Cooper JW, Wade WE, et al. Updating the Beers criteria for potentially inappropriate medication use in older adults: Results of a US consensus panel of experts. *Arch Intern Med* 2003;163:2716-2724.
5. Pugh MJV, Fincke BG, Bierman AS, et al. Potentially inappropriate prescribing in elderly veterans: are we using the wrong drug, wrong dose, or wrong duration? *J Am Geriatr Soc* 2005;53:1282-1289.
6. Barnett MJ, Perry PJ, Langstaff JD, Kaboli PJ. Comparison of rates of potentially inappropriate medication use according to the Zhan criteria for VA versus private sector Medicare HMOs. *J Manag Care Pharm* 2006;12:362-370.
7. Fitzgerald LS, Hanlon JT, Shelton PS, et al. Reliability of a modified medication appropriateness index in ambulatory older persons. *Ann Pharmacother* 1997;31:543-548.
8. Chrischilles EA, VanGilder R, Wright K, et al. Inappropriate medication use as a risk factor for self-reported adverse drug effects in older adults. *J Am Geriatr Soc* 2009;57:1000-1006.
9. Hansten PD, Horn JR. *Hansten and Horn's Managing Clinically Important Drug Interactions*. Vancouver, WA: Applied Therapeutics Inc, 1998.

Table 3. VISN Variation of Rural-Urban Differences in Inappropriate Prescribing

Region	VISN	N	Drugs to Avoid, Zhan ³			Therapeutic Duplication ^{7,8}		
			Rural	Urban	OR*	Rural	Urban	OR*
National		1,549,824	18.7%	17.2%	--->1.10	6.7%	6.2%	--->1.05
Northeast		297,651	14.2%	12.8%	--->1.11	5.3%	4.8%	--->1.07
	1	91,982	13.4%	12.8%	1.04	6.1%	5.4%	--->1.09
	2	42,573	12.7%	13.2%	0.95	5.4%	5.5%	0.95
	3	62,450	10.1%	11.1%	0.89<---	3.8%	4.4%	0.83<---
	4	100,646	15.9%	14.5%	--->1.12	4.9%	4.3%	--->1.10
South		584,482	23.0%	19.6%	--->1.22	7.9%	6.8%	--->1.15
	5	29,727	14.5%	15.4%	0.92<---	5.9%	6.3%	0.91<---
	6	74,095	22.0%	20.7%	--->1.08	8.1%	7.5%	--->1.07
	7	77,169	24.0%	22.8%	--->1.06	8.5%	8.1%	1.03
	8	145,656	18.4%	15.3%	--->1.22	6.8%	5.4%	--->1.21
	9	72,365	24.2%	24.4%	0.99	8.0%	7.3%	--->1.08
	16	125,680	25.9%	23.9%	--->1.11	8.4%	8.2%	1.02
	17	59,790	22.0%	21.3%	--->1.05	7.6%	7.4%	1.03
Midwest		406,152	15.7%	16.1%	0.97<---	5.5%	5.5%	0.99
	10	60,435	17.7%	16.4%	--->1.09	5.9%	5.2%	--->1.12
	11	76,387	16.8%	18.1%	0.91<---	5.0%	5.5%	0.90<---
	12	83,062	14.0%	14.2%	0.99	5.0%	4.9%	0.99
	15	78,735	18.0%	18.0%	1.00	6.4%	6.7%	0.93<---
	23	107,533	13.7%	14.8%	0.92<---	5.3%	6.0%	0.88<---
West		261,539	17.8%	19.5%	0.89<---	7.0%	7.7%	0.88<---
	18	60,153	19.6%	22.1%	0.86<---	6.2%	7.1%	0.86<---
	19	42,937	16.5%	18.1%	0.89<---	6.8%	8.7%	0.75<---
	20	50,622	19.1%	20.5%	0.91<---	8.4%	8.8%	0.94<---
	21	52,720	15.6%	19.1%	0.78<---	6.4%	7.5%	0.84<---
	22	55,107	15.4%	18.3%	0.81<---	6.7%	7.4%	0.88<---

*Adjusted for age and sex. Odds-ratios (OR) significantly greater than 1 are right-justified and preceded by “--->”, whereas ORs significantly less than 1 are left-justified and followed by “<---”. Centered values were not significantly different than one. VISN=Veterans Integrated Service Networks

This brief summarizes: Lund BC, Charlton ME, Steinman MA, Kaboli PJ. Regional Differences in Prescribing Quality Among Elder Veterans and the Impact of Rural Residence. J Rural Health 2013;29:172-9.

To cite this brief: Lund BC, Kaboli PJ. Potentially Inappropriate Prescribing Practices in Rural Elder Veterans [Issue Brief]. Veterans Rural Health Resource Center--Central Region; Washington (DC): VHA Office of Rural Health. Summer 2013, #1. Available from: <http://www.ruralhealth.va.gov/publications.asp>.