

VIReC Database and Methods Cyber Seminar Series



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Measuring Outpatient Pharmacy Use in the VA Using VA Pharmacy Data

March 5, 2012

Presented by:

Todd A. Lee, PharmD, PhD



Audience Poll

- **Have you ever used VA Pharmacy Data?**
 - Yes
 - No

- **How would you rate your overall knowledge of VA Pharmacy Data?**
 - 1 (Never Used)
 - 2
 - 3
 - 4
 - 5 (Used Frequently, Very familiar)



Session Objectives

- **How has outpatient pharmacy utilization been measured in VA studies?**
- **Overview of VA Pharmacy databases**
- **Finding information in the VA Pharmacy databases**
- **Examples of VA studies that have used the VA Pharmacy databases**
- **Where to go for more help**



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How has outpatient pharmacy utilization been measured in VA studies?: Chronic Medication Use

- **Stroupe KT, Smith BM, et al. Effect of Increased Copayments on Pharmacy Use in the Department of Veterans Affairs. *Med Care* 2007; 45:1090-1097**
- How was pharmacy data utilized?

ORIGINAL ARTICLE

Effect of Increased Copayments on Pharmacy Use in the Department of Veterans Affairs

Kevin T. Stroupe, PhD,*†† Bridget M. Smith, PhD,*† Todd A. Lee, PharmD, PhD,*† Elizabeth Tarlov, PhD,§ Ramon Durazo-Arzu, PhD,¶ Zhiqing Huo, MS,‡ Tammy Barnett, MA,*† Lishan Cao, MS,‡ Mariel Burk, PharmD,|| Francesca Cunningham, PharmD,|| Denise M. Hynes, PhD,*§¶ and Kevin B. Weiss, MD*‡

Objectives: In February 2002, the Department of Veterans Affairs (VA) raised medication copayments from \$2 to \$7 per 30-day supply of medication for certain veteran groups. We examined the impact of the copayment increase on medication acquisition from VA.

Methods: This was a retrospective cohort study using data from national VA databases from February 2001 through February 2003. We took a random sample of over 5% of male VA users in 2001. Of 149,107 veterans sampled, 19,504 (13%) had copayments for no drugs, 101,410 (68%) had copayments for some drugs, and 28,193 (19%) had copayments for all drugs. We used multivariable count models to examine changes in the number of 30-day medication supplies after the increase.

Results: After the copayment increase, veterans subject to copayments for all drugs received 8% fewer 30-day supplies of medication annually relative to veterans with no copayments ($P < 0.001$). The effect of the copayment increase on the number of different medications veterans received increased. Among veterans subject to copayments for all drugs, acquisition of lower-cost drugs fell by 34%, higher-cost medications fell by 6%, over-the-counter medications fell by 46%, and prescription-only medications fell by 4% relative to veterans with no drug copayments.

Conclusions: The number of medications veterans obtained from VA decreased after the copayment increase. There were relatively

larger impacts on veterans with higher medication use and on lower-cost and over-the-counter medications.

Key Words: veterans, copayments, drugs

(*Med Care* 2007;45: 1090-1097)

Healthcare payers in both the public and private sectors face ever-increasing medication costs. They have sought to control their medication costs using a variety of strategies including increased cost sharing with patients¹ by raising copayments or coinsurance rates, increasing deductibles, removing drugs from formularies, moving to multistep copayments,² or a combination of these measures.³ The Department of Veterans Affairs (VA), which operates the largest healthcare organization in the United States, spent over \$3 billion in fiscal year 2001 for outpatient medications, accounting for 14% of its medical care budget.⁴ As in the private sector, the VA has increased cost sharing by patients. In February 2002, the VA increased medication copayments from \$2 to \$7 per 30-day medication supply for veterans required to pay copayments,⁵ and in January 2006 copayments were increased again to \$8 per 30-day supply. Moreover, recent proposals have been made to increase copayments further for certain veteran groups.⁶

Several studies outside VA have found that copayment increases have decreased overall prescription-drug utilization.^{1,2,6-9} The impact of cost sharing may depend on drug class and copayment amount.¹⁰ A study of elderly patients found that drug use decreased by 9% for more essential and 15% for less essential medications as cost sharing increased.¹ This reduction in essential medication use was associated with an increase in emergency department visits and adverse event rates.¹ If increased copayments lead to reductions in medication use with resulting adverse effects on health, pharmaceutical cost savings by healthcare payers may be lost due to increases in other healthcare costs.

Because VA patients tend to be older and have more chronic diseases than the general population,¹¹ previous estimates of the impact of copayment changes may not be relevant to the current VA healthcare system. Whether veterans are subject to copayments for no, some, or all drugs

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The views expressed are solely the authors'.

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How has outpatient pharmacy utilization been measured in VA studies?: Quality of Care

- **Tiwari A, Rajan M, Miller D, Pogach L, Olfson M, Sambamoorthi U. Guideline-consistent antidepressant treatment patterns among veterans with diabetes and major depressive disorder. *Psych Serv* 2008; 59: 1139-1147**
- How was pharmacy data utilized?

Guideline-Consistent Antidepressant Treatment Patterns Among Veterans With Diabetes and Major Depressive Disorder

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Leonard Pogach, M.D.
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Usha Sambamoorthi, Ph.D.

Objectives: This study estimated guideline-consistent antidepressant treatment of depression among veterans with diabetes and examined its variation by patient-level demographic characteristics, socioeconomic characteristics, access to care, and health status. **Methods:** Data were retrospectively analyzed from Veterans Health Administration (VHA) and Medicare claims of VHA clinic users with diabetes and major depressive disorder (N=8,953). Major depression was identified by using ICD-9-CM codes 296.2 and 296.3. Incident episode was identified by using 120-day negative diagnosis and medication history on or before the first depression diagnosis date in fiscal year 1999. Guideline-consistent depression treatment was defined as the receipt of antidepressants for at least 90 days within a period of six months after the onset of depression. Chi square tests and logistic regressions were used to analyze patterns of guideline-consistent antidepressant treatment. **Results:** Overall, 51% received any antidepressant treatment for diagnosed major depression; among patients using any antidepressants, 62% received guideline-consistent antidepressant treatment. VHA users who received care from a mental health specialist were more likely to have guideline-consistent treatment than those who were not receiving care from a mental health specialist. African Americans, older veterans, and those with substance use disorders were less likely to have guideline-consistent antidepressant treatment. **Conclusions:** Guideline-consistent depression care was lower for certain subgroups of individuals. Further research is necessary to evaluate the reasons for this finding, so that targeted care coordination strategies could be developed to improve antidepressant treatment. Increased contact with mental health specialty staff, which is now being implemented in the VHA, may increase antidepressant treatment among VHA users with diabetes and major depression. (*Psychiatric Services* 59:1139-1147, 2008)

The prevalence of depression among persons with diabetes is very high and ranges from as low as 11%, when standardized diagnostic interviews are used, to as high as 31%, when assessed by questionnaires (1). Comorbid depression complicates diabetes care and adversely affects health care expenditures and clinical outcomes. Specifically, co-occurring depression as measured by using symptom scales or diagnostic criteria is associated with hyperglycemia (2), has been shown to lower adherence to oral hypoglycemic and lipid-lowering medications (3), and is associated with functional disability (4). Total health care expenditures of individuals with self-reported depression and diabetes are 4.5 times higher than those of individuals with diabetes without depression (5).

However, clinical trials have shown that pharmacologic treatments, specifically the new-generation antidepressants and nonpharmacologic treatments for major depression tend to improve glycemic control (6,7). In a randomized double-blind placebo-controlled trial of patients with comorbid diabetes and depression, fluoxetine, as compared with a placebo, was associated with better glycaemic control and reduced depressive symptoms (7).

Recent studies have documented cost advantages of treating depression among individuals with diabetes. A one-year cross-sectional observation-

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How has outpatient healthcare utilization been measured in VA studies?: Medication Adherence

ORIGINAL ARTICLE

A Refill Adherence Algorithm for Multiple Short Intervals to Estimate Refill Compliance (ReComp)

Chris L. Bryson, MD, MS,*† David H. Au, MD, MS,*† Bessie Young, MD, MS,††
Mary B. McDonnell, MS,* and Stephan D. Fihn, MD, MPH*†

Background: There are many measures of refill adherence available, but few have been designed or validated for use with repeated measures designs and short observation periods.

Objective: To design a refill-based adherence algorithm suitable for short observation periods, and compare it to 2 reference measures.

Methods: A single composite algorithm incorporating information on both medication gaps and oversupply was created. Electronic Veterans Affairs pharmacy data, clinical data, and laboratory data from routine clinical care were used to compare the new measure, ReComp, with standard reference measures of medication gaps (MEDOUT) and adherence or oversupply (MEDSUM) in 3 different repeated measures medication adherence-response analyses. These analyses examined the change in low density lipoprotein (LDL) with simvastatin use, blood pressure with antihypertensive use, and heart rate with β -blocker use for 30- and 90-day intervals. Measures were compared by regression based correlations (R^2 values) and graphical comparisons of average medication adherence-response curves.

Results: In each analysis, ReComp yielded a significantly higher R^2 value and more expected adherence-response curve regardless of the length of the observation interval. For the 30-day intervals, the highest correlations were observed in the LDL-simvastatin analysis (ReComp $R^2 = 0.231$; [95% CI, 0.222–0.239]; MEDSUM $R^2 = 0.054$; [95% CI, 0.049–0.059]; MEDOUT $R^2 = 0.055$; [95% CI, 0.048–0.058]).

Conclusions: ReComp is better suited to shorter observation intervals with repeated measures than previously used measures.

Key Words: drug, compliance, adherence, validity, methods, pharmacy

(*Med Care* 2007;45: 497–504)

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Views expressed in this article are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs, or the University of Washington.

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■ Bryson CL, Au DH, Young B, McDonnell MB, Fihn SD. A Refill Adherence Algorithm for Multiple Short Intervals to Estimate Refill Compliance (ReComp). *Med Care* 2007; 45: 497-504.

■ How was pharmacy data utilized?



How has outpatient pharmacy utilization been measured in VA studies?: Medication Use / Exposure

■ Lee TA, Pickard AS, Au DH, Bartle B, Weiss KB. (2008). Risk for death associated with medications for recently diagnosed chronic obstructive pulmonary disease. *Ann Intern Med.*, 149, 380-390.

■ How was pharmacy data utilized?

ARTICLE

Annals of Internal Medicine

Risk for Death Associated with Medications for Recently Diagnosed Chronic Obstructive Pulmonary Disease

Todd A. Lee, PhD^{1,2}; David A. Sison, PhD^{1,2}; David H. Au, MD, MS; Ross H. Bartle, MPh; and Keith B. Weiss, MD, MPh, MS

Background: Concerns exist regarding increased risk for mortality associated with some chronic obstructive pulmonary disease (COPD) medications.

Objective: To examine the association between various respiratory medications and risk for death in veterans with newly diagnosed COPD.

Design: Nested case-control study in a cohort identified between 1 October 1999 and 30 September 2005 and followed through 30 September 2004 by using National Veterans Affairs inpatient, outpatient, pharmacy, and mortality databases; Centers for Medicare & Medicaid Services databases; and National Death Index Plus data. Cause of death was ascertained for a random sample of 40% of those who died during follow-up. Case patients were categorized on the basis of all-cause, respiratory, or cardiovascular death. Mortality risk associated with medications was assessed by using additional logistic regression adjusted for comorbid conditions, health care use, and markers of COPD severity.

Setting: U.S. Veterans Health Administration health care system.

Participants: 32 180 case patients and 200 501 control participants in the all-cause mortality analysis. Of 11 027 patients with cause-of-death data, 2405 case patients had respiratory deaths and 2159 case patients had cardiovascular deaths.

Measurements: All-cause mortality; respiratory and cardiovascular deaths; and exposure to COPD medication, inhaled corticosteroids, ipratropium, long-acting β -agonists, and theophylline in the 6 months preceding death.

Results: Adjusted odds ratios (ORs) for all-cause mortality were 1.03 (95% CI, 0.78 to 1.34) for inhaled corticosteroids, 1.11 (CI, 1.03 to 1.19) for ipratropium, 1.32 (CI, 1.23 to 1.41) for long-acting β -agonists, and 1.09 (CI, 0.99 to 1.19) for theophylline. Ipratropium was associated with increased cardiovascular deaths (OR, 1.34 [CI, 1.22 to 1.47]), whereas inhaled corticosteroids were associated with reduced risk for cardiovascular death (OR, 0.80 [CI, 0.72 to 0.88]). Results were consistent across sensitivity analyses.

Limitations: Current smoking status and lung function were not measured. Misclassification of cause-specific mortality is unknown.

Conclusions: The possible association between ipratropium and elevated risk for all-cause and cardiovascular death needs further study.

Ann Intern Med 2008;149:380-390.
For author affiliations, see end of text.

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Chronic obstructive pulmonary disease (COPD) is associated with substantial burden in terms of prevalence of disease (1), death and disability risk (2, 3), and health care costs (4). Despite recent interest in examining long-term outcomes associated with medications in patients with COPD (5, 6), some issues are not easily addressed by using randomized clinical trials. From a pharmacovigilance perspective, relatively rare adverse events—such as death associated with medication use—may not be detected in the short term. The patients who receive a medication may not be similar to those participating in clinical trials (7, 8) and may be more vulnerable to such events. Thus, evidence of longer-term benefits and harms associated with medications—particularly in patients with COPD, who tend to be elderly and have multiple comorbid conditions (9)—can be informed by research that relies on observational data.

Potential safety concerns with medications used to manage COPD may be substantial. A recent meta-analysis (10) showed a nearly 2.5-fold increase in respiratory deaths among patients receiving long-acting β -agonists compared with those receiving placebo. In the Lung Health Study (11), the group randomly assigned to ipratropium bromide had more than twice as many cardiovascular deaths as those receiving placebo. In addition, the U.S. Food and Drug Administration recently issued a notice regarding the potential for an increased risk for stroke associated with tiotropium use in patients with COPD (12). The extent to which these safety concerns exist and can be generalized to patients with COPD outside the context of clinical trials is unclear. Therefore, we sought to examine the association between medication use and risk for death, including respiratory and cardiovascular deaths, in a large population of patients with recently diagnosed COPD.

METHODS

We conducted this nested case-control study in patients with recently diagnosed COPD by using national Veterans Affairs inpatient, outpatient, pharmacy, and mortality databases, complemented with data from the Centers for Medicare & Medicaid Services. Our sample comprised U.S. veterans who used the U.S. Veterans Health Admin-

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How has outpatient healthcare utilization been measured in VA studies?: Risk Adjustment

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Predicting Costs of Care Using a Pharmacy-Based Measure Risk Adjustment in a Veteran Population

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W. PAUL NICHOL, MD, **†† NORMAN T. SUZUKI, PHARM.D, **‡‡ EDWARD PERRIN, PhD,*
NANCY D. SHARP, PhD,*† AND JEFFREY TODD-STENBERG*

BACKGROUND. Although most widely used risk adjustment systems use diagnosis data to classify patients, there is growing interest in risk adjustment based on computerized pharmacy data. The Veterans Health Administration (VHA) is an ideal environment in which to test the efficacy of a pharmacy-based approach.

OBJECTIVE. To examine the ability of RxRisk-V to predict concurrent and prospective costs of care in VHA and compare the performance of RxRisk-V to a simple age/gender model, the original RRRisk, and two leading diagnosis-based risk adjustment approaches: Adjusted Clinical Groups and Diagnostic Cost Groups/Hierarchical Condition Categories.

METHODS. The study population consisted of 161,202 users of VHA services in Washington, Oregon, Idaho, and Alaska during fiscal years (FY) 1996 to 1998. We examined both concurrent and predictive model fit for two sequential 12-month periods (FY 98 and FY 99) with

the patient-year as the unit of analysis, using split-half validation.

RESULTS. Our results show that the Diagnostic Cost Group/Hierarchical Condition Categories model performs best ($R^2 = 0.45$) among concurrent cost models, followed by ADG (0.31), RxRisk-V (0.20), and age/sex model (0.01). However, prospective cost models other than age/sex showed comparable R^2 : Diagnostic Cost Group/Hierarchical Condition Categories $R^2 = 0.15$, followed by ADG (0.12), RxRisk-V (0.12), and age/sex (0.01).

CONCLUSIONS. RxRisk-V is a clinically relevant, open source risk adjustment system that is easily tailored to fit specific questions, populations, or needs. Although it does not perform better than diagnosis-based measures available on the market, it may provide a reasonable alternative to proprietary systems where accurate computerized pharmacy data are available.

Key words: Case-mix; pharmacy; veterans; risk adjustment. (Med Care 2003;41:753-760)

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■ Sales AE, Liu CH, Sloan KL, et al. Predicting costs of care using a pharmacy-based measure risk adjustment in a veteran population. Med Care. 2003; 41: 753-760.

■ How was pharmacy data utilized?



Session Objectives

- How has outpatient pharmacy utilization been measured in VA studies?
- Overview of VA Pharmacy databases
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- Where to go for more help



Pharmacy Data Sources

- **Local Databases**

- VistA
- VISN Warehouses



- **National Data Sources**

- PBM
- DSS NDE Pharmacy SAS[®] Datasets

- **Other Key Pharmacy Data Sources**

- DSS Product Table
- National Drug File

Audience Poll

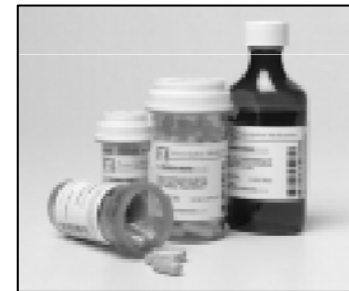
- **Which national sources of VA pharmacy data have you used in the past?**
 - DSS NDE Pharmacy Data
 - PBM Pharmacy Data
 - Both
 - Neither



VA Pharmacy Data Sources

■ VA Decision Support System (DSS) National Data Extract (NDE) Pharmacy SAS Datasets

- Became available in 2003
- Data from FY2002 to present
- Primary source of data is VistA
- All inpatient and outpatient prescriptions dispensed by a VAMC or VA Consolidated Mail Outpatient Pharmacy (CMOP)
- Housed at Austin Information Technology Center (AITC) and directly accessible



VA Pharmacy Data Sources

■ VA Pharmacy Benefits Management (PBM) Database

- Available since 2000
- Data from FY1999 to present
- Primary source of data is VistA
- Contains both inpatient and outpatient prescriptions



PBM vs. DSS

	PBM	DSS
Cost	Drug supply cost	Actual cost (ACT_COST) Dispensing cost (DISPCOST) Supply cost (VS_COST)
Access	Researcher requested extract	Direct access
Data availability	FY1998 (Outpatient) FY2006 (Inpatient)	FY2002 (Outpatient & Inpatient)
Directions for use	SIG available	

How Similar are PBM and DSS Data?

- **CSP 456 Hernia Study**

- **Population**

- 1,591 Patients

- **Prescriptions**

- Outpatient
- FY2002
- Fills and refills
- 42,469 prescriptions

- **Results**

- High match rate between data sources
- Discrepancy in only 1.7% of prescriptions

- **Report Available at:**

- http://www.virec.research.va.gov/References/TechnicalReports/VIREC_TechnicalReport1.pdf



How Similar are PBM and DSS Data?

■ Limitations

- Outpatient only
- Cohort not representative of whole population

■ Conclusions

- DSS and PBM Pharmacy extracts capture same prescriptions
- DSS or PBM?

■ Future Comparisons

- Inpatient data?
- Representative Cohort

■ Anecdotal evidence of other examples where match is not as good



Other Pharmacy Data Sources

■ DSS Product Table

– Key Variables

- IPNum, Feeder Key, Description (short and long), Drug Class
- Feeder Key => 1st 5 characters are VA product file IEN; last 12 characters are NDC

– Available on DSS website

■ National Drug File

– Key Variables

- VA_PRODUCT, FEEDER, NDF_NDC, VA_CLASS



Session Objectives

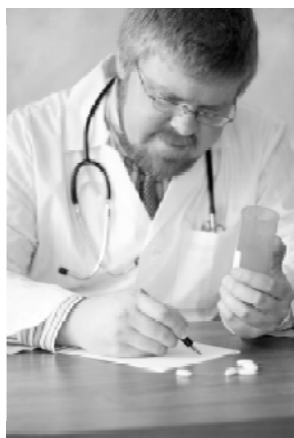
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Key Pharmacy Variables

Variable	DSS	PBM
Days Supply	X	X
Drug Description	X	X
Quantity	X	X
NDC	X	X
Medication class	X	X

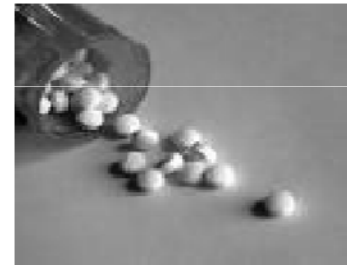
Assessing Outpatient Pharmacy Use: Finding info in VA Pharmacy Datasets

- **Where can I find cost variables?**
- **DSS and PBM contain different cost variables**
 - PBM: cost of the drug product from the supplier
 - DSS:
 - 1) Dispensing Cost (DISPCOST): direct pharmacist labor for dispensing the prescription and the mailing costs
 - 2) Supply Cost (VS_COST): Drug product cost and cost of supplies used in preparing the prescription, such as bottles and labels
 - 3) Actual Cost (ACT_COST): Drug product cost, cost of supplies such as bottles and labels to prepare the prescription, indirect costs, and overhead



Assessing Outpatient Pharmacy Use: Finding info in VA Pharmacy Datasets

- **Why is the NDC for the same prescription different on the PBM record than on the DSS record?**
- The NDC's are obtained from different sources
- Differences can result if Local Drug File has not been updated to reflect supply that was stocked when medication was dispensed
- Different NDC's will refer to the same drug, dosage, and strength, but may indicate a different manufacturer and/or package size



Assessing Outpatient Pharmacy Use: Examples of Types of Questions Addressed with Pharmacy Data

- **Cohort identification**
 - *Can pharmacy data be used to identify specific groups of patients?*
- **Medication utilization**
 - *Recent year? Longer historical view? Does policy change impact medication use?*
- **Healthcare quality**
 - *Are patients being prescribed medications in accordance with quality measures?*
- **Medication adherence**
 - *How much of a prescribed medication are patients using?*
- **Exposure to specific medications or medication classes**
 - *Are specific drugs associated with better/worse outcomes?*
- **Combining outpatient and pharmacy data to identify events**
 - *Can we identify acute exacerbations of COPD with outpatient and prescription data?*
- **Assessing comorbidity or case-mix with medication data**

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How has outpatient pharmacy utilization been measured in VA studies?: Chronic Medication Use

- **Stroupe KT, Smith BM, et al. Effect of Increased Copayments on Pharmacy Use in the Department of Veterans Affairs. *Med Care* 2007; 45:1090-1097**
- **Objective: Evaluate the impact of copayment change for prescription drugs on medication use**

ORIGINAL ARTICLE

Effect of Increased Copayments on Pharmacy Use in the Department of Veterans Affairs

Kevin T. Stroupe, PhD,*†‡§¶|| Bridget M. Smith, PhD,*‡§¶|| Todd A. Lee, PharmD, PhD,*‡§¶|| Elizabeth Tarlov, PhD,§ Ramon Durazo-Arvizu, PhD,¶ Zhiping Huo, MS,‡ Tammy Barnett, MA,*‡ Lishan Cao, MS,‡ Muriel Burk, PharmD,|| Francesca Cunningham, PharmD,|| Denise M. Hynes, PhD,*§¶|| and Kevin B. Weiss, MD*‡§¶

Objective: In February 2002, the Department of Veterans Affairs (VA) raised medication copayments from \$2 to \$7 per 30-day supply of medication for certain veteran groups. We examined the impact of the copayment increase on medication acquisition from VA.

Methods: This was a retrospective cohort study using data from national VA databases from February 2001 through February 2003. We took a random sample of over 5% of male VA users in 2001. Of 149,107 veterans sampled, 19,504 (13%) had copayments for no drugs, 101,410 (68%) had copayments for some drugs, and 28,193 (19%) had copayments for all drugs. We used multivariable count models to examine changes in the number of 30-day medication supplies filled in 2002.

Results: After the copayment increase, veterans subject to copayments for all drugs received 8% fewer 30-day supplies of medication annually relative to veterans with no copayments ($P < 0.001$). The effect of the copayment increase on the number of different medications veterans received increased. Among veterans subject to copayments for all drugs, acquisition of lower-cost drugs fell by 36%, higher-cost medications fell by 6%, over-the-counter medications fell by 40%, and prescription-only medications fell by 4% relative to veterans with no drug copayment.

Conclusions: The number of medications veterans obtained from VA decreased after the copayment increase. There were relatively

larger impacts on veterans with higher medication use and on lower-cost and over-the-counter medications.

Key Words: veterans, copayments, drugs

(*Med Care* 2007;45: 1090-1097)

Healthcare payers in both the public and private sectors face ever-increasing medication costs. They have sought to control their medication costs using a variety of strategies including increased cost sharing with patients¹ by raising copayments or coinsurance rates, increasing deductibles, removing drugs from formularies, moving to multi-tier copayments,² or a combination of these measures.³ The Department of Veterans Affairs (VA), which operates the largest health-care organization in the United States, spent over \$3 billion in fiscal year 2001 for outpatient medications, accounting for 14% of its medical care budget.⁴ As in the private sector, the VA has increased cost sharing by patients. In February 2002, the VA increased medication copayments from \$2 to \$7 per 30-day medication supply for veterans required to pay copayments,⁵ and in January 2005 copayments were increased again to \$8 per 30-day supply. Moreover, recent proposals have been made to increase copayments further for certain veteran groups.⁶

Several studies outside VA have found that copayment increases have decreased overall prescription-drug utilization.^{1,2,6-9} The impact of cost sharing may depend on drug class and copayment amount.¹⁰ A study of elderly patients found that drug use decreased by 9% for more essential and 15% for less essential medications as cost sharing increased.¹ This reduction in essential medication use was associated with an increase in emergency department visits and adverse event rates.¹ If increased copayments lead to reductions in medication use with resulting adverse effects on health, pharmaceutical cost savings by healthcare payers may be lost due to increases in other healthcare costs.

Because VA patients tend to be older and have more chronic diseases than the general population,¹¹ previous estimates of the impact of copayment changes may not be relevant to the current VA healthcare system. Whether veterans are subject to copayments for no, some, or all drugs

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The views expressed are solely the authors'.

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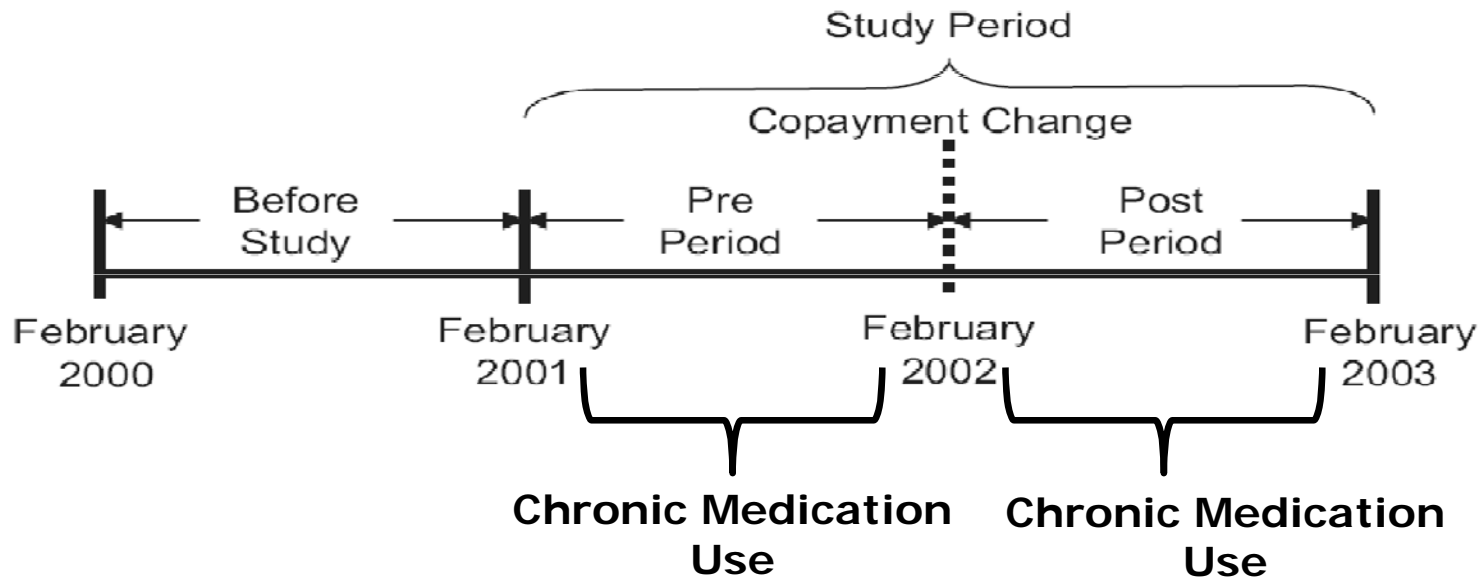
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Medical Care • Volume 45, Number 11, November 2007

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Chronic Medication Use: Stroupe et al. *Med Care* 2007



- Number of 30-day equivalents dispensed over 12 month period
- Days supply variable is key to analysis
- Focused on “chronic” medications, excluded medications for which patient did not receive any 30-day supply
- Dispensing with less than 30-day supply was counted as 1 30-day equivalent

Chronic Medication Use: Stroupe et al. *Med Care* 2007

Copayments for No Drugs*
n = 19,504

	Before	After	Difference
All chronic drugs	55.44	57.95	2.51

Copayments for Some Drugs*
n = 101,410

	Before	After	Difference	Difference In Differences
	41.28	41.29	0.01	-2.50 [†]

Copayments for All Drugs*
n = 28,193

	Before	After	Difference	Difference In Differences
	34.05	33.69	-0.36	-2.87 [†]

[†]P < 0.05

Adapted from Stroupe et al.
Med Care 2007 Table 3

How has outpatient pharmacy utilization been measured in VA studies?: Quality of Care

- **Tiwari A, Rajan M, Miller D, Pogach L, Olfson M, Sambamoorthi U. Guideline-consistent antidepressant treatment patterns among veterans with diabetes and major depressive disorder. *Psych Serv* 2008; 59: 1139-1147.**
- **Objective: Estimate guideline-consistent antidepressant treatment of new episodes of depression in veterans with diabetes**

Guideline-Consistent Antidepressant Treatment Patterns Among Veterans With Diabetes and Major Depressive Disorder

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Mangala Rajan, M.B.A.
Donald Miller, Sc.D.
Leonard Pogach, M.D.
Mark Olfson, M.D., M.P.H.
Usha Sambamoorthi, Ph.D.

Objective: This study estimated guideline-consistent antidepressant treatment of depression among veterans with diabetes and examined its variation by patient-level demographic characteristics, socioeconomic characteristics, access to care, and health status. **Methods:** Data were retrospectively analyzed from Veterans Health Administration (VHA) and Medicare claims of VHA clinic users with diabetes and major depressive disorder (N=3,953). Major depression was identified by using ICD 9 CM codes 296.2 and 296.3. Incident episode was identified by using 120-day negative diagnosis and medication history on or before the first depression diagnosis date in fiscal year 1999. Guideline-consistent depression treatment was defined as the receipt of antidepressants for at least 90 days within a period of six months after the onset of depression. Chi square tests and logistic regressions were used to analyze patterns of guideline-consistent antidepressant treatment. **Results:** Overall, 51% received any antidepressant treatment for diagnosed major depression; among patients using any antidepressants, 62% received guideline-consistent antidepressant treatment. VHA users who received care from a mental health specialist were more likely to have guideline-consistent treatment than those who were not receiving care from a mental health specialist. African Americans, older veterans, and those with substance use disorders were less likely to have guideline-consistent antidepressant treatment. **Conclusion:** Guideline-consistent depression care was lower for certain subgroups of individuals. Further research is necessary to evaluate the reasons for this finding, so that targeted care coordination strategies could be developed to improve antidepressant treatment. Increased contact with mental health specialty staff, which is now being implemented in the VHA, may increase antidepressant treatment among VHA users with diabetes and major depression. (*Psychiatric Services* 59:1139-1147, 2008)

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PSYCHIATRIC SERVICES • ps.psychiatryonline.org • October 2008 • Vol. 59 • No. 10

The prevalence of depression among persons with diabetes is very high and ranges from as low as 11%, when standardized diagnostic interviews are used, to as high as 31%, when assessed by questionnaires (1). Comorbid depression complicates diabetes care and adversely affects health care expenditures and clinical outcomes. Specifically, co-occurring depression as measured by using symptom scales or diagnostic criteria is associated with hypoglycemia (2), has been shown to lower adherence to oral hypoglycemic and lipid-lowering medications (3), and is associated with functional disability (4). Total health care expenditures of individuals with self-reported depression and diabetes are 4.5 times higher than those of individuals with diabetes without depression (5).

However, clinical trials have shown that pharmacologic treatments, specifically the non-generation antidepressants, and nonpharmacologic treatments for major depression tend to improve glycemic control (6,7). In a randomized double-blind placebo-controlled trial of patients with comorbid diabetes and depression, fluoxetine, as compared with a placebo, was associated with better glycemic control and reduced depressive symptoms (7).

Recent studies have documented cost advantages of treating depression among individuals with diabetes. A one-year cross-sectional observation-

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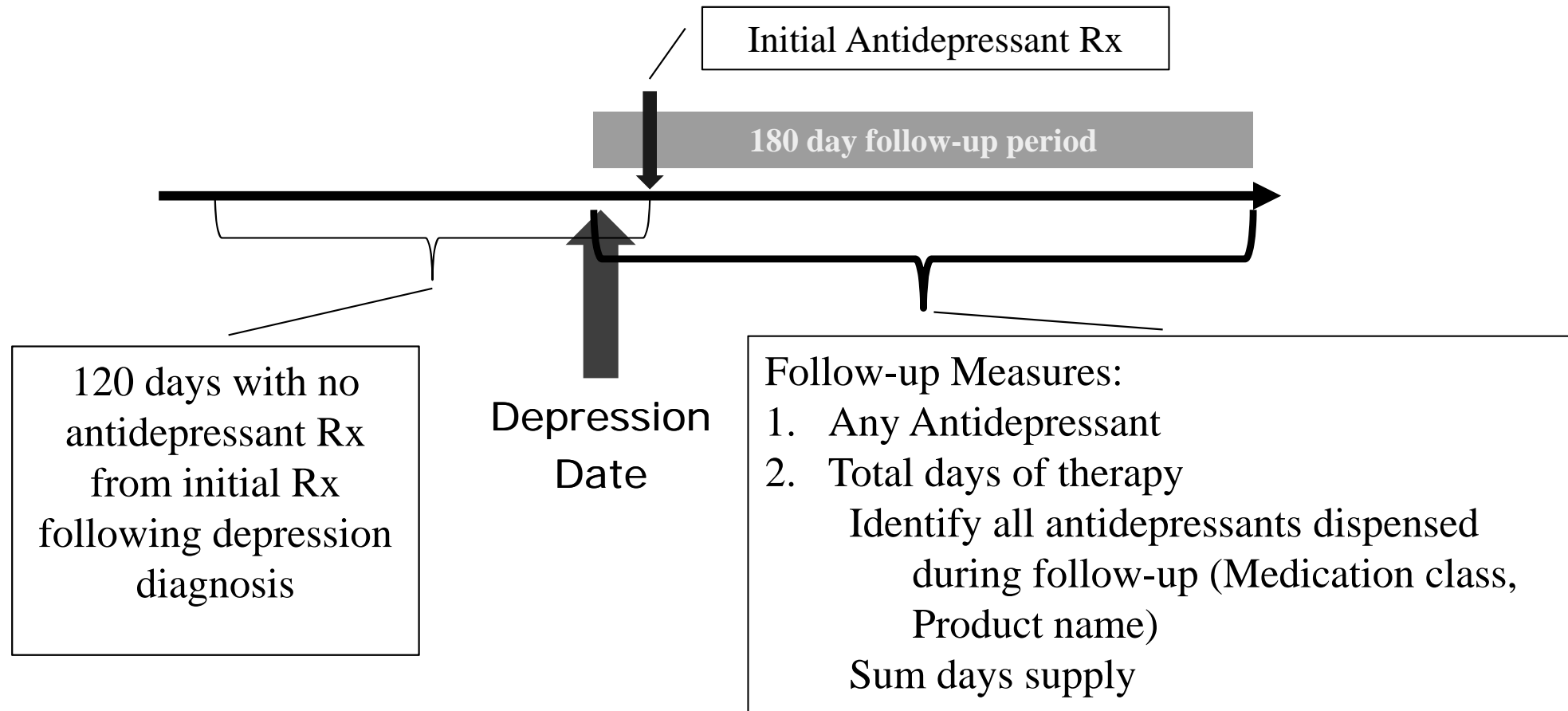


Quality of Care: Tiwari et al. *Psych Services* 2008

- **Cohort of patients with diabetes and new episode of major depressive episode**
- **Guideline-consistent depression treatment**
 - Antidepressant medication for at least 3 months within 6 months of initial diagnosis
- **Evaluated two outcomes**
 - Received antidepressant
 - Guideline-consistent antidepressant use

Quality of Care: Tiwari et al. *Psych Services* 2008

■ How was pharmacy data used?



Quality of Care: Tiwari et al. *Psych Services* 2008

Received Antidepressant during follow-up:

51%

Guideline-consistent depression:

31.4%

(62% of those with any antidepressant)



Quality of Care: Tiwari et al. *Psych Services* 2008

Table 2

Receipt of any antidepressant treatment among persons with diabetes and incident depression who used the Veterans Health Administration (VHA) for health care, fiscal year 1999^a

Variable	Any antidepressant treatment (N=2,001)			Logistic regression		
	N	%	p	AOR	95% CI	p
Age			<.001			
<50	383	59.2		.89	.72–1.09	
50–64	856	58.5		.58	.46–.74	<.001
65–74	467	46.3		.38	.29–.50	<.001
≥75	295	35.3				

Quality of Care: Tiwari et al. *Psych Services* 2008

Table 3

Receipt of guideline-consistent antidepressant treatment among persons with diabetes and incident depression who used the Veterans Health Administration (VHA) for health care, fiscal year 1999^a

Age			<.01			
<50	226	59.0		1.17	.90–1.53	
50–64	568	66.4		.80	.58–1.11	
65–74	283	60.6		.65	.45–.96	<.05
≥75	166	56.3				
Mental health specialty visit			<.001	1.62	1.30–2.01	<.001
Yes	956	64.5				
No	287	55.3				

How has outpatient healthcare utilization been measured in VA studies?: Medication Adherence

ORIGINAL ARTICLE

A Refill Adherence Algorithm for Multiple Short Intervals to Estimate Refill Compliance (ReComp)

Chris L. Bryson, MD, MS,*† David H. Au, MD, MS,*† Bessie Young, MD, MS,††
Mary B. McDonnell, MS,* and Stephan D. Fihn, MD, MPH*†

Background: There are many measures of refill adherence available, but few have been designed or validated for use with repeated measures designs and short observation periods.

Objective: To design a refill-based adherence algorithm suitable for short observation periods, and compare it to 2 reference measures.

Methods: A single composite algorithm incorporating information on both medication gaps and oversupply was created. Electronic Veterans Affairs pharmacy data, clinical data, and laboratory data from routine clinical care were used to compare the new measure, ReComp, with standard reference measures of medication gaps (MEDOUT) and adherence or oversupply (MEDSUM) in 3 different repeated measures medication adherence-response analyses. These analyses examined the change in low density lipoprotein (LDL) with simvastatin use, blood pressure with antihypertensive use, and heart rate with β -blocker use for 30- and 90-day intervals. Measures were compared by regression based correlations (R^2 values) and graphical comparisons of average medication adherence-response curves.

Results: In each analysis, ReComp yielded a significantly higher R^2 value and more expected adherence-response curve regardless of the length of the observation interval. For the 30-day intervals, the highest correlations were observed in the LDL-simvastatin analysis (ReComp $R^2 = 0.231$; [95% CI, 0.222-0.239]; MEDSUM $R^2 = 0.054$; [95% CI, 0.049-0.059]; MEDOUT $R^2 = 0.055$; [95% CI, 0.048-0.058]).

Conclusions: ReComp is better suited to shorter observation intervals with repeated measures than previously used measures.

Key Words: drug, compliance, adherence, validity, methods, pharmacy

(*Med Care* 2007;45: 497-504)

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Views expressed in this article are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs, or the University of Washington.

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■ **Bryson CL, Au DH, Young B, McDonnell MB, Fihn SD. A Refill Adherence Algorithm for Multiple Short Intervals to Estimate Refill Compliance (ReComp). *Med Care* 2007; 45: 497-504.**

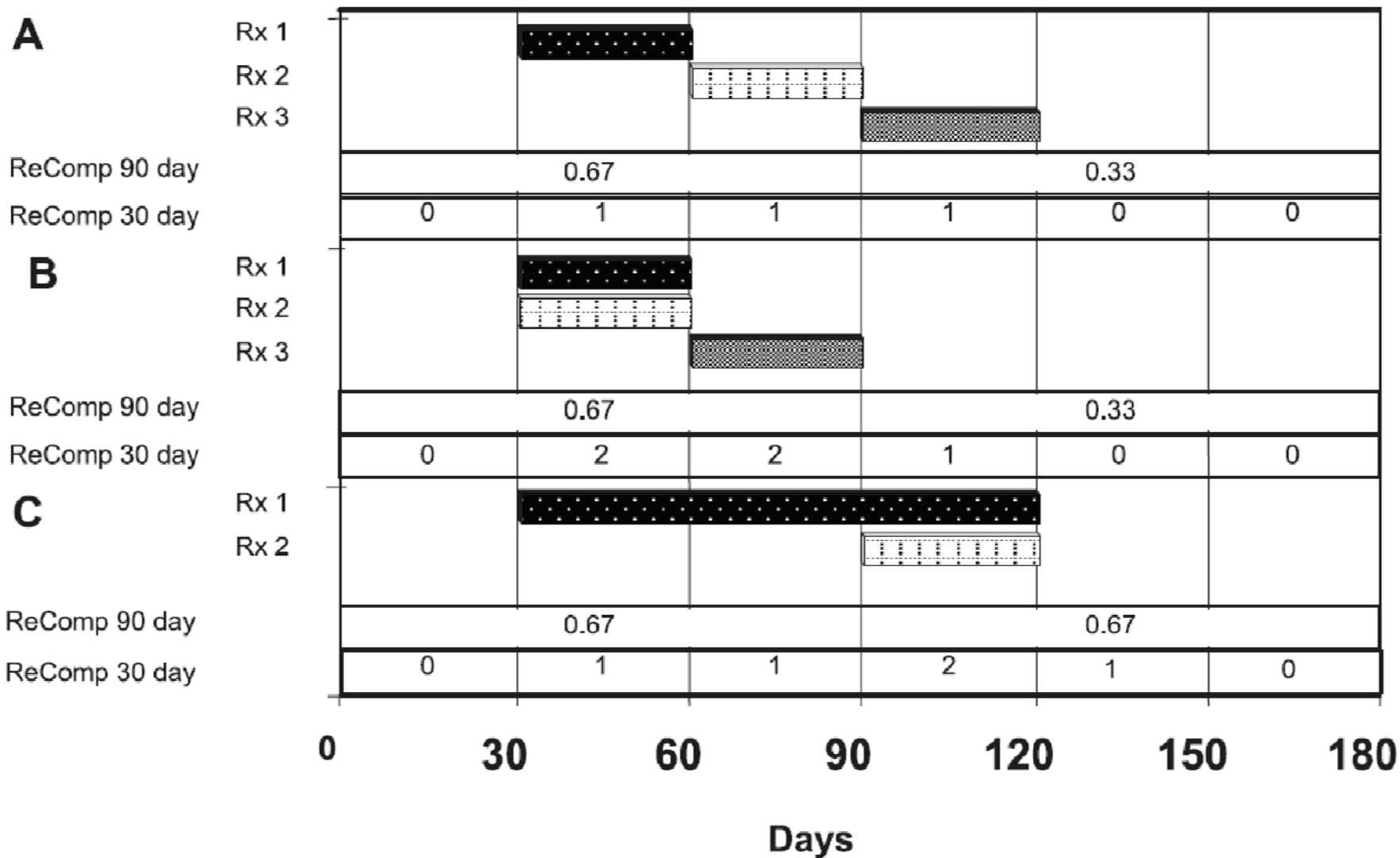
■ **Objective:** Design a refill based algorithm of medication use that can be used for short observation periods



Medication Adherence: Bryson et al. *Med Care* 2007

- **Use data from ACQUIP to compare 3 methods of determining medication use**
 - MEDSUM – Daily doses divided by days in period
 - MEDOUT – Number of medication gaps
 - ReComp – Algorithm for describing medication use / adherence
- **Evaluated the association between medication adherence using the measures and outcomes for select medications**
 - Simvastatin and LDL
 - Antihypertensives and BP
 - Beta-blockers and heart rate

Medication Adherence: Bryson et al. *Med Care* 2007



Medication Adherence: Bryson et al. *Med Care* 2007

TABLE 1. Characteristics of the 3 Validation Cohorts, Outcome Measures, and Recomp Scores

	LDL Cohort	BP Cohort	HR Cohort
Mean number of fills (SD)	8 (6)	10 (10)	4 (4)
Recomp mean (SD)	0.47 (0.73)	1.41 (1.32)	0.51 (1.01)
Recomp range	0–21.6	0–22	0–42.8
MEDSUM mean (SD)	0.45 (0.58)	2.91 (1.81)	0.51 (1.03)
MEDSUM range	0–4.33	0–17	0–9
1-MEDOUT mean (SD)	0.75 (0.33)	0.59 (0.29)	0.14 (0.28)
1-MEDOUT range	0–1	0–1	0–1

From Bryson et al *Med Care* 2007

Medication Adherence: Bryson et al. *Med Care* 2007

Regression	Measure	30-day	90-day
		R^2	R^2
LDL-Simvastatin	ReComp	0.231	0.213
	MEDSUM	0.054	0.142
	MEDOUT	0.053	0.133
BP	ReComp	0.090	0.083
	MEDSUM	0.007	0.050
	MEDOUT	0.007	0.046
HR β -Blocker	ReComp	0.104	0.134
	MEDSUM	0.041	0.102
	MEDOUT	0.042	0.101

How has outpatient pharmacy utilization been measured in VA studies?: Medication Use / Exposure

■ Lee TA, Pickard AS, Au DH, Bartle B, Weiss KB. (2008). Risk for death associated with medications for recently diagnosed chronic obstructive pulmonary disease. *Ann Intern Med.*, 149, 380-390.

■ Objective: Examine association between COPD-related medication use and risk of death

ARTICLE

Annals of Internal Medicine

Risk for Death Associated with Medications for Recently Diagnosed Chronic Obstructive Pulmonary Disease

Todd A. Lee, PhD^{1,2}; Paul A. Simon, PhD^{1,2}; David H. Au, MD, MS; Ross H. Bartle, MPh; and Kevin B. Weiss, MD, MPh, MS

Background: Concerns exist regarding increased risk for mortality associated with some chronic obstructive pulmonary disease (COPD) medications.

Objective: To examine the association between various respiratory medications and risk for death in veterans with newly diagnosed COPD.

Design: Nested case-control study in a cohort identified between 1 October 1999 and 30 September 2005 and followed through 30 September 2004 by using National Veterans Affairs inpatient, outpatient, pharmacy, and Medicare databases; Centers for Medicare & Medicaid Services databases; and National Death Index Plus data. Cause of death was ascertained for a random sample of 40% of those who died during follow-up. Case patients were categorized on the basis of all-cause, respiratory, or cardiovascular death. Mortality risk associated with medications was assessed by using additional logistic regression adjusted for comorbid conditions, health care use, and markers of COPD severity.

Setting: U.S. Veterans Health Administration health care system.

Participants: 32 180 case patients and 200 501 control participants in the all-cause mortality analysis. Of 11 027 patients with cause-of-death data, 2435 case patients had respiratory deaths and 2159 case patients had cardiovascular deaths.

Measurements: All-cause mortality; respiratory and cardiovascular deaths; and exposure to COPD medication, inhaled corticosteroids, ipratropium, long-acting β -agonists, and theophylline in the 6 months preceding death.

Results: Adjusted odds ratios (ORs) for all-cause mortality were 1.03 (95% CI, 0.78 to 1.34) for inhaled corticosteroids, 1.11 (CI, 1.03 to 1.19) for ipratropium, 1.32 (CI, 1.03 to 1.67) for long-acting β -agonists, and 1.09 (CI, 0.99 to 1.19) for theophylline. Ipratropium was associated with increased cardiovascular deaths (OR, 1.34 [CI, 1.22 to 1.47]), whereas inhaled corticosteroids were associated with reduced risk for cardiovascular death (OR, 0.80 [CI, 0.72 to 0.88]). Results were consistent across sensitivity analyses.

Limitations: Current smoking status and lung function were not measured. Misclassification of cause-specific mortality is unknown.

Conclusions: The possible association between ipratropium and elevated risk for all-cause and cardiovascular death needs further study.

Ann Intern Med 2008;149:380-390.
For author affiliations, see end of text.

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Chronic obstructive pulmonary disease (COPD) is associated with substantial burden in terms of prevalence of disease (1), death and disability risk (2, 3), and health care costs (4). Despite recent interest in examining long-term outcomes associated with medications in patients with COPD (5, 6), some issues are not easily addressed by using randomized clinical trials. From a pharmacovigilance perspective, relatively rare adverse events—such as death associated with medication use—may not be detected in the short term. The patients who receive a medication may not be similar to those participating in clinical trials (7, 8) and may be more vulnerable to such events. Thus, evidence of longer-term benefits and harms associated with medications—particularly in patients with COPD, who tend to be elderly and have multiple comorbid conditions (9)—can be informed by research that relies on observational data.

Potential safety concerns with medications used to manage COPD may be substantial. A recent meta-analysis (10) showed a nearly 2.5-fold increase in respiratory deaths among patients receiving long-acting β -agonists compared with those receiving placebo. In the Lung Health Study (11), the group randomly assigned to ipratropium bromide had more than twice as many cardiovascular deaths as those receiving placebo. In addition, the U.S. Food and Drug Administration recently issued a notice regarding the potential for an increased risk for stroke associated with tiotropium use in patients with COPD (12). The extent to which these safety concerns exist and can be generalized to patients with COPD outside the context of clinical trials is unclear. Therefore, we sought to examine the association between medication use and risk for death, including respiratory and cardiovascular deaths, in a large population of patients with recently diagnosed COPD.

Methods
We conducted this nested case-control study in patients with recently diagnosed COPD by using national Veterans Affairs inpatient, outpatient, pharmacy, and mortality databases, complemented with data from the Centers for Medicare & Medicaid Services. Our sample comprised U.S. veterans who used the U.S. Veterans Health Admin-

See also:
Print
Editors' Notes 381
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Conversion of graphics into slides

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Medication Use / Exposure: Lee et al. *Ann Intern Med* 2008

- **Nested case-control study of patients with newly diagnosed COPD**
- **Identified all-cause and respiratory-related and cardiovascular-related deaths**
- **Examined the association between respiratory medications and risk for events**

Medication Use / Exposure: Lee et al. *Ann Intern Med* 2008

- **How was pharmacy data used?**
- **Pharmacy data was used to define medication exposure in 6 months preceding an index date**
 - Medication use (yes / no)
 - Medication regimens
 - Actively treated patients / current users
 - Amount of medication / dose
 - Needed to quantify amount of use of inhaled medications
 - Pharmacy data not always easy to work with – particularly true with regard to inhaled products
 - More straightforward to calculate cumulative exposure when dealing with tablets/capsules than with inhalers

Medication Use / Exposure: Lee et al. Ann Intern Med 2008

SAS System Viewer - RESP_MED02.SAS7BDAT

File Edit View Window Help

RESP_MED02.SAS7BDAT

	ID	FRP_DATE	VA_PRODUCT	SIG	DAY _SU PPL	TL QTY
1		11/06/01	ALBUTEROL 90MCG/SPRAY INHL,ORAL	INHALE 1 PUFF(S) BY INHALATION FOUR TIMES A DAY	90	4
3	1	11/06/01	FLUTICASONE PROPIONATE 220MCG/SPRAY AEROSOL, INHL,ORAL,13GM	2 PUFFS BID	30	1
6		12/10/01	THEOPHYLLINE 200MG TAB,SA (THEOCHRON)	TAKE 1 TABLET(S) BY MOUTH TWICE A DAY	90	180
6		03/18/02	THEOPHYLLINE 200MG TAB,SA (INWOOD)	TAKE 1 TABLET(S) BY MOUTH TWICE A DAY	90	180
7	2	02/25/02	ALBUTEROL 90MCG/IPRATROPIUM BR 18MCG/SPRAY INHALER,ORAL,14.7GM	INHALE 2 PUFFS BY MOUTH FOUR TIMES A DAY	90	4
8		10/11/01	IPRATROPIUM BR 18MCG/SPRAY AEROSOL, INHL	SW & INHALE 4 PUFFS PO QID UD	90	8
9		10/29/01	ALBUTEROL 90MCG/SPRAY INHL,ORAL	SW & INHALE 2 PUFFS PO QID P	30	2
10		12/14/01	ALBUTEROL 90MCG/SPRAY INHL,ORAL	SW & INHALE 2 PUFFS PO QID P	90	4
11		12/30/01	IPRATROPIUM BR 18MCG/SPRAY AEROSOL, INHL	SW & INHALE 4 PUFFS PO QID UD	90	8
12	3	04/10/02	SALMETEROL XINAFOATE 21MCG/ACTUAT INHL,ORAL,13GM	INHALE 2 PUFFS BY MOUTH TWICE A DAY	30	1
13		04/12/02	ALBUTEROL 90MCG/SPRAY INHL,ORAL	SW & INHALE 2 PUFFS PO QID P	90	4
14		04/12/02	IPRATROPIUM BR 18MCG/SPRAY AEROSOL, INHL	SW & INHALE 4 PUFFS PO QID UD	90	8
15		04/30/02	SALMETEROL XINAFOATE 21MCG/ACTUAT INHL,ORAL,13GM	INHALE 2 PUFFS BY MOUTH TWICE A DAY	30	1
16		08/09/02	SALMETEROL XINAFOATE 21MCG/ACTUAT INHL,ORAL,13GM	INHALE 2 PUFFS BY MOUTH TWICE A DAY	30	1
17		08/29/02	SALMETEROL XINAFOATE 21MCG/ACTUAT INHL,ORAL,13GM	INHALE 2 PUFFS BY MOUTH TWICE A DAY	30	1

Ready Hdn cols:0 Obs 1-349793 of 349793 NUM

Medication Use / Exposure: Lee et al. *Ann Intern Med* 2008

■ **VA_PRODUCT**

- Used to determine specific product
- Used to determine dose strength
- Used to determine number of actuations

■ **SIG**

- Used to determine dosing frequency
- Used to determine number of doses per day

Medication Use / Exposure: Lee et al. *Ann Intern Med* 2008

1	MEDICATION USE / EXPOSURE, INHL	QUANTITY IN MEDICATION (WITH ONLINE) WITH FORM	QU	EV
1	FLUTICASONE PROPIONATE 220MCG/SPRAY AEROSOL, INHL, ORAL, 13GM	2 PUFFS BID	30	1
1	IPRATROPIUM BR 18MCG/SPRAY AEROSOL, INHL	INHALE 2 PUFF(S) BY INHALATION FOUR TIMES A DAY	90	6

■ Calculation of cumulative ICS exposure

- Determine strength for each prescription
 - Fluticasone 220 μ g
- Convert strength to beclomethasone equivalents
 - BDP_Equiv => $220 * 0.5 = 110\mu\text{g}$ per dose
- Determine number of doses per prescription
 - quantity dispensed * doses per product
 - 1 canister * 120 actuations/canister = 120 doses
- Calculate beclomethasone equivalents for each prescription and sum for cumulative exposure

How has outpatient healthcare utilization been measured in VA studies?: Risk Adjustment

MEDICAL CARE
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Predicting Costs of Care Using a Pharmacy-Based Measure Risk Adjustment in a Veteran Population

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W. PAUL NICHOL, MD, *†† NORMAN T. SUZUKI, PHARM.D, *‡‡ EDWARD PERRIN, PhD,*
NANCY D. SHARP, PH.D,*† AND JEFFREY TODD-STENBERG*

BACKGROUND. Although most widely used risk adjustment systems use diagnosis data to classify patients, there is growing interest in risk adjustment based on computerized pharmacy data. The Veterans Health Administration (VHA) is an ideal environment in which to test the efficacy of a pharmacy-based approach.

OBJECTIVE. To examine the ability of RxRisk-V to predict concurrent and prospective costs of care in VHA and compare the performance of RxRisk-V to a simple age/gender model, the original RRRisk, and two leading diagnosis-based risk adjustment approaches: Adjusted Clinical Groups and Diagnostic Cost Groups/Hierarchical Condition Categories.

METHODS. The study population consisted of 161,202 users of VHA services in Washington, Oregon, Idaho, and Alaska during fiscal years (FY) 1996 to 1998. We examined both concurrent and predictive model fit for two sequential 12-month periods (FY 98 and FY 99) with

the patient-year as the unit of analysis, using split-half validation.

RESULTS. Our results show that the Diagnostic Cost Group/Hierarchical Condition Categories model performs best ($R^2 = 0.45$) among concurrent cost models, followed by ADG (0.31), RxRisk-V (0.20), and age/sex model (0.01). However, prospective cost models other than age/sex showed comparable R^2 : Diagnostic Cost Group/Hierarchical Condition Categories $R^2 = 0.15$, followed by ADG (0.12), RxRisk-V (0.12), and age/sex (0.01).

CONCLUSIONS. RxRisk-V is a clinically relevant, open source risk adjustment system that is easily tailored to fit specific questions, populations, or needs. Although it does not perform better than diagnosis-based measures available on the market, it may provide a reasonable alternative to proprietary systems where accurate computerized pharmacy data are available.

Key words: Case-mix; pharmacy; veterans; risk adjustment. (Med Care 2003;41:753-760)

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■ Sales AE, Liu CH, Sloan KL, et al. Predicting costs of care using a pharmacy-based measure risk adjustment in a veteran population. *Med Care.* 2003; 41: 753-760.

■ Objective: Compare pharmacy based risk adjustment methods to other methods in VA data

Risk Adjustment: Sales et al. *Med Care* 2003

- **Comparison of VA-specific pharmacy-based risk adjustment model to other risk adjustment models (ACG, HCC, RxRisk)**
- **Development of a VA-based version of RxRisk (Chronic Disease Score)**
 - Sloan KL, et al. Construction and characteristics of RxRisk-V: a VA-adapted pharmacy-based case-mix instrument. *Med Care* 2003; 41(6): 761-74
 - Includes 45 chronic disease categories identified through Rx data
- **Potential value in using pharmacy-based measures versus ICD-based measures**

Risk Adjustment: Sales et al. Med Care 2003

TABLE 3. Comparing Model Performance for Prospective Costs

Models	Number of Parameters	R-Squared	Adjusted R-Squared
Age/Sex	21	0.011	0.011
HCC	127	0.154	0.153
ADG	53	0.126	0.125
RxRisk	50	0.111	0.111
RxRisk-V	64	0.123	0.122

Adapted from Sales et al Med Care 2003



Session Objectives

- How has outpatient pharmacy utilization been measured in VA studies?
- Overview of VA Pharmacy databases
- Finding information in the VA Pharmacy databases
- Examples of VA studies that have used the VA Pharmacy databases
- Where to go for more help

VI ReC Help

■ VI ReC Webpage

<http://www.virec.research.va.gov>

- Information on VA data sources and how to access data
- Resource users guide for pharmacy data
 - <http://www.virec.research.va.gov/References/RUG/RUG-Pharmacy-2nd-Ed-er.pdf>



VIReC Help (cont'd)

■ HSRData Listserv

- Join at the VIReC Web site
- Discussion among >400 data stewards, managers, and users
- Past messages in archive (on intranet)

■ VIReC Help Desk

- VIReC staff will answer your question and/or direct you to available resources on topics
- VIReC@va.gov
- (708) 202-2413



Questions?

Selected Recent References on VA Outpatient Pharmacy Use

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- VIREC Technical Report: Comparison of VA Outpatient Prescriptions in the DSS Datasets and the PBM Database
<http://vaww.virec.research.va.gov/References/TechnicalReports/VIRECTechnicalReport1.pdf>



Upcoming Seminar

- **April 5, 2012**
- Applying Comorbidity Measures Using VA and Medicare data

