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Journal

Research in Social and Administrative Pharmacy, 11(4)

ISSN

1551-7411

Authors

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Publication Date

2015-07-01

DOI

10.1016/j.sapharm.2014.10.007

Peer reviewed



Available online at www.sciencedirect.com

 ScienceDirect

Research in Social and
Administrative Pharmacy 11 (2015) 499–506

RESEARCH IN SOCIAL &
ADMINISTRATIVE PHARMACY

Original Research

Association of increased emergency rooms costs for patients without access to necessary medications

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Abstract

Background: Prescription medications are an important component of chronic disease management. They are vital in preventing unnecessary ER visits. However, few studies have examined the association between patients' self-reported inability to receive necessary medications and emergency room costs.

Objectives: The study objectives were to: 1) determine differences in ER costs based on self-reported ability to obtain necessary medications. 2) identify differences in ER costs based on self-reported ability to obtain necessary medications among medication users. The association was also examined by insurance category.

Methods: Respondent data from 10 years (2002–2011) of the U.S. Medical Expenditure Panel Survey was analyzed. The models employed estimated the association of respondents reporting being 'unable to receive necessary medications' on ER expenditures. Secondly, the relationship was assessed by insurance category: private, public, and uninsured. Two-part cost regression models with bootstrapped estimates to produce 95% confidence intervals of cost differences were applied for these analyses. Significance was set at $\alpha = 0.05$. Analyses were completed using SAS 9.4 (Cary, NC) and Stata 13 (College Station, TX). Estimates were in 2011 US dollars.

Results: People unable to receive necessary medications experienced increased average annual ER costs of \$46.62 with 95% a confidence interval [CI] of 34.76–58.49) compared to patients able to receive necessary medications.

By insurance category, respondents unable to receive necessary medications experienced increased ER costs of \$104.80 (95% CI: 60.57–149.03), \$42.16 (95% CI: 24.65–59.68), and \$33.18 (95% CI: 18.54–47.82), for Publically Insured, Privately Insured, and Uninsured, respectively. Findings were similar for those already using medications.

Conclusions: Inability to obtain necessary medications is associated with increased emergency room costs. Those with public insurance have a larger increase in ER costs if they are without necessary medications compared to those insured privately or without insurance.

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Keywords: Pharmacy; Pharmacists; Costs; Insurance; Medications; Emergency rooms

The authors have no conflicts of interest to report in this non-sponsored study. This research has not been presented as an abstract at any public forum.

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<http://dx.doi.org/10.1016/j.sapharm.2014.10.007>

Introduction

Prescription medications prevent the acute sequelae of chronic diseases that result in emergency and inpatient care.^{1,2} Suboptimal consumption of necessary medications translates into poor management of chronic illnesses³ and is associated with higher utilization of health care.^{4–8} Osterberg and Blaschke estimated that 33–69% of hospital admissions were related to poor medication adherence at an associated cost of \$100 billion a year.⁹ Research by Law et al discerned four unmet needs in the medication use process: 1) Patients see the physician at the right time. 2) Patients use medications as directed. 3) Patients receive adequate counseling. 4) Patients are monitored appropriately. This work revealed that patients understood the importance of taking their medications as directed and that they shared some responsibility in accomplishing in doing so.¹⁰ Van Servellen et al found that factors associated with access to care in terms of cost and ability to see medical specialists were correlated with adherence in patients with HIV.¹¹ However, the scientific literature is confounded by a variation in the explanatory factors of appropriate consumption and a wide range in the measured extent of their impact.^{12,13} Publications from controlled clinical trials with robust internal validity are likely needed to ascertain predictive characteristics. Individuals who are not able to receive needed medications are at risk for diminished management of their syndrome.^{14,15} Separate recent studies found appropriate medication consumption was associated with a 18–19% reduction in coronary artery disease events.^{16,17} This loss of therapeutic control translates to increases in catastrophic health service use and the concomitant medical costs.^{18,19} However, the subsequent health care resource use is largely unknown for patients who specifically realize they are in need of prescription medications, but are unable to obtain them. Thus, additional research is needed in quantifying the association between access to medications and downstream health system costs. Our goal was to quantify the association between individual emergency room costs and inability to receive necessary medications using a pooled 10-year publically available, health services dataset of people living in the U.S.

Methods

Sample

Respondent data from the most recent 10 years (2002–2011) of released data from the Medical

Expenditure Panel Survey [MEPS] Household Component [HC] files and Medical Conditions files was analyzed to answer the research question. The final analysis dataset was created by pooling the annual cross-sectional datasets in the 10 year period. Respondents included were ages 18–64 years old. Respondents were determined to be unable to obtain necessary medications based on selecting ‘yes’ to a question asking if “in the last 12 months they were unable to obtain prescription medications they or a doctor believed necessary.” Only patients that needed medications were included in this analysis (i.e. those that answered ‘inapplicable’ to the question asking if they were unable to receive necessary medications were not included in the analysis set). MEPS is designed to provide a national reflection of family and individual demographic characteristics and health services use.^{20,21} The HC and Medical Conditions files are data from a sample of families and individuals in selected communities across the United States, drawn from a nationally representative subsample of households that participated in the National Health Interview Survey from the prior year with oversampling of minorities and the poverty stricken.^{22–24}

Statistical analysis

Estimation was performed to measure the effect of survey respondents reporting being ‘unable to receive necessary medications’ on ER expenditures using survey data extracted from a national dataset of health services use in the United States. Secondly, the relationship by insurance category was estimated: private, public, and uninsured. For valid estimates to be measured, patient characteristics that could jointly influence the likelihood of exposure and outcome must be adjusted.²¹ For this reason, multiple regression adjusting for influential characteristics was implemented. This involved use of a 2-part generalized linear model with 1000 bootstrapped estimates to produce 95% confidence intervals of cost differences using the direct substitution method. This method incorporates the likelihood of an individual incurring costs as well as the average estimate of the individual’s costs based on their characteristics employing the survey weighting in incremental dollar changes.²⁵ The regression model dependent variable was costs in 2011 \$US.

Regression model independent variables

Variables included for adjustment of confounding were age, gender, race, poverty status, marital status, census region, insurance coverage status,

Charlson comorbidity, and survey year. Education was coded as “high school graduate or more” or “less than high school graduate”. Based on pre-defined MEPS categories, income was collapsed to categories of “low income” and “greater than low income”. MEPS defines low income status as receiving an adjusted income of less than 200% of the federal poverty level. To adjust for differences in health status due to comorbidities the Charlson Comorbidity Index^{6,7} was applied to the list of conditions obtained by respondents in the annually compiled MEPS medical conditions file. The Charlson Comorbidity Index was modified for use with 3-digit ICD-9 Codes using the Deyo approach of Charlson comorbidity scoring.²⁶ Only those with complete data for the regression variables were included in the analysis. To characterize poverty level by insurance category, the percentages of low income respondents by insurance category and ability to receive necessary medications were tabulated.

As a subgroup analysis, the association of inability to receive necessary medications and ER costs in established users of medications was measured. This was achieved by executing the regression analyses restricted to patients that reported filling at least one prescription during the year.

Descriptive statistics were determined using *t*-tests for continuous variables and chi-squared tests for categorical variables. Significance was set at $\alpha = 0.05$. Analyses were completed using SAS 9.4 (Cary, NC) and Stata 13 (College Station, TX).

Results

The survey weighted analysis set represented 182,189,150 people living in U.S. annually. Of these 472,539 annually (2.6%) reported being ‘unable to receive necessary medications’, and 177,463, 611 (97.4%) reported ‘able to receive necessary medications’. Patients unable to receive necessary medications were older (42.8 years old versus 40.8 years old) and experienced more comorbidities (Charlson Scores of 0.34 versus 0.17), compared to respondents that were able to receive necessary medications, respectively, with *P*-values <0.01. Respondents unable to receive necessary medications were more likely low income (53.7% versus 26.6%), and of black race (14.7% versus 12.1%). Respondents unable to receive necessary medications were less likely to be male (36.8% versus 46.5%), have a high school education (80.5% versus 84.9%), to be married (37.6% versus 48.4%), and to

have private health insurance (44.7% versus 73.8%). Respondents unable to receive necessary medications were more likely to experience at least one ER visit a year with 28.3% of those unable to receive necessary medications going to the ER compared to 12.3% of those able to receive necessary medications. *P*-values for chi-squared tests for frequency were <0.01 (Table 1).

For all insurance categories, those unable to receive necessary medications were more likely to be low income compared to those able to receive necessary medications. The differences in percentage of low income status respondents between those unable and able were more pronounced for those with public coverage (18.0% versus 7.2%) and the uninsured (22.9% versus 9.0%) (Table 2).

People who were unable to receive necessary medications experienced increased average annual ER costs of \$46.62 with a 95% confidence interval [CI] of \$34.76 to \$58.49, compared to patients able to receive necessary medications adjusted for age, gender, race, poverty level, insurance status, education, comorbidity level, marital status, census region, and year.

Among people that had public insurance, respondents who were unable to receive necessary medications experienced increased ER costs of \$104.80 with a 95% CI of 60.57–149.03. Among those that had private insurance, respondents who were unable to receive necessary medications experienced a statistically significant increase in ER costs of \$42.16 (95% CI: 24.65–59.68). For the uninsured, respondents unable to receive necessary medications experienced a statistically significant increase in ER costs of \$33.18 (95% CI: 18.54–47.82) (Table 3).

Medication users analysis

Among medications users, respondents who were unable to receive necessary medications experienced ER costs of \$54.16 with a 95% CI of 37.03–71.28. Among medications users that had public insurance, respondents who were unable to receive necessary medications experienced ER costs of \$111.46 (95% CI: 56.25–166.66). Among medications users that had private insurance, respondents who were unable to receive necessary medications experienced a non-statistically significant increase in ER costs of \$41.25 (95% CI: 20.69–61.80). Among uninsured medication users, those unable to receive necessary medications experienced an increase in ER costs \$57.43 with a 95% CI of 25.75–89.10 (Table 3).

Table 1
Summary respondent characteristics, weighted

Characteristics	Not able to obtain Necessary medications (<i>n</i> = 4,725,539 annualized)	Able to obtain Necessary medications (<i>n</i> = 177,463,611 annualized)	<i>P</i> value
Age, mean, years	42.7	39.9	<0.001
Charlson Comorbidity Index score, mean	0.34	0.17	<0.001
Annual number of prescription medications including refills, mean	20.8	9.0	<0.001
Male, %	37.6	48.4	<0.001
Race			
White	79.5	80.5	<0.001
Black	14.7	12.1	
Asian	1.6	4.8	
Other	4.1	2.6	
Region			
Northeast, %	12.9	18.6	<0.001
Midwest, %	21.4	22.1	
South, %	45.2	36.0	
West, %	20.5	23.4	
Insurance coverage			
Private, %	44.7	73.8	<0.001
Public, %	21.5	9.2	
Uninsured, %	33.8	16.9	
High school graduate/GED or more education, %	80.5	84.9	<0.001
Low income, %	53.7	26.6	<0.001
Married, %	39.2	54.7	<0.001
Any annual emergency room visits, %	28.3	12.3	<0.001

The majority of respondents reported the reason they were unable to receive necessary medications was because they could not afford care (71.7%). The next most common reason reported by respondents was that the insurance company would not approve, cover, or pay for care (14.6%). The next most common reason for being unable to receive necessary care was 'other' by 9.4%.

Discussion

Using a survey database of national health services use and cost, respondents that were not able to receive necessary medications were associated with increases in emergency room costs during the same year, adjusted for influential

characteristics on health service use including comorbidities. Similar increases were observed in ER costs in subgroup analyses of those who had filled a prescription medication during the year.

The association of inability to receive medications and ER costs varied by insurance category. Respondents with public insurance had larger increases in ER costs (\$104.80) if they were unable to receive necessary medications compared to those with private insurance (\$42.16) or the uninsured (\$33.18). The findings were similar when the analysis was restricted to respondents that had filled a prescription that year.

A patient that is not able to receive a necessary medication is at risk for suboptimal management. These findings suggest that this risk manifests as elevated health services utilization and expenditures

Table 2
Income category breakdown by insurance status, weighted

	Unable to receive necessary medications			Able to receive necessary medications		
	Private	Public	Uninsured	Private	Public	Uninsured
Low income, %	12.7	18.0	22.9	10.4	7.2	9.0

Table 3

Change in annual emergency rooms costs for those unable to receive necessary medications compared to those able to receive necessary medications in 2011 US dollars^a

	Combined insurance Categories	Private insurance	Public insurance	Uninsured
All respondents, dollars (95% confidence interval)	+\$46.62 (34.76–58.49)	+42.16 (24.65–59.68)	+104.80 (60.57–149.03)	+33.18 (18.54–47.82)
Respondents with at least one annual prescription fill, dollars (95% confidence interval)	+54.16 (37.03–71.28)	+41.25 (20.69–61.80)	+111.46 (56.25–166.66)	+57.43 (25.75–89.10)

^a The estimates were adjusted in the multiple regression model for age, gender, race, poverty status, marital status, census region, insurance coverage status, Charlson comorbidity, and survey year.

ultimately borne by the person, the third party payer, or the government if publically insured. The primary analysis demonstrates that a person not able to receive necessary medications is at risk for increased ER costs, those receiving public insurance are particularly vulnerable to the absence of necessary medications. Patients without insurance were associated with the smallest difference in ER costs for those unable to receive necessary medications. This aligns with other published work demonstrating uninsured patients incurring reduced health care costs than those with private insurance. Coughlin et al found total annual medical expenditures for the uninsured to be significantly less than those with private insurance. The uninsured are billed the complete cost of services without the benefit of any financing from insurance. Hence, the uninsured are less likely to utilize emergency services, as well as overall health services, regardless of need. This has been associated with the dual challenges of failure to seek medical care when needed^{27–29} and societal burden of uncompensated medical care when the uninsured do not pay their medical bills.^{30,31}

The analyzed data was from non-Medicare aged patients, so the bulk of the publically insured are low income, working-age individuals. Previous published studies have shown worse health outcomes for the poverty-stricken.^{32–34} Mojtabai and Olfson in an analysis of adherence and income in patients observed a 13% increase in non adherence for the low income. They measured adjusted odds ratios of 1.49 and 1.75 for the outcome of ‘hospitalization in the past 2 years’ and the outcome of ‘health got worse’ respectively for patients with poor adherence due to costs.³⁵ Cystic fibrosis patients that received Medicaid coverage were found to have an adjusted risk

of death 3.65 times that of non-Medicaid recipients and were 1.60 times more likely to experience pulmonary exacerbations than non-Medicaid clients.³⁶ Investigators have observed evidence of suboptimal provision of medications at discharge, follow-up care, and outpatient care for Medicaid recipients versus the privately insured.³⁷ This could partially explain the increase in negative health outcomes. This analysis suggests that they are also more sensitive to the absence of treatment. As the U.S. Accountable Care Act (ACA) rolls out, policy experts have described the wide variation in Medicaid programs from state to state.^{38–40} These variations translate into differences in benefit packages for the poor.⁴¹ Greater than 3 out of 4 respondents that did not receive a necessary medication reported that they could not afford it in this study. Policymakers must ensure that persons at-risk receive pharmacy benefits that provide affordable access to medications in order to avoid unnecessary utilization and costs of emergency rooms. Possible mechanisms for achieving this have been proposed with some value-based health plans attempting to reduce or eliminate copayments to improve medication consumption behavior.¹⁹

Previously published studies have revealed improvements in chronic care management when pharmacists are involved in the follow-up of patients. This has manifested as improved control of chronic diseases, improvements in adherence, reduced medication spend per patient, and diminished hospital costs.^{42–44} These findings have led to renewed calls for in-person pharmacist counseling and follow-up to improve medication taking behavior.⁴⁵ Related to these study findings, the next steps may involve: 1) Pharmacist follow-up

to ensure patients are contacted when they have a medication on record that they have not picked up, coupled with patient education of the importance of taking it as directed. 2) Pharmacist counseling on ways of subsidizing the medication or substituting a less costly, equivalently effective medication in coordination with the prescriber. Under the ACA, medical services are predicted to be under duress with expanding coverage.⁴⁶ It becomes more important to dampen overuse of emergency services by improving medication consumption behavior.

There are limitations to this analysis. MEPS is by design a cross-sectional reflection of the United States each year. The survey questions are not framed temporally to assess a cause and effect relationship between absence of necessary medications leading to ER visit. Thus, this was an association study that demonstrated that those unable to receive necessary medications had an increased probability of ER visit in that same year. The analysis was restricted to those with complete data for all variables of interest and to adults ages 18–64 years of age. Random missingness of variables was assumed. There is the potential that subjects removed from the dataset due to absent variables could influence the study estimates. Surveys are subject to possible recall bias that may affect estimates.

Conclusion

Inability to obtain necessary medications is associated with increased emergency room costs. Those with public insurance have a larger increase in ER costs if they are unable to receive necessary medications compared to those with private insurance or are uninsured. This research can be extended by conducting these analyses in a longitudinal cohort over an extensive time horizon that includes health services utilization and outcomes.

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