

## ORIGINAL RESEARCH

## Cost-Related Medication Underuse: Prevalence Among Hospitalized Managed Care Patients

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**BACKGROUND:** The affordability of prescription medications continues to be a major public health issue in the United States. Estimates of cost-related medication underuse come largely from surveys of ambulatory patients. Hospitalized patients may be vulnerable to cost-related underuse and its consequences, but have been subject to little investigation.

**OBJECTIVE:** To determine impact of medication costs in a cohort of hospitalized managed care beneficiaries.

**METHODS:** We surveyed consecutive patients admitted to medical services at an academic medical center. Questions about cost-related underuse were based on validated measures; predictors were assessed with multivariable models. Participants were asked about strategies to improve medication affordability, and were contacted after discharge to determine if they had filled newly prescribed medications.

**RESULTS:** One-hundred thirty (41%) of 316 potentially eligible patients participated; 93 (75%) of these completed postdischarge surveys. Thirty patients (23%) reported cost-related underuse in the year prior to admission. In adjusted analyses, patients of black race were 3.39 times (95% confidence interval [CI], 1.05 to 11.02) more likely to report cost-related underuse than non-Hispanic white patients. Virtually all respondents (n = 123; 95%) endorsed at least 1 strategy to make medications more affordable. Few (16%) patients, prescribed medications at discharge, knew how much they would pay at the pharmacy. Almost none had spoken to their inpatient (4%) or outpatient (2%) providers about the cost of newly prescribed drugs.

**CONCLUSIONS:** Cost-related underuse is common among hospitalized patients. Individuals of black race appear to be particularly at risk. Strategies should be developed to address this issue around the time of hospital discharge. *Journal of Hospital Medicine* 2012;7:104–109 © 2011 Society of Hospital Medicine

The affordability of prescription medications continues to be one of the most pressing public health issues in the United States. Many patients reduce their prescribed doses to make medications last longer or do not fill prescriptions because of cost.<sup>1</sup> Cost-related medication underuse affects patients with and without drug insurance coverage,<sup>2</sup> and is likely to become even more problematic as employers scale back on drug benefits<sup>3</sup> and drug prices continue to increase.<sup>4</sup> The landmark Patient Protection and Affordability Act passed in March 2010 does little to address this issue.<sup>5</sup>

Existing estimates of cost-related medication underuse come largely from surveys of ambulatory patients.

For example, using data from the Medicare Current Beneficiary Survey, Maden et al. estimated that 11% to 15% of patients reduced medication use in the past year because of cost.<sup>6</sup> Tseng and colleagues found very similar rates of cost-related underuse in managed care beneficiaries with diabetes.<sup>7</sup>

Hospitalized patients, who have a high burden of disease and tend to use more medications than their ambulatory counterparts, may be particularly vulnerable to cost-related underuse but, thus far, have been subject to little investigation. New medications, which are frequently prescribed at the time of discharge, may exacerbate these issues further and contribute to preventable readmissions. Accordingly, we surveyed a cohort of medical inpatients at a large academic medical center to estimate the prevalence and predictors of cost-related medication underuse for hospitalized managed care patients, and to identify strategies that patients perceive as helpful to make medications more affordable.

### METHODS

#### Study Sample

We identified consecutive patients newly admitted to the general medicine, cardiology, or oncology services at Brigham and Women's Hospital from November

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2008 to December 2009. For our survey, we included only those patients who received medical benefits through 1 of 3 large insurers with whom our hospital has pay-for-performance contracts. Annually, there are approximately 4000 patients covered by these insurers admitted to the 3 clinical services we evaluated. We focused on patients who had a primary care physician at one of the hospital's outpatient practices because of the existence of an automated infrastructure to identify these managed care beneficiaries of these insurers who are newly hospitalized, and because patients covered by commercial insurance plans likely represent a conservative lower-bound of cost-related medication underuse among hospitalized patients.

Patients were surveyed on the first non-holiday weekday after admission. We excluded patients who had been discharged prior to the daily admission list being generated, or who, on a previous admission, had completed our survey or declined to be surveyed. We also excluded several patients who were not beneficiaries of the target insurers and were erroneously included on the managed care admission roster.

Potentially eligible patients were approached on the hospital ward by 1 of 3 study care coordinators (2 nurses and 1 pharmacist) and were asked if they were willing to participate in a research project about medication use that involved a short verbally delivered in-person (inpatient) survey, a brief postdischarge telephone call, and a review of their electronic health record. The Institutional Review Board of Brigham and Women's Hospital approved this study.

### Inpatient Survey

Our survey instrument was developed iteratively and pilot-tested to improve face validity. Questions about cost-related underuse were based on validated measures.<sup>8,9</sup> Specifically, we asked whether in the past year patients had: (1) not filled a prescription because it was too expensive, (2) skipped doses to make medicines last longer, (3) took less medicine than prescribed to make the medicine last longer, or (4) split pills to make the medication last longer.

Questions about strategies to improve medication affordability assessed whether patients thought it would be helpful to: (1) discuss medication affordability with healthcare workers (inpatient doctors, outpatient doctors, nurses, pharmacists, or social workers); (2) have their medications reviewed by a nurse or pharmacist; (3) receive information about lower cost but equally effective medication options, or about programs that provide medications at reduced costs; and/or (4) have their copayments/coinsurance lowered. Possible responses to all of these questions were binary, ie, yes or no.

In addition, patients were asked about the nature of their drug insurance coverage, the prescription medications that they currently use, whether they know

their copayment levels (for generic and brand-name medications), and, if so, what these amounts were, their annual household income, and their self-identified race. Information on patient age, gender, and the primary reason for hospitalization was obtained from the electronic health record. This source was also used to verify the accuracy of the self-reported preadmission medication list. When there were discrepancies between preadmission medications reported by patients and those recorded in their chart, the later was used because our hospital reconciles and records all medications at the time of hospital admission for all patients.

### Postdischarge Survey

Within 3 days of discharge, patients were contacted by telephone and asked about new medications they were prescribed on discharge, if any. The discharge summary was used to verify the accuracy of the information provided by patients. The interviewers clarified any apparent discrepancies between the 2 sources of information with the patient. Patients who had been prescribed a new medication were asked whether or not they had filled their prescription. For patients who had, we asked whether: (1) they knew how much they would have to pay prior to going to the pharmacy, (2) they had discussed less expensive options with their pharmacist, and (3) they had discussed medication costs with their inpatient or outpatient physicians.

### Data Analysis

We used descriptive statistics to summarize the characteristics of our respondents and our overall survey results. We generated univariate and multivariable logistic regression models to identify whether prehospitalization cost-related medication underuse was influenced by patient age, gender, income, race, and the number of medications patients used on a regular basis. For the purpose of these analyses, we classified patients as reporting cost-related underuse if they responded yes to any of the 4 strategies described above (ie, not filling medications, skipping doses, taking less medication, or splitting pills to make medicines last longer). Patients whose incomes were above the median level in our cohort were categorized as being of high-income. Our multivariable model had a c-statistic of 0.75, suggesting good discriminative ability.

## RESULTS

During the study period, 483 potentially-eligible patients were admitted to the general medicine, cardiology, and oncology services. We excluded 167 because they had been discharged prior to being identified, had been surveyed or already declined participation on a prior admission, or were not managed care enrollees (see Appendix A). Of the remaining 316 subjects, 130 participated in the inpatient survey

(response rate = 41%); 93 (75%) of these patients were reached by telephone after hospital discharge and completed the postdischarge survey. The baseline characteristics of our respondents are presented in Table 1. Patients had a mean age of 52 years, were 50% male and two-thirds of white race, represented a range of household incomes, and almost all had employer-sponsored prescription coverage. Prior to admission, patients took an average of 5 prescription medications and paid an average copayment of \$10.80 and \$21.60 for each generic and brand-name prescription, respectively.

### Cost-Related Medication Underuse

Thirty (23%) of the survey respondents reported at least 1 cost-related medication underuse strategy in the year prior to their hospital admission (Figure 1), most commonly not filling a prescription at all because of cost ( $n = 26$ ; 20%). Rates of cost-related underuse were highest for patients of black race, low income, and women (Figure 2).

In unadjusted analyses, black respondents had 4.60 (95% confidence interval [CI], 1.63 to 13.0) times the odds of reporting cost-related underuse than non-Hispanic white respondents (Table 2). The association of black race and cost-related underuse appears to be confounded, in part, by income (adjusted odds ratio for black race was 4.16; 95% CI, 1.34 to 12.86) and the number of medications patients used on a regular basis (adjusted odds ratio for black race was 4.14; 95% CI, 1.44 to 11.96). After controlling for these variables, as well as age and gender, the relationship between race and cost-related underuse remained statistically significant (adjusted odds ratio 3.39; 95% CI, 1.05 to 11.02) (Table 2).

### Strategies to Help Make Medications More Affordable

Virtually all respondents ( $n = 123$ ; 95%) endorsed at least one of the proposed strategies to make medications more affordable (Figure 3). A majority felt that lowering cost sharing (94%), or receiving information about lower-cost medication options (83%) or programs to subsidize medication costs (83%) would be helpful. Approximately 70% of patients stated that speaking to their outpatient physicians might be helpful, although only 14% reported actually speaking with their primary care provider about medication costs in the past year. Results were mixed for other strategies, including speaking with their inpatient physicians.

### Postdischarge Medication Use

Seventy-six (82%) respondents to the outpatient survey were prescribed a new medication at the time of hospital discharge, and virtually all (95%) had filled prescriptions for these medications by the time of the follow-up survey. Patients paid an average of \$27.63

**TABLE 1. Baseline Characteristics**

Characteristic	N = 130
Age, mean years (SD)	52 (11.2)
Male, %	65 (50.0)
Race/ethnicity,* n (%)	
Caucasian/white	84 (67.2)
Black/African American	20 (16.0)
Latino/Hispanic	13 (10.4)
Asian	3 (2.4)
American Indian or Alaska Native	1 (0.8)
Other	4 (3.2)
Annual household income,* n (%)	
<\$30,000	15 (12.8)
\$30,000-\$75,000	49 (41.9)
>\$75,000	53 (45.3)
Insurance coverage for outpatient prescription drugs,* n (%)	
Employer or spouse's employer	123 (96.0)
Independent	5 (3.9)
Medication copayments,* mean \$ (SD)	
Brand-name medications	21.6 (14.2)
Generic medications	10.8 (6.0)
No. of medications prior to admission, mean (SD) <sup>†</sup>	5.5 (4.3)
Category of discharge diagnosis, n (%)	
Cardiovascular	40 (30.8)
Gastrointestinal	23 (17.7)
Pulmonary	23 (17.7)
Infectious	13 (10.0)
Oncology	5 (3.8)
Renal	6 (4.6)
Psychiatric	3 (2.3)
Hematologic	4 (3.1)
Neurologic	5 (3.8)
Musculoskeletal	5 (3.8)
Respiratory	2 (1.5)
Endocrine	1 (0.8)

\* Among those providing a response. <sup>†</sup> As obtained from the hospital record.

(standard deviation \$39.24) in out-of-pocket costs for these medications. Few (16%) patients knew how much they would have to pay before they had gone to the pharmacy to fill their prescription (see Appendix B). Even fewer patients asked, or were spoken to by their pharmacist, about less expensive medication options (7%), and almost none had spoken to their inpatient (4%) or outpatient providers (2%) about the cost of their newly prescribed drugs.

### DISCUSSION

Almost a quarter of the medical inpatients we surveyed had not filled a medication because of cost, or had skipped doses, reduced dosages, or split pills to make their medicines last longer in the prior year. This amount is larger than that found in many prior studies, conducted in outpatient settings, in which 11% to 19% of patients report cost-related underuse.<sup>6-8,10,11</sup> Our results are particularly striking considering that our study cohort consisted exclusively of patients with commercial health insurance, the vast majority of whom also had employer-sponsored drug coverage. Cost-related medication underuse may be even more prevalent among hospitalized patients with

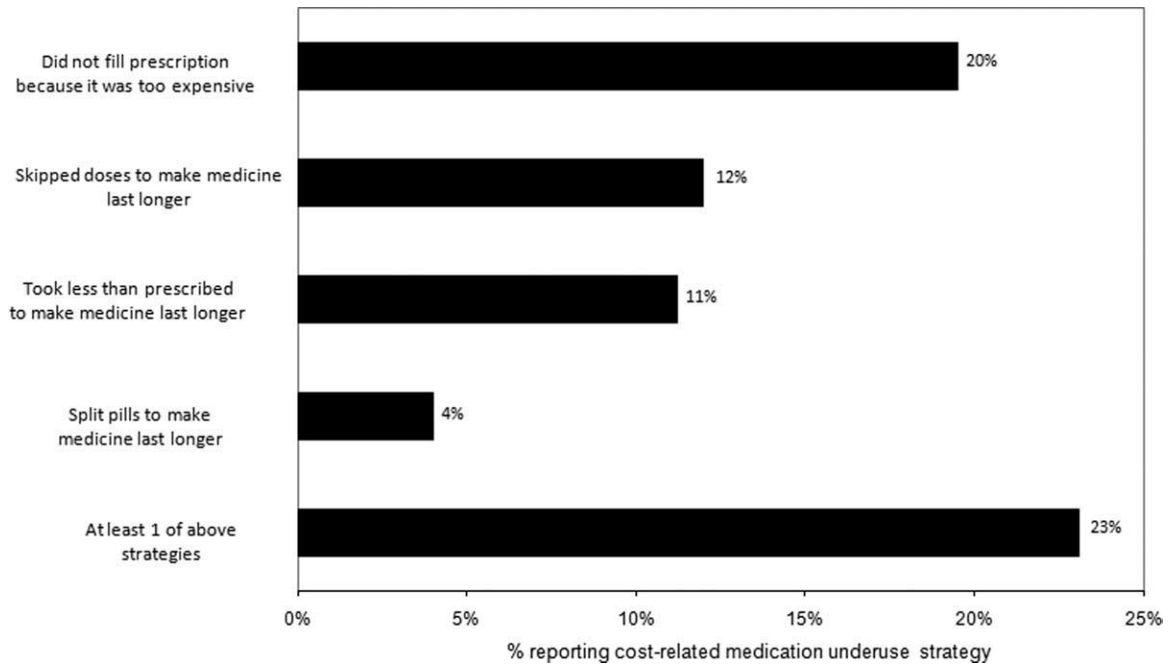


FIG. 1. Cost-related medication underuse strategies reported by hospitalized managed care beneficiaries.

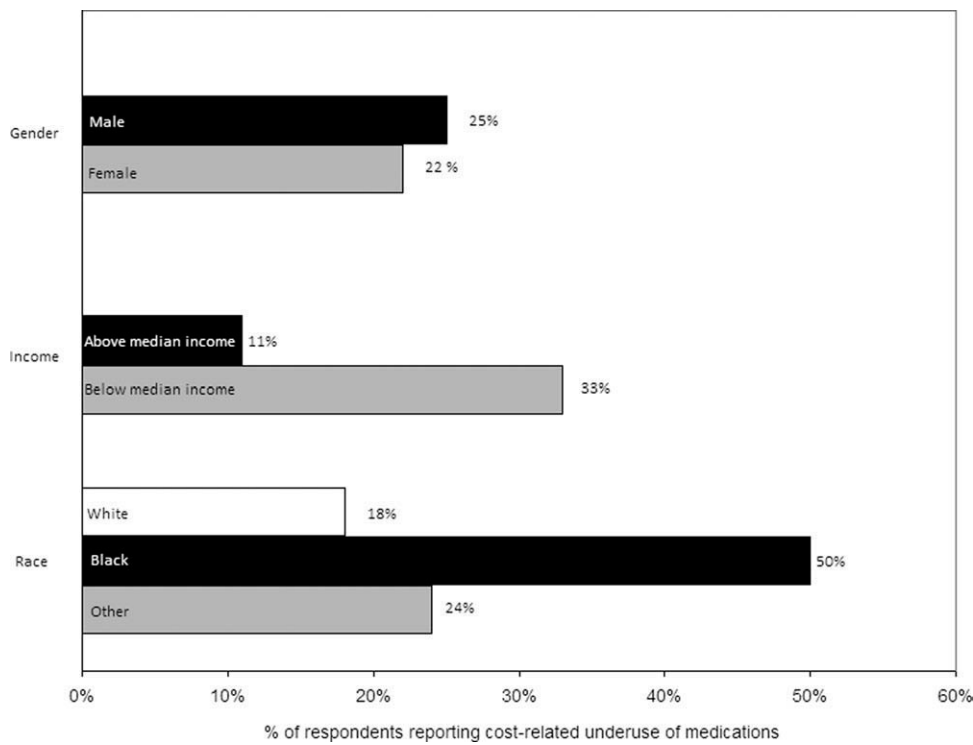


FIG. 2. Cost-related medication underuse by gender, income, and race.

less generous benefits, including the uninsured and perhaps even beneficiaries of Medicare Part D.

Reductions in medication use because of cost were particularly high among black patients, whose odds of reporting cost-related underuse were more than 3 times higher than that of patients of non-Hispanic white race. Race-related differences in cost-related underuse have been observed in outpatient studies,<sup>6-8,12</sup> and

may be an important contributor to racial disparities in evidence-based medication use.<sup>13-15</sup> These differences may, in part, reflect racial variations in socioeconomic status; lower income patients, who are more likely to be from a racial or ethnic minority, are more sensitive to cost sharing than higher income individuals.<sup>16</sup> Consistent with this, the relationship between race and cost-related underuse in our study was

smaller but still highly significant in multivariable models that adjusted for income.

Not surprisingly, the underuse of effective prescription medications is associated with adverse clinical and economic consequences.<sup>17</sup> Heisler et al. found that patients who had restricted medications because of cost were 76% more likely to report a decline in their health status than those who had not.<sup>18</sup> The health effects of cost-related underuse are likely to be particularly significant for hospitalized patients, given their high burden of disease and the frequency with which they are prescribed medications at discharge to treat the condition that led to their initial hospitalization. Thus, targeting efforts to address cost-related underuse patients who are hospitalized may be an efficient method of improving patient health and reducing preventable readmissions. This is consistent with efforts that address, in the inpatient setting, other health issues that are commonly encountered in the ambulatory arena, such as immunizations and smoking cessation.<sup>19</sup>

**TABLE 2.** Predictors of Cost-Related Underuse

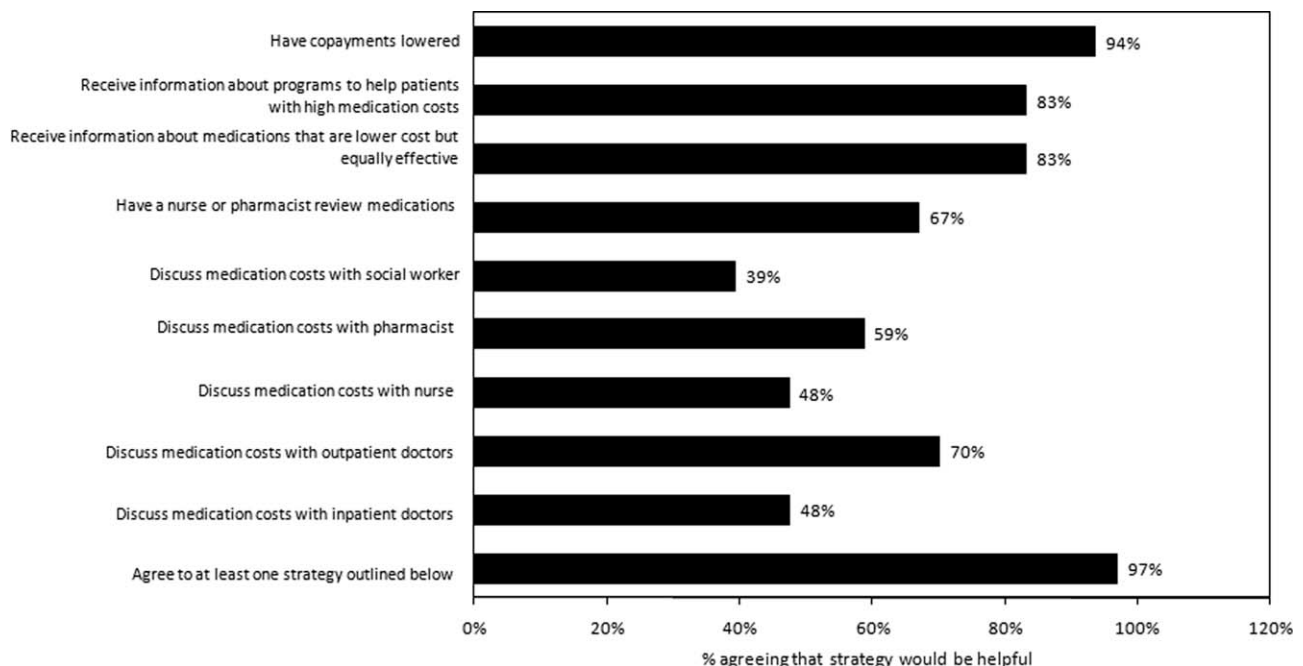
Predictor	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)
Age (per additional year)	0.98 (0.94–1.02)	0.97 (0.93–1.01)
Male (vs female)	0.84 (0.37–1.90)	1.03 (0.43–2.48)
Race (vs white race)		
Black	4.60 (1.63–13.0)	3.39 (1.05–11.02)
Other	1.10 (0.36–3.37)	0.77 (0.20–2.99)
No. of medications (per additional medication)	1.10 (1.00–1.20)	1.10 (1.00–1.22)
High income (vs low income)	0.62 (0.27–1.42)	0.71 (0.24–2.07)

Abbreviations: CI = confidence interval.

Our survey respondents endorsed numerous strategies as being potentially helpful. Predictably, support for lowering copayments was extremely high. While this may not be practical or even desirable for some medications, lowering copayments for highly effective medications, such as statins and antihypertensives, in the context of value-based insurance design, is an increasingly adopted strategy that has the potential to simultaneously improve clinical outcomes and reduce overall health spending.<sup>20,21</sup>

While the majority of patients felt that talking to their outpatient physicians or pharmacists about medication costs might be helpful, the effectiveness of this strategy is unclear. Consistent with prior results,<sup>22,23</sup> the vast majority of the patients we surveyed had not discussed medication costs prior to their admission or after filling newly prescribed medications. Further, although physicians could help reduce drug expenditures in a variety of ways, including the increased ordering of generic drugs,<sup>24</sup> many physicians are uncomfortable talking to their patients about costs,<sup>25</sup> have limited knowledge about their patients' out-of-pocket expenditures, feel that addressing this issue is not their responsibility,<sup>26</sup> or do not have resources, such as electronic formulary information, that could facilitate these discussions in an efficient manner.

An alternative strategy may be to provide patients with better education about medication costs. Virtually none of the patients we surveyed knew how much they would pay for their new prescriptions before visiting the pharmacy. These findings are similar to those observed in the outpatient setting,<sup>27</sup> and suggest an opportunity to provide patients with information about the cost of their newly and previously prescribed drugs,



**FIG. 3.** Strategies that respondents felt would be helpful to make medications more affordable.

and to facilitate discussions between patients and inpatient providers about pre-discharge prescribing decisions, in the same spirit as other pre-discharge patient education.<sup>28</sup> Of course, issues related to transitions of care between the hospital and community setting, and coordination between inpatient and outpatient providers, must be adequately addressed for this strategy to be effective.

Our study has several notable limitations. It had a relatively small sample size and low response rate. Respondents may have differed systematically from non-respondents, and we were unable to compare the characteristics of both populations. Further, we studied commercially insured inpatients on internal medicine services at an academic medical center, and thus our results may not be generalizable to patients hospitalized in other settings, or with different types of insurance coverage, including the uninsured. The primary outcome of our study was to determine self-reported cost-related underuse. While we used validated measures,<sup>8</sup> it is possible that patients who reported reducing their medication use in response to cost may not have actually done so. We did not collect information on education or health literacy, nor did we have access to detailed information about our respondents' pharmacy benefit design structures; these important factors may have confounded our analyses, and/or may have been mediators of our observed results, and should be evaluated further in future studies. We did not have adequate statistical power to evaluate whether patients using specific classes of medications were particularly prone to cost-related underuse.

Despite these limitations, our study is the first, to our knowledge, to evaluate the impact of medication costs on use in a cohort of hospitalized individuals. The high levels of cost-related underuse that we observed is concerning. Our results support calls for the further development of interventions to address high medication costs and for the consideration of novel approaches to assist patients around the time of hospital discharge.

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## References

- USA Today/Kaiser Family Foundation/Harvard School of Public Health. *The Public on Prescription Drugs and Pharmaceutical Companies*. 2008. Available at: <http://www.kff.org/kaiserpolls/pomr030408pkg.cfm>. Accessed September 5, 2008.
- Goldman DP, Joyce GF, Escarce JJ, et al. Pharmacy benefits and the use of drugs by the chronically ill. *JAMA*. 2004;291(19):2344–2350.
- Kaiser Family Foundation and Health Research and Educational Trust. *Employer Health Benefits Annual Survey*, 2009. 2009. Available at: <http://ehbs.kff.org/pdf/2009/7936.pdf>. Accessed May 5, 2010.
- Kaiser Family Foundation. *Prescription Drug Trends*. 2007. Available at: [http://www.kff.org/rxdrugs/upload/3057\\_06.pdf](http://www.kff.org/rxdrugs/upload/3057_06.pdf). Accessed December 5, 2007.
- The Patient Protection and Affordable Care Act, H.R. 3590, Section 2713 (c). Washington, DC: 111 Congress; 2010.
- Madden JM, Graves AJ, Zhang F, et al. Cost-related medication non-adherence and spending on basic needs following implementation of Medicare Part D. *JAMA*. 2008;299(16):1922–1928.
- Tseng CW, Tierney EF, Gerzoff RB, et al. Race/ethnicity and economic differences in cost-related medication underuse among insured adults with diabetes: the Translating Research Into Action for Diabetes Study. *Diabetes Care*. 2008;31(2):261–266.
- Soumerai SB, Pierre-Jacques M, Zhang F, et al. Cost-related medication nonadherence among elderly and disabled Medicare beneficiaries: a national survey 1 year before the Medicare drug benefit. *Arch Intern Med*. 2006;166(17):1829–1835.
- Safran DG, Neuman P, Schoen C, et al. Prescription drug coverage and seniors: findings from a 2003 national survey. *Health Aff (Millwood)*. Jan-Jun 2005;Suppl Web Exclusives: W5-152-W155-166.
- Piette JD, Heisler M, Wagner TH. Cost-related medication underuse among chronically ill adults: the treatments people forgo, how often, and who is at risk. *Am J Public Health*. 2004;94(10):1782–1787.
- Piette JD, Heisler M, Wagner TH. Problems paying out-of-pocket medication costs among older adults with diabetes. *Diabetes Care*. 2004;27(2):384–391.
- Gellad WF, Haas JS, Safran DG. Race/ethnicity and nonadherence to prescription medications among seniors: results of a national study. *J Gen Intern Med*. 2007;22(11):1572–1578.
- Benner JS, Glynn RJ, Mogun H, Neumann PJ, Weinstein MC, Avorn J. Long-term persistence in use of statin therapy in elderly patients. *JAMA*. 2002;288(4):455–461.
- Chapman RH, Benner JS, Petrilla AA, et al. Predictors of adherence with antihypertensive and lipid-lowering therapy. *Arch Intern Med*. 2005;165(10):1147–1152.
- Roth MT, Esserman DA, Ivey JL, Weinberger M. Racial disparities in the quality of medication use in older adults: baseline findings from a longitudinal study. *J Gen Intern Med*. 2010;25(3):228–234.
- Chernew M, Gibson TB, Yu-Isenberg K, Sokol MC, Rosen AB, Fendrick AM. Effects of increased patient cost sharing on socioeconomic disparities in health care. *J Gen Intern Med*. 2008;23(8):1131–1136.
- Choudhry NK. Relationship between high cost sharing and adverse outcomes: a truism that's tough to prove. *Am J Manag Care*. 2010;16(4):287–289.
- Heisler M, Langa KM, Eby EL, Fendrick AM, Kabeto MU, Piette JD. The health effects of restricting prescription medication use because of cost. *Med Care*. 2004;42(7):626–634.
- Smith PM, Burgess E. Smoking cessation initiated during hospital stay for patients with coronary artery disease: a randomized controlled trial. *Can Med Assoc J*. 2009;180(13):1297–1303.
- Choudhry NK. Copayment levels and medication adherence: less is more. *Circulation*. 2009;119(3):365–367.
- Choudhry NK, Patrick AR, Antman EM, Avorn J, Shrank WH. Cost-effectiveness of providing full drug coverage to increase medication adherence in post-myocardial infarction Medicare beneficiaries. *Circulation*. 2008;117(10):1261–1268.
- Piette JD, Heisler M, Wagner TH. Cost-related medication underuse: do patients with chronic illnesses tell their doctors? *Arch Intern Med*. 2004;164(16):1749–1755.
- Alexander GC, Casalino LP, Meltzer DO. Patient-physician communication about out-of-pocket costs. *JAMA*. 2003;290(7):953–958.
- Shrank WH, Cox ER, Fischer MA, Mehta J, Choudhry NK. Patients' perceptions of generic medications. *Health Aff (Millwood)*. 2009;28(2):546–556.
- Alexander GC, Casalino LP, Meltzer DO. Physician strategies to reduce patients' out-of-pocket prescription costs. *Arch Intern Med*. 2005;165(6):633–636.
- Shrank WH, Asch SM, Joseph GJ, et al. Physicians' perceived knowledge of and responsibility for managing patients' out-of-pocket costs for prescription drugs. *Ann Pharmacother*. 2006;40(9):1534–1540.
- Shrank WH, Fox SA, Kirk A, et al. The effect of pharmacy benefit design on patient-physician communication about costs. *J Gen Intern Med*. 2006;21(4):334–339.
- Koelling TM, Johnson ML, Cody RJ, Aaronson KD. Discharge education improves clinical outcomes in patients with chronic heart failure. *Circulation*. 2005;111(2):179–185.