

RESEARCH LETTERS

Health Care as a "Market Good"?  
Appendicitis as a Case Study

Consumer-driven health care has emerged as a new paradigm in allowing patients to have a stronger say in how their health care dollars are spent.<sup>1</sup> Patients are encouraged to consider medical care a commodity that can be bought and sold. Yet health care is a unique industry in which many traditional market principles fail. Consumers of health care do not always have good infor-

mation about their condition and rely on the advice of professionals. Moreover, studies have shown that total costs and charges at different health care facilities vary substantially for what should be similar services.<sup>2</sup>

In this study, we analyzed charges for an unpredictable and emergent condition: acute appendicitis. We anticipated that charges would vary significantly in an unpredictable and nonobvious way.

**Methods.** We performed a retrospective analysis of patients hospitalized for appendicitis in 2009 using detailed demographic and financial data from the Patient Discharge Database of California's Office of Statewide Health Planning and Development.<sup>3</sup>

We included visits with a principal diagnosis of appendicitis as defined by *International Classification of Diseases, Ninth Revision*, codes that had a hospital charge reported with the visit. To isolate only uncomplicated episodes of acute appendicitis, we included only visits for patients 18 to 59 years old with hospitalization that lasted fewer than 4 days with routine discharges to home.<sup>4,5</sup> The main outcome of interest was total charges per visit. It has been well described that the actual cost of care and charges billed to the patient are not necessarily the same.<sup>6</sup> But for the uninsured or underinsured, these charges are what the patient ultimately sees and therefore represent the perceived cost of their care.

We chose to examine median rather than average charges to avoid the influence of outliers and present more robust estimates. For the multiple regression analyses, we fitted hierarchical mixed-effects models that regressed the logarithm of total charges on covariates and a hospital random intercept. Charges per county were also described. Using logarithmic charges allows the interpretation of effect sizes of the covariates in the model as percentage increases in median charge. Analyses were performed using SAS statistical software (version 9.2). This study was exempt from the institutional review board at the University of California, San Francisco.

**Results.** We examined a total of 19 368 adult patients hospitalized with appendicitis. The median hospital charge among all patients was \$33 611, with a lowest observed charge of \$1529 and highest of \$182 955.

The **Table** provides results of the hierarchical model for percentage increase in median charge for various patient and hospital factors. When analyzing patient factors, increasing ages were associated with increased median charge. There were slightly increased charges for Medicaid patients (2.3%; 95% CI, 1.3%-3.4%) and the uninsured (1.4%; 95% CI, 0.4%-2.5%). When considering hospital-level factors, the estimated median charge for appendicitis from a county hospital was 36.6% lower (95% CI, 22.5%-48.2%) than from nonprofit hospitals, and for-profit hospitals had 16.3% higher charges (95% CI, 5.4%-28.4%).

**Table. Results of Hierarchical Mixed-Effects Regression Model of Appendicitis Charges**

Patient Factors	Difference, % (95% CI)
Age, y	
18-34	1 [Reference]
35-64	2.6 (1.8 to 3.4)
≥65	5.8 (3.9 to 7.7)
Sex	
Male	1 [Reference]
Female	1.8 (1.0 to 2.7)
Race/ethnicity	
Non-Hispanic white	1 [Reference]
Non-Hispanic black	-0.8 (-4.0 to 2.6)
Hispanic	1.0 (-0.2 to 2.1)
Other	0.6 (-1.4 to 2.6)
Unknown	-4.0 (-12.7 to 5.7)
Insurance	
Medicare	1.5 (-0.8 to 3.9)
Medi-Cal	2.3 (1.3 to 3.4)
Private	1 [Reference]
Uninsured	1.4 (0.4 to 2.5)
Other	-0.3 (-3.2 to 2.5)
Comorbidity	
Congestive heart failure	12.8 (5.0 to 21.2)
Pulmonary circulation disease	51.4 (14.4 to 100.4)
Hypertension	3.6 (2.3 to 5.0)
Chronic lung disease	3.8 (2.1 to 5.6)
Diabetes mellitus	7.6 (5.6 to 9.7)
Diabetes mellitus with complications	15.4 (7.0 to 24.4)
Renal failure	8.6 (3.2 to 14.2)
Coagulopathy	25.3 (17.3 to 33.8)
Obesity	6.7 (5.1 to 8.3)
Fluid and electrolyte disorders	9.6 (7.7 to 11.6)
Deficiency anemia	9.2 (6.1 to 12.4)
Drug abuse	5.9 (2.3 to 9.7)
Depression	3.2 (0.8 to 5.6)
Hospital factors	
Trauma center	7.6 (-3.8 to 20.3)
Teaching	8.0 (-9.9 to 29.5)
Ownership	
Nonprofit	1 [Reference]
County	-36.6 (-48.2 to -22.5)
For-profit	16.3 (5.4 to 28.4)
Missing	-2.1 (-29.1 to 35.2)

To limit the role of geographic variation, we analyzed charges within counties. While Fresno County had the smallest range of charges, the lowest and highest charges still differed by a remarkable \$46 204.

Finally, when considering the explanatory power of the covariates, we found that 67.8% of the variation in charges could be predicted by patient-level and hospital-level factors. The remaining 32.2% of the variation was unexplained.

**Comment.** Our first result of the median charge for treating “uncomplicated” appendicitis of \$33 611 would certainly startle many patients. Given estimates that 60% of bankruptcies in the United States involve catastrophic medical expenses,<sup>7</sup> these data should alarm those making decisions about our society’s ability to obtain medical care without financial catastrophe.

A patient with severe abdominal pain is in a poor position to determine whether his or her physician is ordering the appropriate blood work, imaging, or surgical procedure. Price shopping is improbable, if not impossible, because the services are complex, urgently needed, and no definitive diagnosis has yet been made.<sup>8</sup> In our study, even if patients did have the luxury of time and clinical knowledge to “shop around,” we found that California hospitals charge patients inconsistently for what should be similar services as defined by our relatively strict definition of uncomplicated appendicitis.

In order to consider health care a good that abides by traditional market theory, both consumers and producers should have a reasonable sense of how much the good costs. Yet health care providers are often unaware of what their recommendations cost.<sup>9</sup> Consumers (ie, patients) with adequate insurance are shielded from charges, while the underinsured or uninsured see staggeringly high numbers without understanding what the charges mean, let alone if they are appropriate. Our findings suggest that there are inherent limitations of market theory within the health care system, and much work remains to be done to allow consumers to fulfill the role of a true consumer in the health care marketplace.

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1. Herzlinger RE, Parsa-Parsi R. Consumer-driven health care: lessons from Switzerland. *JAMA*. 2004;292(10):1213-1220.
2. Pacific Business Group on Health. Hospital costs in California: wide variations in charges raise questions on pricing policies. San Francisco, CA: Pacific Business Group on Health. <http://www.pbgh.org/news-and-publications/pbgh-articles-a-publications>. Accessed January 2011.
3. California Office Statewide Health Planning and Development (OSHPD). 2009 Patient Discharge Data: Public Data Set. <http://www.oshpd.ca.gov/HID/Products/PatDischargeData/PublicDataSet/index.html>. Accessed February 2011.
4. Crandall M, Shapiro MB, Worley M, West MA. Acute uncomplicated appendicitis: case time of day influences hospital length of stay. *Surg Infect (Larchmt)*. 2009;10(1):65-69.
5. Horattas MC, Guyton DP, Wu D. A reappraisal of appendicitis in the elderly. *Am J Surg*. 1990;160(3):291-293.
6. Finkler SA. The distinction between cost and charges. *Ann Intern Med*. 1982;96(1):102-109.
7. Shih A, Davis K, Schoenbaum S, Gauthier A, Nuzum R, McCarthy D. Organizing the U.S. Health Care Delivery System for High Performance. *The Commonwealth Fund*. <http://www.commonwealthfund.org/Publications/Fund-Reports/2008/Aug/Organizing-the-U-S--Health-Care-Delivery-System-for-High-Performance.aspx>. Accessed January 2011.
8. Ginsburg PB. Shopping for price in medical care. *Health Aff (Millwood)*. 2007;26(2):w208-w216.
9. Allan GM, Lexchin J, Wiebe N. Physician awareness of drug cost: a systematic review. *PLoS Med*. 2007;4(9):1486-1496.

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## HEALTH CARE REFORM

### Effect of Physician Payment Disclosure Laws on Prescribing

With the enactment of the Physician Payments Sunshine Provision of the Affordable Care Act, pharmaceutical manufacturers are now required to disclose certain payments made to physicians—for example, payments for consulting, honoraria, gifts, or travel.<sup>1</sup> This law is based on the premise that transparency in these transactions is of public importance and that disclosure acts as a deterrent against quid pro quo exchanges; physicians may be reluctant to accept large payments if these payments are publicly known and perceived as compensation for prescribing certain therapies.<sup>2,3</sup>

To predict deterrence effects of the federal sunshine law, we studied the experience of 2 states, Maine and West Virginia, that previously implemented sunshine laws. We examined the effect of these laws on the prescribing of HMG-CoA [(3-hydroxy-3-methylglutaryl)-Coenzyme A] reductase inhibitors (statins) and selective serotonin reuptake inhibitors (SSRIs), 2 therapeutic classes in which marketing plays an important role because the therapies within each class are pharmacologically and clinically highly sub-