Pharmaceutical "Charge Compression" under the Medicare Outpatient Prospective Payment System

Mary Jo Braid, Kevin F. Forbes, and Donald W. Moran

Analysis of the actual acquisition costs of a sample of pharmaceuticals demonstrates that payment rates for pharmaceutical therapies under the Medicare hospital outpatient prospective payment system (OPPS) are systematically biased against fully reimbursing high cost pharmaceutical therapies. Under the Centers for Medicare and Medicaid Services' (CMS') methodology, which assumes a constant markup, a bias in the cost estimate occurs when hospitals apply below average markups in establishing their charges for pharmaceutical products with above average costs. We developed a model of the relationship between product costs and charge markups. The logarithmic model shows that an increase in the acquisition cost per episode can be expected to lead to a reduction in the charge markup multiple. When markups for pharmaceuticals decline as acquisition cost increases, a rate-setting methodology that assumes a constant markup results in reimbursement for higher cost products that can be far below acquisition cost. The incentives in the payment system could affect site of care choices and beneficiary access.
Key words: *Medicare reimbursement, hospital outpatient prospective payment system, pharmaceutical, charge compression.*

SINCE the implementation of the outpatient prospective payment system (OPPS) in August 2000, hospital charge-setting practices have emerged as a critical issue in understanding the effects of the new payment system. Payment rates under this system are based on estimates of cost calculated by multiplying the hospital charge by a departmental average cost-to-charge ratio. It has been suggested that this system contains a material downward bias in cost estimates relative to actual hospital acquisition costs for high-cost pharmaceuticals because hospitals apply below average markups in establishing their posted charges for pharmaceutical products with above average costs. This hypothesis, which the Centers for Medicare and Medicaid Services (CMS) has labeled "charge compression," would, if confirmed, result in under reimbursement of pharmacy services relative to other services in the outpatient setting. It would also affect the incentives hospital decision makers face in deciding between therapeutic alternatives and also in determining appropriate sites of care for various therapies.

The charge compression hypothesis theorizes that when hospitals allocate the costs of operating the pharmacy department in setting prices in their chargemasters, they do not use a constant percentage allocation method that would result in charges with uniform markups over product acquisition cost. This theory is consistent with information gleaned from discussions with hospital reimbursement consultants and other experts in

***Acknowledgments*:** This article was supported by funding from Centocor, Inc.

Mary Jo Braid, MPH, *is a Principal with The Moran Company, a health policy consulting firm located in Rosslyn, VA.*

Kevin F. Forbes, PhD, *is an Associate Professor and Chair of the Department of Business and Economics at The Catholic University of America in Washington, DC.*

Donald W. Moran *is the President of The Moran Company located in Rosslyn, VA.*

J Health Care Finance 2004;30(3):21–33

the field regarding the way hospitals set their charges. The information provided by these sources, while anecdotal, suggests that many or most hospitals allocate costs, at least in part, on the basis of a standardized, flat dollar per order charge. In addition, these very high cost items may have low markups on a percentage basis. If charges were, in fact, being set this way, the charge compression hypothesis would be confirmed because such a practice would result in very high charge markups for the lowest-cost pharmacy items (*e.g.*, aspirin), while at the same time generating very low percentage markups for the highest-cost items (*e.g.*, expensive biotechnology products). We tested the charge compression hypothesis empirically.

Background

In August of 2000, with the implementation of the OPPS, Medicare began reimbursing most outpatient hospital services based on ambulatory payment classifications (APCs). Prior to that time, hospital outpatient departments were paid based on allowable cost as reported on hospital cost reports. CMS sets APC payment rates prospectively by using claims data and hospital cost reports. Payment rates for 2003 were set using claims data for dates of service between April 1, 2001, and March 31, 2002, and the most recently submitted cost reports presented by the hospital available at the time the rates were set.

APCs are groupings of procedure codes with similar clinical characteristics and costs. There are 569 APCs in 2003. When a hospital bills for a procedure, it is paid the rate for the APC to which that procedure maps. In general, this payment is intended to cover the entire facility cost of the procedure, including all incidental supplies. Hospitals can be paid an additional amount, however, for selected drugs and devices. Due to historical limits on payments to hospital outpatient departments, in aggregate CMS reimburses less than the actual hospital costs as represented in hospital cost reports.

In establishing the OPPS, Congress required CMS to pay for new medical technologies on a passthrough basis for no less than two years and no more than three years.[1] When prospective APC payments started in August of 2000, most pharmaceuticals and medical devices were paid on this basis. Hospitals were paid 95 percent of average wholesale price (AWP) for passthrough drugs and biologicals. Beginning in 2003, when the passthrough status for many products expired, CMS decided to continue to pay separately for drugs and biologicals that it estimated cost more than $150 per administration. The payment for pharmaceutical therapies that were below the $150 threshold were packaged with the primary procedure payment across a number of APCs. In 2003, there were 160 drugs and biologicals that were separately paid under their own APC because they met this threshold. At the time the final rule was published, there were also 17 drugs that still qualified for passthrough payments at 95 percent of AWP.

Since CMS does not collect actual acquisition cost data for drugs and biologicals under the Medicare program, the payment rates for separately reimbursed drugs that do not qualify for passthrough status are based on an estimate of hospital cost using billed charges from the claims data and cost report data. This is the same mechanism used to set payments for all APCs in the OPPS.

To establish payment for a separately reimbursed drug or biological, the

cost-to-charge ratio for each hospital's pharmacy department is calculated from its cost report. Then, for each claims line, CMS multiplies the billed charge by that hospital's pharmacy department cost-to-charge ratio. CMS then calculates the estimated per unit cost by dividing this number by the total billed units. CMS then calculates the median cost per unit across all OPPS hospitals, weighted by the number of units billed for each drug. The payment weight is calculated by dividing this median cost by the median cost of APC 601, which serves as the reference APC for the purpose of weight calculations. CMS then calculates a conversion factor, which is a dollar amount that the weight is multiplied by to reach the payment rate. The conversation factor is calculated to assure that the budget neutrality requirements of the program are met.

Study Data

Using Medicare OPPS claims data, we conducted an empirical test of hospital charge-setting practices across all hospitals in the United States.[2] We used the OPPS claims data file that contained claims with dates of service from April 1, 2001, through March 31, 2002. This is the file CMS used to set the final payment APC weights for 2003.

Since, during this period, hospitals were eligible to receive transitional passthrough payments for designated pharmaceutical products, the dataset contains over 13 million claims lines coded for specific pharmaceutical products using the Health Care Financing Administration (HCFA) common procedure coding system (HCPCS) classifications, permitting us to identify the use of individual pharmaceutical products.[3] Since each claims line contains posted charge and billed units information, these data permit us to directly observe how specific hospitals establish unit charges for specific products.

We pulled the claims lines for pharmaceuticals from the claims file and calculated the estimated cost per unit. We then trimmed records that were three standard deviations from the geometric mean based on the estimated cost per unit, as CMS does in its rate-setting methodology. With the remaining records, we calculated the median charge per unit for each pharmaceutical.

To evaluate hospital charge-setting practices, it is necessary to compare the available charge information for specific products with data on product-specific hospital acquisition costs. For this part of the analysis, we obtained product-specific acquisition cost data from the pharmacy departments of two large hospitals, the larger of which was a member of one of the largest national group purchasing organizations (GPO) and hence acquired its drugs at the national contract price. The pricing information we were able to obtain from these datasets, while not strictly representative of all possible prices paid by hospitals, should be representative of the competitively determined market price paid by a significant number of hospitals nationwide. We used the pricing information for this hospital, therefore, as our default dataset, substituting pricing information from the second hospital only when analysis of the first hospital's data relative to the Medicare OPPS payment rate in 2001 (95 percent of AWP) made clear that that hospital's data reflected unit pricing anomalies relative to the unit volume concepts embodied in the HCPCS classification system.

We received acquisition cost data on 152 separate drugs. In this analysis, we trimmed

13 outlier observations based on markups that were less than one or more than three standard deviations from the mean. This left us with acquisition cost data for 139 drugs, 80 of which were separately payable in 2003.

The acquisition costs that we received for the two hospitals are the costs recorded in the financial systems of each hospital's pharmacy based on data current in early 2002. Since pharmaceutical manufacturers change their prices on different schedules and with different frequencies, the recorded prices for many of these products would have been applicable in 2001, while others may have been updated in 2002. Based on our experience in working with pharmaceutical pricing information, price timing issues might cause us to slightly over estimate the prices prevailing in 2001, which corresponds with the first three quarters of the CMS public use file.

From our prior work with proprietary pricing information, we have observed that the variance in actual acquisition costs net of contract discounts for specific products across hospitals is not large (perhaps plus or minus 5 percent), and that the national GPO contract price should fall to the low end of the actual price distribution. We believe, therefore, that the charge markups over acquisition cost we estimate in this analysis are probably slightly overstated relative to a true national average, but accurately reflect the relationship between costs and charges across products.

We used the hospital ownership type reported by the hospitals on the Medicare cost report found on the healthcare cost report information system (HCRIS). We collapsed the reported ownership type to three categories: (1) for profit; (2) not-for profit; and government.

Study Design

We hypothesized that the markup for a drug (*i.e.*, the ratio of the amount charged by a hospital relative to its acquisition cost) is a function of its acquisition cost. This is represented by the equation:

$$MARKUP_i = f\ (Acquisition\ Cost_i)$$

where:

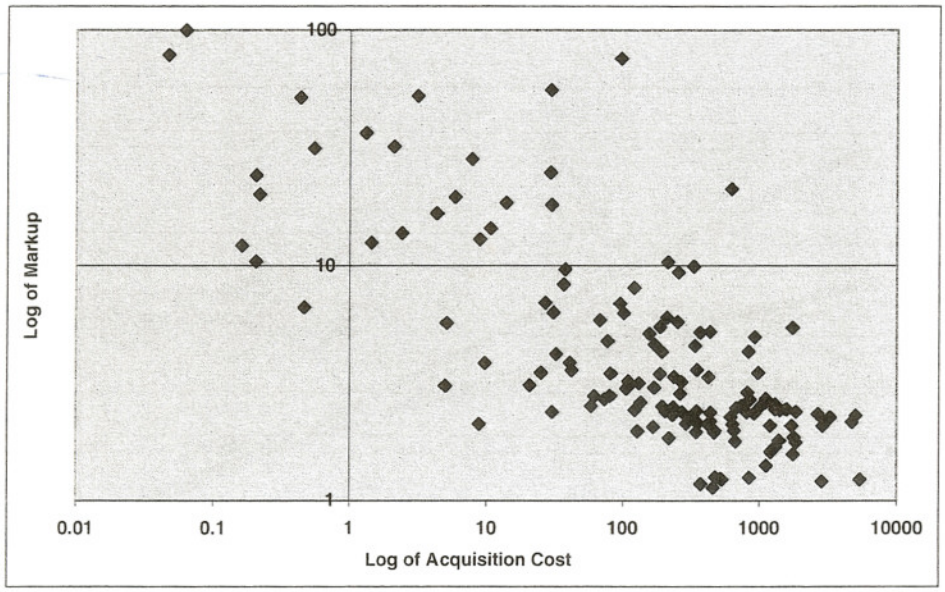
$MARKUP_i$	is the ratio of median charge per administration relative to the acquisition cost per administration; and
$Acquisition\ Cost_i$	is the acquisition cost per administration.

We tested this hypothesis using the drug as the unit of analysis. We calculated the median charge per unit recorded in the OPPS claims data. Also from the OPPS claims data, we calculated the average units per claims line. The median charge per unit multiplied by the average units per claims line results in the median charge per administration. The acquisition cost per administration was obtained using the unit acquisition cost obtained from the hospitals and multiplying this by the average units per line obtained from the OPPS claims data.

Results

The relationship between acquisition cost and markup is logarithmic. Moreover, charge compression exists in the sense that the markup declines as acquisition cost increases. Figure 1 shows the log of the markup plotted against the log of the acquisition cost for the 139 drugs in the study. The figure suggests that the markup tends to decline

Figure 1. Acquisition Cost and Markups



nonlinearly as acquisition cost increases given that both axis in the diagram are scaled in logarithms. A possible explanation of this inverse relationship is that the markup is partly determined by a fixed per order cost that gets allocated over a larger dollar amount as acquisition cost increases.

A model specification that incorporates this finding is the double logarithmic formulation:

$$\ln(\text{MARKUP}_i) = c + b \ln(\text{Acquisition Cost}_i)$$

where c and b are parameters to be estimated in the analysis.

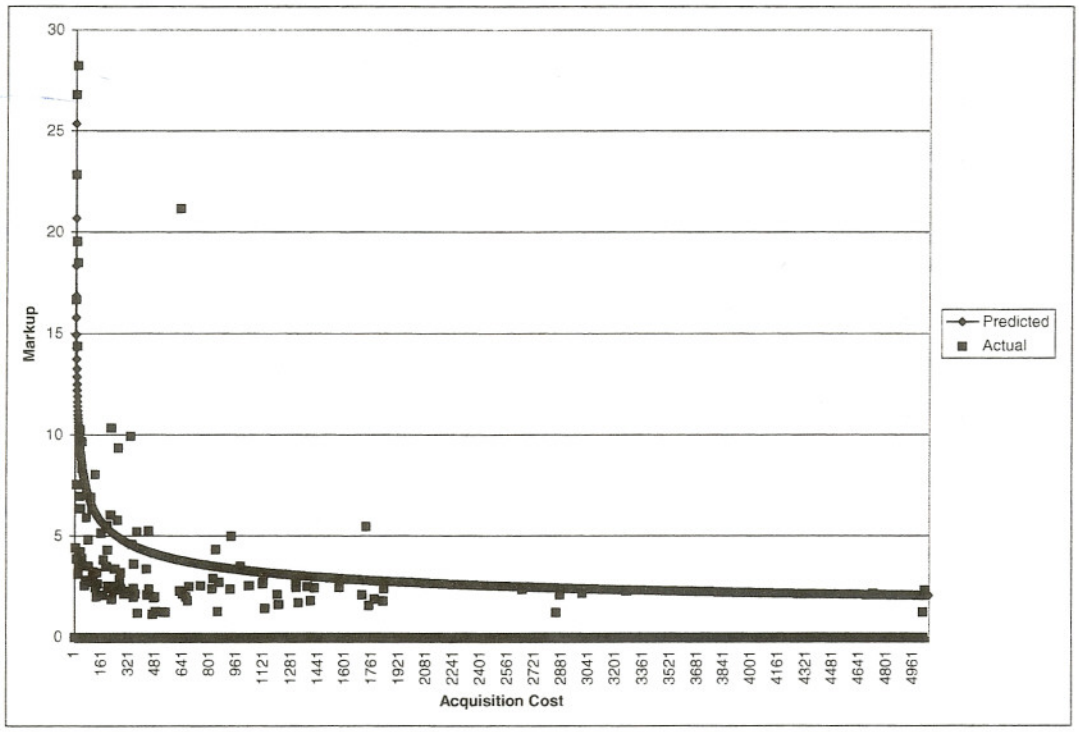
This model was estimated for 139 drugs. The results are presented in Figure 2.

As Figure 2 illustrates, the constant term (c) was estimated to equal 2.885 while the coefficient on ln (Acquisition Cost) was −0.295. This finding of a negative coefficient on ln (Acquisition Cost) is consistent with the hypothesis of charge compression. Specifically, given the t-statistic of 12.26 (in absolute value), the null hypothesis that the markup is independent of the acquisition cost can be rejected at less than the one percent level. In terms of overall explanatory power, the model has an R^2 of 0.558. Perhaps more interesting is how much of the actual markup (as separate from the logarithmic form) is explained by the model. The R^2 of the markup is a more modest 0.476. These

Figure 2. Model Estimates

	Estimated Coefficient	T-Statistic
C	2.885	19.38
Ln (Acquisition Cost)	−0.295	12.26
Number of Observations	139	
R-Squared in Terms of Ln (Markup)	0.558	
R-Squared in Terms of Markup	0.476	

Figure 3. Pharmaceutical Acquisition Cost and Markup: Actual vs. Predicted



are respectable levels of explanatory power given that the data are cross-sectional in nature.

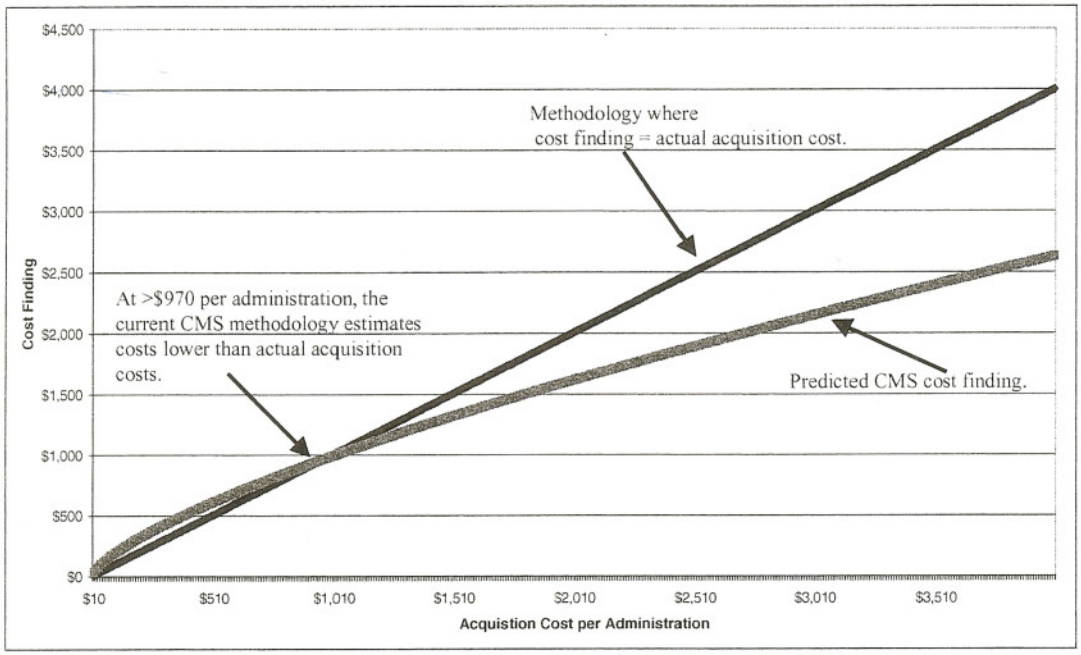
This model predicts an inverse relationship between the cost of the product and the expected percentage charge markup. Figure 3 presents the model predicted values and the actual observed values.

Due to the double log functional form in the model, the coefficient on the independent variable can be interpreted as an elasticity. In this case, the estimated coefficient on ln (Acquisition Cost) indicates that the markup declines approximately 2.95 percent for every 10 percent increase in acquisition costs. The model predicts that the least costly products (those under $20 per episode) will have markups in excess of 1,000 percent. For instance, the model predicts that a product with an acquisition cost of $5 will have a markup of 1,577 percent. The model also predicts that the markup percentage falls as acquisition cost rises. The markup is predicted to be less than 3.00 for products with acquisition costs per administration greater than approximately $1,400.

Modeling the Effect on CMS Cost Estimates

Given that the national average hospital pharmacy department cost-to-charge ratio is approximately 0.30, a pharmaceutical product would need a charge multiple of 3.33 in order for the current CMS methodology

Figure 4. Acquisition Cost and Predicted Cost Finding



to produce a cost estimate equal to actual product acquisition cost. The charge multiple would have to be even greater to account for the labor and overhead associated with running the pharmacy.

The effect of using a constant cost-to-charge ratio to estimate cost, as the current CMS methodology does, is illustrated in Figure 4. We first plot a methodology in which the actual acquisition cost per administration would equal the estimated cost finding. Of course, this does not include pharmacy overhead costs. We then plot the CMS predicted cost finding as a function of the acquisition cost using this model. For this graph, we use the national average cost-to-charge ratio of 0.30.

With the national average hospital pharmacy department cost-to-charge ratio of approximately 0.30, the model predicts that the CMS cost finding will exceed acquisition cost when acquisition cost per administration is $970 or less. For example, a product with an acquisition cost of $100 dollars has a predicted cost finding of $195. The results also indicate that the CMS cost finding will be less than the acquisition cost when the acquisition cost exceeds $970. For example, a product with an acquisition cost of $1,500 has a predicted cost finding of approximately $1,320 given the average hospital pharmacy department cost-to-charge ratio of approximately 0.30. This deficiency between the predicted cost finding and the acquisition cost increases as the acquisition cost goes up. For example, while the predicted deficiency is approximately $180 for a product with acquisition cost of $1,500, it increases to approximately $850 for a product with an acquisition cost of $3,000.

Effect of Hospital Characteristics

Further, we investigated whether the pattern of charging behavior is affected by whether the hospital is for profit as compared to either not-for-profit, or government operated. To address this issue, consider the following estimating equation:

$$\ln(\text{MARKUP}_{k,i,}) = c_k + b_k \ln(\text{Acquisition Cost}_{ki})$$

where k = for profit, not-for-profit, and government run hospitals.

The equation was estimated using Zellner's Seemingly Unrelated Regression technique. This method takes into account that the error term in one equation may be related to the error term in the other two equations. This is an especially useful technique given that if the model over predicts the markup for a particular drug in the for profit sector, there is a good chance that it may over predict for the other two ownership types. The results are also corrected for the presence of heteroscedasticity.

The estimation results are presented in Figure 5. Consistent with the results reported in Figure 2, note that the coefficients on ln (Acquisition Cost) are negative in all three cases. It is also worth observing that the magnitude of the coefficients on ln (Acquisition Cost) is larger in absolute value than when the analysis was conducted at the more aggregate level. This is not entirely surprising, given the inherent biases that result from aggregation. Also note that both the constant term and the coefficient on ln (Acquisition Cost) are larger in absolute value for the profit seeking hospitals, as compared to both the nonprofit and government run hospitals. This suggests that while charge compression is evident for all three types of ownership, it is a more robust phenomenon in the for profit sector. This conjecture was tested using a Wald test. This test enables one to test whether the observed differences in the estimated coefficients are the result of random chance. The results of this analysis indicate that the coefficients in the nonprofit equation are not statistically different from those in the government equation. The results also indicate that the observed differences in the coefficients for the for profit hospitals and those of the other two sectors are statistically significant at the 5 percent significant level.

In terms of explanatory power, the for profit equation is able to account for 51 percent of the variation in the logarithm of the markup (but only 42.7 percent of the variation in markup itself), while the R-squares

Figure 5. Parameter Estimates for Ln (Markup) Equation by Type of Hospital Ownership

	For Profit Hospitals	Not-for-Profit Hospitals	Government Operated Hospitals
C	3.46*	2.93*	3.15*
Ln (Acquisition Cost)	−0.381*	−0.322*	−0.359*
R-Squared in Terms of Ln (Markup)	0.511	0.47	0.39
R-Squared in Terms of the Markup	0.427	0.153	0.297
N	138	138	138

*Statistically significant at 1 percent.

for the other two equations are significantly lower. This is not entirely surprising given that the econometric specification presumes that decision makers only take economic considerations into account when setting charges.

Bias in Payment Rates

The results presented previously suggest that the charge compression phenomenon is real, measurable, and has a clearly material downward effect on Medicare's accounting-based estimate of the cost for pharmaceutical products in the outpatient hospital setting. CMS uses the cost estimate to set payment rates. Here, we examine to what extent reimbursement rates are also affected.

In the absence of any bias in reimbursement, the ratio of reimbursement payment to acquisition cost would be a constant one.[4] Moreover, there would not be any systematic relationship between the reimbursement rate and acquisition costs. To test whether bias is present, consider the following regression model that relates the natural logarithm of the reimbursement rate with the natural logarithm of acquisition costs:

$$\ln(\text{Reimbursement Rate}) = a + b \ln(\text{Acquisition Cost})$$

where Reimbursement Rate = 2003 Medicare payment rate/acquisition cost.

The model was estimated using data for the 80 drugs that are separately reimbursed under Medicare OPPS in 2003. The results are reported in Figure 6.

As shown in Figure 6, in terms of overall explanatory power, the model has a R^2 of 0.216. The R^2 is a somewhat more respectable 0.33 if measured in terms of the reimbursement rate as opposed to its natural logarithm of the reimbursement rate. In any event, the model's overall explanatory power is relatively modest, but not hopelessly so given that the data are cross-sectional in nature. It is possible that this model, which uses reimbursement rates, is slightly less predictive compared to the model that looked at CMS's estimated costs. This is because of the effect of the policy implemented by CMS in the final rule, which dampens the effect of changes in payment rates that resulted from using only the cost finding. Under the dampening policy, CMS limited the reduction in median costs for APCs whose median costs would otherwise have fallen by more than 15 percent in 2003, compared to 2002. However, only one-half of the difference over the 15 percent threshold was returned and these limited increases were further mitigated by application of budget neutrality requirements. Even with the dampening policy, the bias in reimbursement rates is still evident and statistically significant.

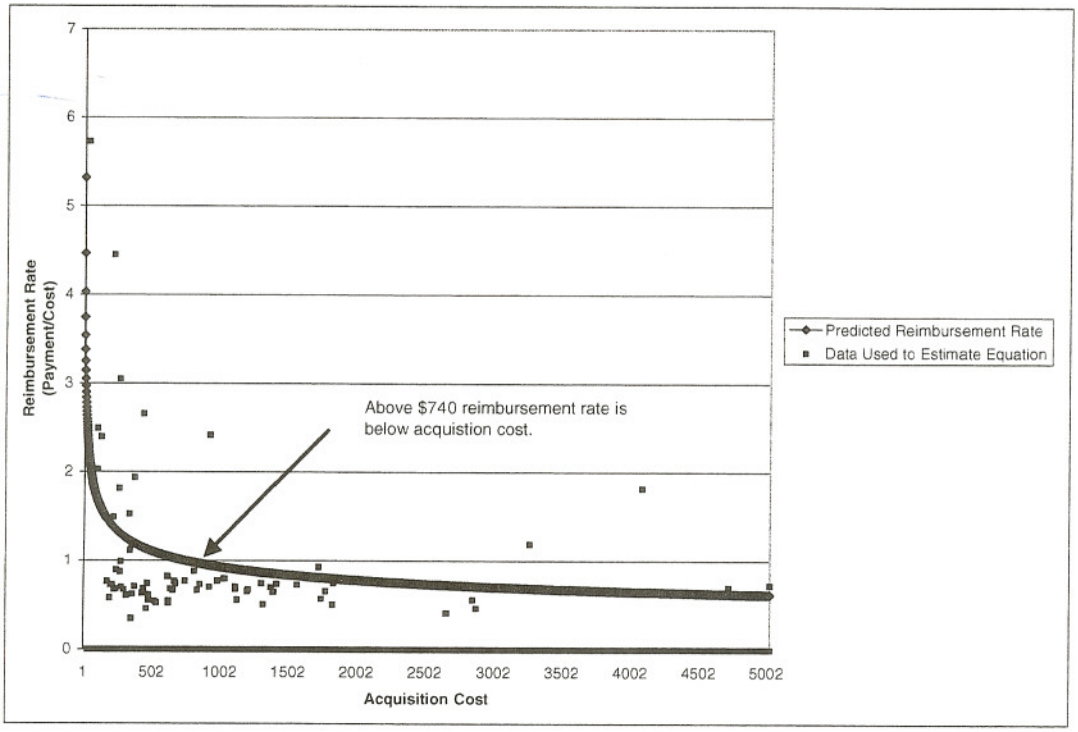
Figure 6. Estimated Parameters for Reimbursement Equation

	Estimated Coefficient	T-Statistic
C	1.4618	3.12*
Ln (Acquisition Cost)	−0.2531	3.61*
Number of Observations	80	
R-Squared in Terms of Ln (Markup)	0.216	
R-Squared in Terms of Markup	0.33	

*Statistically significant at the 1 percent level.

The coefficient on ln (Acquisition Cost) was −0.2531 and the associated t statistic indicates that the coefficient is highly statistically significant. This finding of a negative and highly statistically significant coefficient on ln (Acquisition Cost) is consistent with

Figure 7. Acquisition Cost and Reimbursement Rate



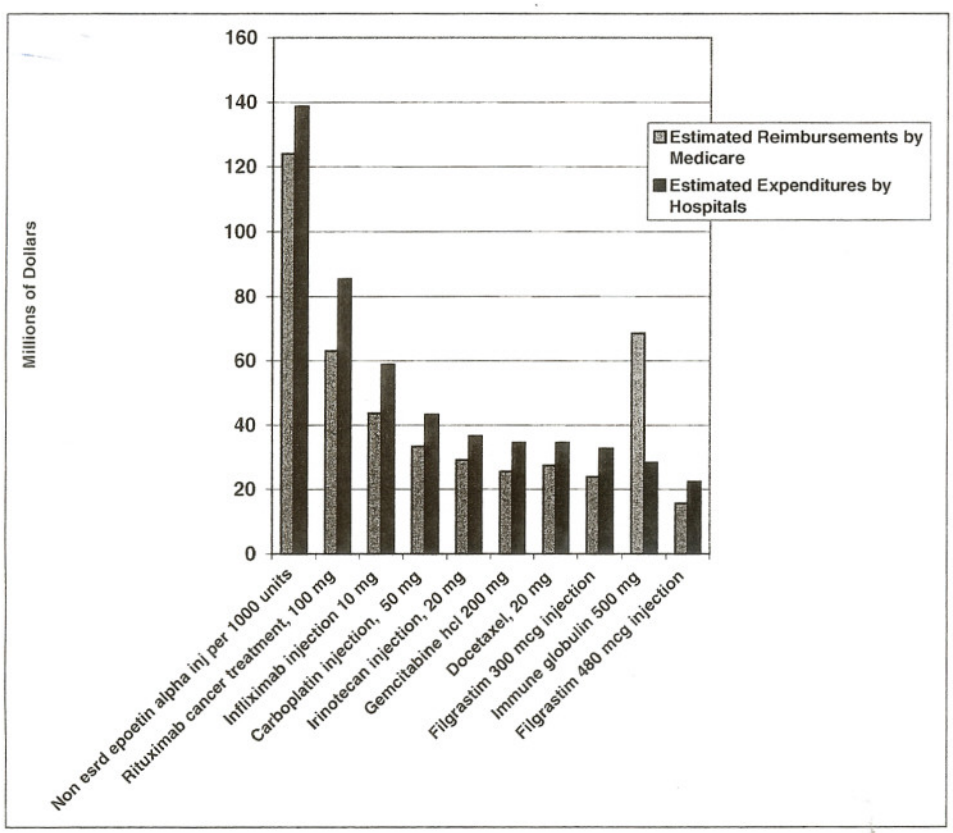
the hypothesis that charge compression, in conjunction with CMS' methodology for reimbursing hospitals, biases the payment system away from full reimbursement for high cost drugs. Specifically, the results indicate that a 10 percent increase in acquisition cost reduces the reimbursement rate by about 2.5 percent.

Figure 7 depicts the estimated relationship between acquisition cost and the reimbursement rate. Observe that the reimbursement rate is systematically below unity once the acquisition cost per administration exceeds approximately $740.

To illustrate the reimbursement effects at the drug level, we identified the top 10 drugs in our sample based on total expenditures using 2001 and 2002 volumes and 2003 payment rates. Figure 8 shows the aggregate reimbursement compared to acquisition expenditures for these drugs. Nine of ten of them are reimbursed at less than acquisition cost.

As is predicted in the model, there are some drugs that are reimbursed at a rate greater than acquisition cost in addition to those reimbursed at less than acquisition cost. We used our sample of 80 separately reimbursed drugs and compared the reimbursement rate to the acquisition cost. Using this comparison, we divided them into those that were reimbursed more than and

Figure 8. Medicare Reimbursements and Acquisition Expenditures by Hospitals for Top 10 Pharmaceuticals



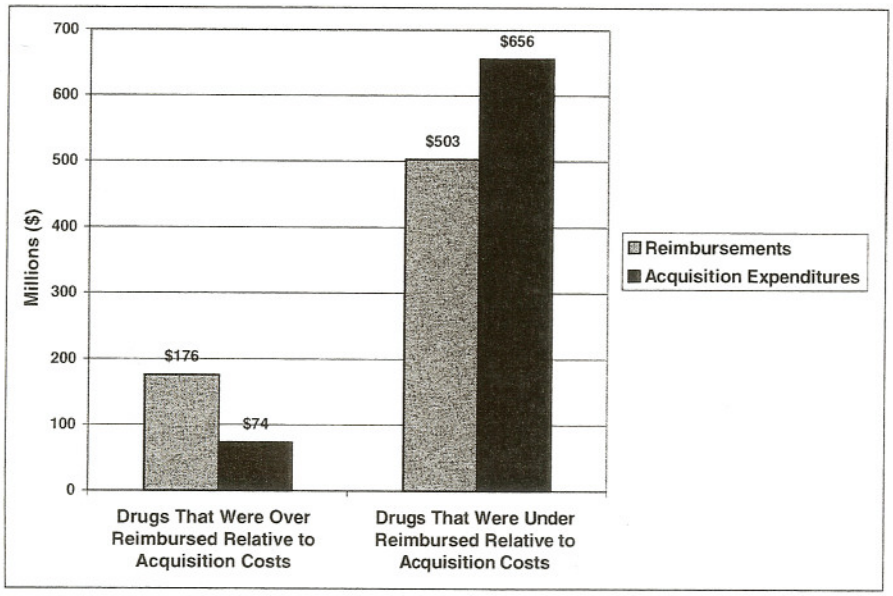
less than acquisition cost. Figure 9 shows the aggregate over and under reimbursement, based on 2001 and 2002 volumes.

These numbers are likely to understate the under reimbursement in 2003 since the acquisition costs we used are based on data from early in 2002. While those drugs reimbursed more than acquisition cost have an aggregate excess reimbursement of $102 million, drugs reimbursed less than acquisition costs have a short fall of $153 million. These numbers are only for 80 of the 160 drugs separately payable in 2003 for which we had actual acquisition cost data.

Policy Implications

We find, in these results, convincing evidence that the hypothesized charge compression phenomenon is real. We found that the relationship between acquisition cost and markup is logarithmic and that the charge markup declines as acquisition cost per administration increases. When the model is estimated taking into account hospital

Figure 9. Medicare Reimbursements and Hospitals Acquisition Expenditures for Both Over and Under Reimbursed Drugs



ownership type, the same relationship between markup and acquisition cost is shown for each category of ownership. This relationship has an effect on the payment rates that CMS sets. Higher cost pharmaceutical therapies are systematically reimbursed below acquisition cost (*i.e.*, the payment system is biased against full reimbursement for higher cost therapies). Reimbursement compared to acquisition cost for the top 10 pharmaceuticals by total expenditures indicates that 9 of the 10 are significantly under reimbursed.

The biased reimbursement has an effect on the incentives hospitals face when making decisions on services to offer and organization of outpatient health care delivery. Access to care for selected therapies could be diminished under this system.

REFERENCES

1. The OPPS was established under the Balanced Budget Act of 1997 (BBA). The passthrough program was required by the Balanced Budget Refinement Act (BBRA). The relevant statutory provisions can be found in § 1833(t) of the Social Security Act. The passthrough program is described in paragraph (6).
2. The OPPS data file contained claims from 4,522 hospitals. Claims from hospitals in Maryland and hospitals with outlier cost-to-charge ratios were removed from the database prior to its release.
3. While the HCPCS coding system for drugs is based on the generic name, rather than the brand name, the vast majority of drug products eligible for separate reimbursement under the

OPPS in 2001 and 2002 had no actual generic equivalents.

4. Overall, the OPPS methodology is designed, due to the effect of statutory budget neutrality requirements, to reimburse hospitals at approximately 82 percent of total costs. In theory, therefore, one could expect the ratio of reimbursement to acquisition costs to be 0.82, except that non-product acquisition costs would not be covered. In a prior study, The Moran Company replicated the methodology employed by Myers & Stauffer in a 1999 study for the Health Care Financing Administration (now the Centers for Medicare and Medicaid Services (CMS)) and found that non-product costs typically total at least 33 percent of product acquisition costs.