RAND

Cost Estimates for Cost Outlier Cases Under Medicare's Prospective Payment System

Grace M. Carter and J. David Rumpel

RAND/UCLA/Harvard Center for Health Care Financing Policy Research

The research described in this report was sponsored by the Health Care Financing Administration, U.S. Department of Health and Human Services, Master Research Contract Number 500-92-0023.

ISBN: 0-8330-1507-9

RAND is a nonprofit institution that seeks to improve public policy through research and analysis. RAND's publications do not necessarily reflect the opinions or policies of its research sponsors.

Published 1994 by RAND
1700 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138
To obtain information about RAND studies or to order documents,
call Distribution Services, (310) 451-7002

RAND

Cost Estimates for Cost Outlier Cases Under Medicare's Prospective Payment System

Grace M. Carter and J. David Rumpel

Prepared for the
Health Care Financing Administration
U.S. Department of Health and Human Services

RAND/UCLA/Harvard Center for Health Care Financing Policy Research

Preface

This report describes findings from a study of how Medicare cost outlier payments are calculated. This study is part of the process used by the Health Care Financing Administration (HCFA) to continually improve the Prospective Payment System which is used to pay hospitals for the inpatient care of Medicare beneficiaries. The research reported here was performed in the RAND/UCLA/Harvard Center for Health Care Policy Research and was supported under Master Contract 500-92-0023 between HCFA and RAND.

Contents

Preface iii

Tables vii

Summary ix

Acknowledgments xiii

1. INTRODUCTION 1
   - Outlier Policy 1
   - Purposes of Outlier Policy 2
   - Possible Problems with Cost Outlier Payments 3
   - Scope of This Study 4

2. DATA AND METHODS 6
   - Data 6
   - Sample Definitions 7
   - Variable Definitions 8
     - RCCs 8
     - Markup 9
     - Case-Level Costs 9
     - Reimbursement Under Current Policy 10
     - Profit 11
     - Risk 11

3. RCC TRENDS 13
   - National Trends 13
   - Hospital Groups 14
   - Predicting RCCs 16
   - Types of Service 19

4. EFFECT OF RCC INACCURACY ON PAYMENT 22
   - Effect of RCC Problems on Payments Under Current Policy 22
     - Estimates of Cost per Case 22
     - Distribution of Cost Outlier Payments 25
   - Alternative Policies 27
   - Outcomes of Alternatives 27

5. CONCLUSIONS 32

References 35

Tables

2.1. Number of Hospitals and Cases in Each Annual Hospital Set 8
3.1. Average Operating and Capital RCCs and Rate of Change (Case Weighted) 14
3.2. PPS 7 Average RCCs, and Average Annual Rate of Change (Case Weighted), by Hospital Characteristics 15
3.3. Pearson Correlation Coefficient Across Years in Operating RCCs (Hospital Weighted) 17
3.4. Pearson Correlation Coefficient Across Years in Sum of Operating and Capital RCCs (Hospital Weighted) 17
3.5. Pearson Correlation Coefficients of Annual Rate of Change in Operating RCCs (Hospital Weighted) 18
3.6. Pearson Correlation Coefficients of Annual Rate of Change of Sum of Operating and Capital RCCs (Hospital Weighted) 18
3.7. Percentage of Charges in Each Department for Cost Outliers and All Cases and Medium PPS 7 Operating RCC 19
3.8. Average Ancillary and Per Diem Operating RCCs and Rate of Change (Case Weighted) 20
3.9. Average Ancillary and Per Diem RCCs and Rate of Change (Case Weighted) 21
4.1. Estimates of Cost, by Method and Type of Case 22
4.2. Relationship Between Ancillary RCC, Markups, and Cost Outlier Reimbursement Under Current Policy 26
4.3. Summary Statistics Comparing Current Policy to Outlier Alternatives 28
4.4. Outlier Payments for Alternative Policies, by Percentage of Reimbursement from Cost Outliers Under Current Policy 29
4.5. Outlier Payments and Profit per Case for Alternative Policies, by Profit in Base Case 29
4.6. Profit per Case for Alternative Policies, by Percentage of Reimbursement from Cost Outliers Under Current Policy 30
4.7. Average Profit per Case, by Hospital Characteristics for Simulated Policies 31

Summary

This report studies how Medicare cost outlier payments are calculated. The Health Care Financing Administration (HCFA) uses a prospective payment system (PPS) to pay for Medicare hospital stays. Under this system, each case is paid a prospectively set price based on its Diagnosis-Related Group (DRG). But the PPS also provides outlier payments for exceptionally costly or long-staying cases. In this report we evaluate the magnitude of problems in measuring the cost of these outlier cases and describe the likely outcome of improving the cost outlier payment formula.

Outlier payments are made in addition to the regular DRG payment. The cost outlier payment formula uses the ratios of cost to charges (RCC) from the most recent settled cost report for each hospital. The charges for each potential cost outlier case are multiplied by the ratio and adjusted by payment factors to get an estimate of the standardized cost of the case. The cost outlier payment formula pays a fraction of the difference between the standardized cost for the case and the cost outlier threshold. The fraction is called the "marginal cost factor" and is currently 0.75 in most DRGs and 0.9 in burn DRGs.

Outlier payments are intended to reduce financial risk to the hospital and to reduce financial incentives to underserve extremely high-cost or long-staying patients. In addition, they help ensure that reimbursement amounts are fair to all participating hospitals.

Concerns have been raised about the accuracy of the RCC used for cost outlier payments. Inaccuracy in the RCC would mean that the insurance provided by outlier payments is not as effective as it might be and might provide incentives for care that is not cost effective. In addition, it might cause payment inequities. The causes of inaccuracy in the RCC that have been hypothesized include a temporal decline in the RCC. Since the RCC used for payment comes from an old cost report, the cost of outlier cases (and therefore outlier payments) are overestimated at hospitals with a declining RCC. In addition, many hospitals use different markups for different services. Typically, markups are much higher (and RCCs therefore much lower) for ancillary services than for the routine care and special care billed through per diem charges. Therefore, if cost outliers tend to use a higher than average proportion of ancillary services, then cost outliers would be overpaid.

We investigated (1) how RCCs changed over the five-year period from FY 1986 to FY 1990; (2) how RCCs varied among different services and how that affects cost estimates for cost outlier cases; and (3) the implications of attempting to fix the problems with the RCC.

Data and Methods

We analyzed trends in RCCs for the five years from PPS III through PPS VII using data from the Medicare hospital cost reports and a 20 percent sample of discharges from the Medicare Provider Analysis and Review (MEDPAR) file from FY 1986 through FY 1991.

We used RCCs calculated at the departmental level and per diem cost estimates to estimate the cost of each FY 1991 case on our sample MEDPAR. Although this estimate is somewhat inaccurate, it improves on the single RCC method by accounting for systematic variations in markup across departments and accommodation costs. It is also more accurate than the RCC used to pay cost outliers because it is based on data that are contemporaneous with the case. Thus, we use it to roughly gauge inaccuracies in the current cost outlier payment method. We also simulated reimbursement on the FY 1991 MEDPAR to determine the effect of alternative methods of estimating costs in the cost outlier formula.

RCC Trends

Throughout the period from PPS III through PPS VII, RCCs have been declining between 2 and 3 percent a year. The consistency of the rate of decline means that HCFA can expect these declines to continue and can use this information to set cost outlier thresholds that bring total outlier payments closer to the target amount.

Almost all hospital groups share the same trend in RCC. The rate of decline in RCC for proprietary hospitals is similar to that for nonprofit hospitals. Two groups had different trends: New Jersey hospitals actually had a substantial annual increase in RCC and New York hospitals had a slight increase. The largest declines in RCC occurred in the Mountain and Pacific states.

The RCC from an old cost report is a good, but far from perfect, predictor of the current RCC for a hospital. For example, the correlations between the operating RCCs for cost reports that are one year apart range from 0.87 to 0.93. For periods two years apart, the correlations range from 0.79 to 0.87. We tried various

models to improve prediction. Unfortunately, neither hospital characteristics nor time series analyses produced a useful improvement in prediction.

Cost outlier cases typically receive a higher percentage of ancillary charges and a lower percentage of accommodation charges. The RCCs for ancillary services are lower than the RCCs for accommodation services. In addition, the RCC for ancillary services declined much faster than the average RCC from PPS III through PPS VII, averaging about 4 percent per year.

Effect of RCC Inaccuracy on Payment

The inaccuracies just identified imply that the current policy overestimates the cost of cost outlier cases and that cost outlier payments per case are higher than intended by policy. Using the departmental RCC cost calculation as a standard, we estimate that, under current payment policy, the cost of the average cost outlier case is overestimated by 23 percent. Using separate ancillary and accommodation RCCs instead of one RCC would reduce the overestimate of the cost of cost outlier cases to 10.3 percent. If the ancillary RCC is first multiplied by 0.96 to reflect the expected decline in RCC, then the overprediction of the cost of cost outlier cases becomes only 6 percent.

We simulated two alternatives to the current payment of cost outliers. In one alternative we estimated the cost of the case using separate RCCs for ancillary and accommodation charges. In the other alternative, we multiplied the ancillary RCC by 0.96 to account for deflation and used the same accommodation RCC.

Many hospitals have no or very few cost outliers and our alternative polices have little effect on these hospitals. The two-RCC policy changes reimbursement from its current amounts by less than half of one percent for 77 percent of hospitals. However, 62 hospitals gain more than 2 percent of revenue and 92 hospitals lose more than 2 percent of revenue from this policy. The statistics for the policy with a deflator are very similar.

There are 243 hospitals that receive at least 8 percent of their Medicare reimbursement from cost outlier payments. These hospitals have higher than average errors in their RCCs from both a greater than average difference between their markups on ancillary and accommodation services and stronger than average declining trends in the ancillary RCC. They would lose only 14 percent of their outlier payments (about $104 per case) if separate RCCs were used for ancillary and accommodation charges. This suggests that under current policy there are at most a small number of hospitals who gain an unfair advantage because of their RCCs.

Going to separate RCCs slightly increases the correlation between cost and reimbursement under PPS and, because the error being eliminated is imprecise measurement, it improves the equity of PPS. Errors in the RCC are found in most groups of hospitals and thus no one hospital group would either gain or lose substantially from improved measurement of costs.

Conclusions

The inaccurate estimate of the cost of cost outlier cases contravenes current policy intent in two important ways. First, it changes the fraction of the excess costs that are insured from the intended 75 percent to 92 percent. Second, cases face different cost outlier thresholds, and therefore receive different payment amounts, depending on the mix of ancillary and accommodation services required by the patient.

It would be possible to improve the measurement of the cost of cost outlier cases by using separate RCCs for ancillary and accommodation charges. The improvement in cost measurement would increase provider equity. A few hospitals now obtain additional cost outlier payments because of their pricing structure. Improvement in cost measurement would redistribute these unfair payments across all hospitals with a stronger relationship to the actual cost of their cases. The effect on provider equity is quite small, however, because the amount of funds being redistributed is very small. The effect on the provider level correlation between cost and payment is positive but very small both because of the small amount of money being redistributed and because some hospitals with high average losses would lose funds in the redistribution.

Although the improved cost measurement has only modest effects, it appears to be very easy to implement. The planned phaseout of day outlier payments will increase the amount of cost outlier payments and therefore will increase the benefits of using two RCCs to improve accuracy in cost measurement.

Acknowledgments

We thank Sheila O'Dougherty, our HCFA project officer, for organizing discussions by HCFA staff that helped to formulate this research and for reviewing an earlier draft of the report. RAND staff members Dana Goldman and Catherine Jackson and HCFA staff member Elizabeth Richter also provided helpful reviews of an earlier draft. We thank Helen Barnes for typing various early drafts and Patricia Bedrosian for editing the draft and overseeing its production.

1. Introduction

This report studies how Medicare cost outlier payments are calculated. The Health Care Financing Administration (HCFA) uses a prospective payment system (PPS) to pay for Medicare hospital stays. Under this system, each case is paid a prospectively set price based on its Diagnosis-Related Group (DRG). But the PPS also provides outlier payments for exceptionally costly or long-staying cases. In this report we evaluate the magnitude of problems in measuring the cost of these outlier cases, examine different approaches to solving these problems, and describe the likely outcome of improving the cost outlier payment formula.

Outlier Policy

Outlier payments are made in addition to the regular DRG payment. The outlier reimbursement amount covers both operating costs and the federal share of capital costs. There are two kinds of outliers: Cost outliers are cases whose standardized charges exceed a cost threshold and day outliers are cases that remain in the hospital longer than a day threshold. The thresholds depend on DRG and are set so that the estimated amount of outlier payment equals a policy goal, currently 5.1 percent of Medicare hospital reimbursement.

The cost outlier payment formula uses two ratios of costs to charges (RCCs) from the most recent available settled cost report for each hospital—a ratio of operating costs to charges and a ratio of capital costs to charges. The charges for each potential cost outlier case are multiplied by these ratios and adjusted by payment factors to get an estimate of the standardized operating cost of the case and a second estimate of the standardized capital cost of the case. The cost outlier payment formula pays a fraction of the difference between the sum of these standardized costs for the case and the cost outlier threshold. The fraction is called the "marginal cost factor" and is currently 0.75 in most DRGs and 0.9 in burn DRGs.

For cases that exceed the day outlier threshold, the day outlier payment formula is based on the average federal reimbursement for a day in the same DRG at the same hospital. For each day beyond the outlier threshold, the formula adds to the DRG payment a fraction of the average daily federal reimbursement. A fraction is used because days late in a stay cost substantially less than an average

day. The fraction is currently 0.55 which is also the estimated ratio of the cost of a day outlier day to an average day (Carter and Rumpel, 1992).

When a case exceeds both the day threshold and the cost threshold, it will receive the larger amount from the two payment formulas.

Purposes of Outlier Policy

Outlier payments are intended to reduce financial risk to the hospital and to reduce financial incentives to underserve extremely high-cost or long-staying patients. Outlier payments can be viewed as insurance for the hospital against the random event of receiving very expensive cases (Keeler et al., 1988). The premium for the policy is the reduction in the DRG payment to provide the outlier set-aside. The insurance payment is, of course, the outlier payment. For cost outliers, the marginal cost factor is the fraction of the hospital's loss that is insured. One minus this multiplier is the coinsurance rate. The day outlier payment multiplier is the product of the fraction of the hospital's loss that is insured and the ratio of the extra cost incurred for each outlier day to the reimbursement for a typical day.

The design of outlier policy requires trading off the benefits of the insurance (protection against financial risk to the hospital, mitigation of access and underservice problems for costly and long-staying patients) against moral hazard—the wasteful overconsumption of insured services (unnecessary or non-cost-effective care for the outlier patient). As discussed more in Keeler et al. (1988), a positive coinsurance rate is an effective way to reduce moral hazard.

One conclusion from the insurance model is that outlier payments should not exceed the marginal cost incurred after a patient crosses the outlier threshold. If reimbursement is set at marginal cost or more, then hospitals will have an incentive to provide additional care that is not cost-effective.[1] Further, by reducing the payment rates and paying outlier supplements to more cases, one can improve the amount of insurance provided for the same total amount of outlier payments.

Another conclusion from the insurance model is that maximum insurance is provided by a "fixed loss" policy where outlier payments are proportional to the costs incurred beyond a threshold set to produce the same fixed loss in each DRG. If thresholds were set by this fixed loss policy (and they will be in the future under current legislation), and if costs were well estimated in the cost outlier

[1]The physician hospital team values care for the sake of their reputations and morale, and thus they may choose to provide care even when it causes a short-term financial loss to the hospital.

formula, then cost outliers would provide maximum insurance. (Note that because services per day vary widely across cases (Carter and Melnick, 1990), the relationship between the cost of the case and day outlier payments is much weaker than the relationship between the cost of the case and cost outlier payments and therefore day outlier payments provide less effective insurance than cost outlier payments.)

A secondary goal of outlier payments (and a primary goal of the PPS) is to provide equitable reimbursement for all hospitals. Some hospitals may consistently receive patients who are costlier than average for their DRG. Although other parts of the PPS including the continuous refinement of DRGs and special payments for special categories of hospitals (teaching, disproportionate share, sole community providers, and rural referral centers) are intended to address systematic differences across hospitals in costs, outlier payments may also help alleviate remaining differences between a hospital's expected payment per case and the cost of efficiently treating that group of cases.

Possible Problems with Cost Outlier Payments

Various observers have raised concerns about the accuracy of the RCCs used for cost outlier payments. Inaccuracy in the RCC would mean that the insurance provided by outlier payments is not as effective as it might be. Inaccuracy also might introduce payment inequities among providers. Finally, if the inaccuracy resulted in payments that exceeded marginal cost, it would provide incentives for care that was not cost effective.

RCCs have been declining nationally since the introduction of PPS. Because the RCCs used to calculate cost outlier payments come from the latest settled cost report, they may be up to two years old and will overestimate costs at any hospital whose RCC is declining. This results in overpaying cost outliers—i.e., each case gets more reimbursement than is intended by current policy. It also causes difficulties in determining the cost outlier threshold that will result in attaining the payment target.

Another problem with the RCC is that it is a substantial simplification of the relationship between costs and charges. In many hospitals, different markups are used for different services. Thus, the "true" ratio of costs to charges for a case depends on which services the case received. As the Hospital Association of New York State (1992) pointed out, it is typical for hospitals to have much higher markups (and therefore lower RCCs) for ancillary services than for the routine care and special care billed through per diem charges. Therefore, if cost outliers

use a higher than average proportion of ancillary services, then cost outliers would be overpaid. If, instead, cost outliers use a lower than average proportion of ancillary services, they would be underpaid.

Despite these potential problems, cost outliers are more effective at providing insurance to hospitals than day outliers. Consequently, as the PPS has been refined, a greater emphasis has been placed on cost outlier payment. In the initial version of PPS, when a case exceeded both the day threshold and the cost threshold it received the day outlier payment. In FY 1989, the current rule of paying the maximum of the two formulas was instituted. In FY 1993, the payment rate for day outliers was decreased to its current level.

In OBRA93, Congress called for the elimination of day outlier payments by FY 1998. In its most recent set of recommendations, the Prospective Payment Assessment Commission (ProPAC, 1993) has suggested eliminating day outlier payments over three years. ProPAC further suggests increasing the marginal cost factor from its current 0.75 to 0.80 which, with the same outlier payment pool, would result in higher payments per outlier case and fewer outlier cases. Thus, it is particularly timely to examine how well costs are estimated using the current formula and how that formula might be improved.

Scope of This Study

In this study, we investigated the extent to which the potential problems with the RCC are manifested in the current PPS and ways to improve the estimate of the costs of a cost outlier case. In particular, we studied:

- How RCCs changed over the five-year period from FY 1986 to FY 1990. What was the rate of change? Did the rate vary for different hospital groups? How well did an old RCC predict the current RCC for a particular hospital? Can one predict the change in the RCC with enough reliability to improve on the use of the old RCC to estimate costs?
- How RCCs varied among different services and the policy implications of this variance. What were the RCCs for different services and groups of services? How did the service mix of the typical cost outlier case differ from other cases? How did the differences in service mix and RCCs affect the estimated cost of outlier cases and cost outlier payments? Does variation in RCC among different services enable some hospitals to obtain an unfair share of cost outlier payments?
- What are the implications of attempting to fix the problems with the RCC? What would be the effect of using different RCCs for ancillary and per diem

services? What would be the effect of adjusting RCCs for their expected trend?

This project was funded as part of HCFA's process to continually improve the PPS. Related issues have been studied elsewhere and include the purpose of outlier payments and the balance between day and cost outliers (Keeler et al., 1988), the effectiveness of recent changes in outlier policy (Carter and Farley, 1992), the appropriate formula for day outlier payments (Carter and Rumpel, 1992), and the use of payment factors to standardize charges in the cost outlier formula (Carter and Rumpel, 1993).

2. Data and Methods

Data

We use data from the Medicare hospital cost reports as recorded on the PPS minimum data sets for the third through the eighth years of PPS and a 20 percent sample of discharges from the Medicare Provider Analysis and Review (MEDPAR) file from FY 1986 through FY 1991. Each cost report record contains data on one hospital fiscal year. The data for PPS III refer to the hospital's fiscal year that began in federal FY 1986. Other PPS years are defined analogously. Our data series ends with PPS VIII, which refers to the hospital's fiscal year that began in federal FY 1991.

The cost reports are prepared by hospitals and sent to HCFA by the Medicare Fiscal Intermediary (FI). They are subject to audit by the FI, and updated versions of the cost report are then sent to HCFA. Each minimum data set contains only the most recent cost report for each hospital year. The process of auditing often reduces the estimate of capital costs and therefore the capital RCCs on the final file are frequently lower than those computed on earlier, unaudited files.[1] For example, the case-weighted average ratio of capital costs to charges calculated from the PPS VI file that we use in this report was 0.05758 compared to a similar RCC of 0.05976 from a PPS VI file prepared a year earlier.[2] HCFA reports a similar decline in capital costs from auditing earlier minimum data sets (*Federal Register*, 1991). Operating cost RCCs were virtually unchanged on the two PPS VI files that we were able to compare (0.60049 in the later file, compared to 0.60064). Adding the ratios for operating and capital costs shows that the earlier file overestimated the total cost to charge ratio by approximately 0.4 percent.

We received the cost report data files in the late fall of 1992. The PPS VIII file contains only unaudited case reports and thus would overestimate capital costs and, therefore, slightly overestimate total costs. More important, it is missing a significant fraction of hospitals. Consequently, we chose to restrict our analyses

[1] Capital costs were paid entirely on a passthrough basis until FY 1992. Thus, there was an incentive for hospitals to increase their estimate of capital costs.

[2] As we will explain in more detail below, the calculation of RCCs requires case-level data as well as cost reports. We used the same case-level data for both RCC calculations.

of trends in RCCs to the five years from PPS III through PPS VII. However, we do use the PPS VIII file to estimate the cost of cases on the FY 1991 MEDPAR file that are in PPS VIII whenever the file is available. Many of the hospitals missing from our PPS VIII file have fiscal start dates from late in the fiscal year and thus missing data are less of a problem for this purpose than for analyzing trends. In addition, a comparison of the 0.4 percent bias in total (i.e., the sum of operating and capital) cost estimated from the analysis of PPS VI data above with the magnitude of the annual decline in RCCs (to be presented in Section 3), shows that using the unaudited PPS VIII data is likely to produce more accurate cost estimates than using an earlier cost report.

The MEDPAR file contains one record for each hospitalization. The record identifies the hospital and DRG and includes charges by hospital department,[3] number of days spent in routine care, special care, charges for routine care, and charges for special care.

We use hospital characteristics from a file received from HCFA. The hospital characteristics were the most recent data available in the fall of 1991.

Sample Definitions

We use two different strategies for including hospitals in the analysis of RCC trends. One strategy is to construct a hospital set for each year. Conceptually, this annual hospital set consists of all the hospitals that meet current criteria for PPS. It is constructed for a particular year as all the hospitals for which we have good data for the year and which either were on PPS during PPS VII or have no cost report in PPS VII but were on PPS during the year. Thus, throughout the time period of study, the sample includes current PPS hospitals in New Jersey and excludes cancer hospitals. It also includes new hospitals and hospitals that are now closed in each year that they served Medicare patients. RCC trends measured on this sample are useful for predicting future values of average RCCs which might be used, for example, to set cost outlier thresholds. Table 2.1 shows the number of hospitals and cases in the annual hospital set each year.
Our second sampling strategy is to define a consistent set of hospitals that were on PPS during PPS VII and have data for each of the years PPS III through PPS VII. This sample allows us to analyze how RCC trends vary for groups of

[3]The departments include different types of ancillary services, such as operating room, anesthesiology, and laboratory.

Table 2.1

Number of Hospitals and Cases in Each Annual Hospital Set

Year	No. of Hospitals	No. of Medicare Cases
PPS III	5,526	9,475,940
PPS IV	5,465	9,303,980
PPS V	5,399	9,334,334
PPS VI	5,289	9,411,944
PPS VII	5,209	9,599,230

existing hospitals without confounding by the fact that new or recently closed hospitals may have unusual RCC values. There are 4,878 hospitals in this hospital set, or from 88 to 94 percent of the hospitals in the annual sample. The hospitals in the consistent hospital set cared for 9,030,607 Medicare cases during PPS VII (94 percent of the cases in the annual sample).

We used FY 1991 PPS discharges to estimate the effect of RCC problems on the estimated cost of cost outlier cases and the effect of remedying these problems. This required a third sample because we needed to be able to estimate the reimbursement that each case received and case-level costs. We excluded hospitals that were missing data necessary to calculate reimbursement and the somewhat larger set of hospitals that bill entirely on a per diem basis (i.e., all-inclusive providers) because the departmental RCC method of calculating case-level costs is inappropriate for them. There are 4,767 hospitals in this simulation data set and these hospitals cared for an estimated 9,119,355 Medicare cases during FY 1991.

Variable Definitions

RCCs

We analyze ratios of operating costs net of direct medical education costs to charges (operating RCCs), capital costs to charges (capital RCCs), and their sum. The cost report files supply data on total ancillary costs by department (cost report variables F318 through F342 on each file), direct medical education ancillary costs (F415-F438), capital ancillary costs (F351-F374), total per diem costs for routine and special care (F452-F455), direct medical education costs for routine and special care (F409-F412), and capital per diem costs for routine and special care (F345-F348). Direct medical education costs were subtracted from total costs in

each department and per diem category.[4] Operating costs in each department and per diem category were estimated as total costs minus direct medical education costs minus capital costs. Summing across ancillary departments and per diem categories provides the numerator of each ratio.

The cost report files also supply data on ancillary charges by department (F291-F315). Average per diem charges for routine care and for special care were estimated from contemporaneous MEDPAR files, with each case assigned to its hospital's PPS year containing the day of discharge. These average per diem charges were then multiplied by the number of routine days (F54) or special care days (sum of F56-F58) from the cost report to estimate the total per diem charges. Summing ancillary charges and per diem charges provides the single denominator which is used for all three ratios (i.e., operating RCC, capital RCC, and total RCC).

In addition to the operating RCCs, capital RCCs, and the total RCCs, we also calculated RCCs for individual ancillary departments, for routine care, and for special care. These are calculated in the obvious way from the elements just described.

We present trends in the RCCs by using case-weighted mean values of the RCCs. These trends show how the RCC for the typical Medicare case changed over time. To calculate the case-weighted mean, we estimate the RCC for each hospital and year, then weight by the number of Medicare cases in that hospital and year.

Markup

Markup is the percentage by which charges exceed costs. It is defined for total (i.e., the sum of operating and capital) costs and separately for accommodation and ancillary costs. In each case:

$$\text{Markup} = 100 * (1/\text{RCC} - 1).$$

Case-Level Costs

We estimated the cost of each case on the FY 1991 MEDPAR sample using the departmental RCC method. This method is similar to that described in Newhouse et al. (1989) except that capital costs are included. Ancillary charges for the

[4]The salaries of interns and residents are reimbursed in a separate payment that is not based on DRGs.

case in each of 13 departments are multiplied by the appropriate cost-to-charge ratio and then summed. Per diem costs are calculated as the number of days spent in routine care times the routine care per diem plus the number of days spent in special care units times the special care per diem. The total cost of the case is the sum of ancillary costs and per diem costs.

The ancillary department RCCs and per diem costs come from the PPS VII or PPS VIII cost report, whichever year included the day of discharge. If the PPS VIII cost report was not available, we used the PPS VII cost report. Before calculating per diem cost, routine care and special care per diems were inflated (or deflated) according to the number of months from the center of the hospital's fiscal year until the month of admission. An annual rate of 9.6 percent was used for routine care and 8.7 for special care; these were the annual rates of increase observed from PPS VII to PPS VIII for hospitals for which both cost reports were available.

The departmental RCC method which was just described produces our best estimate of case-level costs. This estimate is somewhat inaccurate because hospitals use different markups for different services within the same department, because nursing costs may vary for different patients within the same type of accommodation, and because hospitals use different rules to allocate fixed costs.[5] However this estimate improves on the single RCC method by accounting for systematic variations in markup across departments and accommodation costs. It is also more accurate than the RCC used to pay cost outliers because it is based on data that are contemporaneous with the case.

Reimbursement Under Current Policy

For each case on the 1991 MEDPAR sample file, we estimated the reimbursement that the case would have received under a slightly simplified version of the current PPS for operating costs and the payment system for capital costs planned for the completion of the transition to a fully national capital PPS. The simplification of operating cost payments anticipates the movement to a system with only two rates (one for large urban areas and another for all other areas) and also excludes the effects of the Medicare Geographic Classification Review Board. The formulas used for reimbursement under both the operating cost PPS and the capital cost PPS are described in detail in Carter and Rumpel (1992).

The outlier payment parameters are based on the policy in use for FY 1993 (*Federal Register*, 1992). We use a day payment multiplier of 0.55 and the arith-

[5]See Ashby (1993) and Carter and Rogowski (1992) for further discussion of problems with cost estimates from the Medicare cost report.

metic mean length of stay (LOS) to calculate the outlier per diem. We calculated the day outlier thresholds using the FY 1993 formula which is the geometric mean LOS plus the minimum of 23 days or three standard deviations (in the log scale). The cost outlier threshold was the greater of two times the DRG rate or $27,100. The constant is deflated from the FY 1993 value to meet outlier payment goals. The current marginal cost factor of 0.75 was used.

To simulate current cost outlier payment, we used RCCs calculated with the PPS VI minimum data set.[6] Although we do not know exactly which cost report was used to estimate the cost outlier payment for any case, we expect that the PPS VI cost report was used most frequently. It is likely that some cases were still being paid with PPS V early in FY 1991 (particularly at hospitals with a fiscal year that starts late in the federal fiscal year) and that some cases were being paid with PPS VII late in the year (particularly at hospitals with a fiscal year that starts early in the federal fiscal year).

The average reimbursement per case in our simulation is slightly higher than that which was actually paid in FY 1991. We expect that most of the difference exists because actual FY 1991 outlier payments turned out to be lower than the amount estimated when the rates were set. Since we recalculated outlier thresholds, our outlier payments are 4.8 percent of reimbursement which is close to the current policy target of 5.1 percent. The difference between simulated payments and actual payments should not seriously affect inferences about the effect of changing the calculation of the cost of cost outlier cases.

Profit

In simulations we calculate profit as reimbursement minus covered cost. We estimate the cost of covered services by prorating the total cost of the case using the case's ratio of covered charges to total charges.

Risk

We use the methodology developed by Keeler et al. (1988) to describe the effect of each year's outlier payments on the financial risk faced by all hospitals and groups of hospitals. Risk is estimated by assuming that each case is drawn at random from a hospital-specific distribution of profit. It is defined as the stan-

[6]State-level operating RCCs were used when the calculation for a particular hospital of the operating RCC was outside of the range 0.35 to 1.245. If the capital RCC was outside the range 0.016 to 0.252, it was set to 0.07.

dard deviation of annual profit from Medicare cases expressed as a percentage of annual Medicare revenues at the hospital.

3. RCC Trends

This section first describes ratios of costs to charges for the average bundle of services at each hospital. The RCC now used for cost outlier payments comes from the hospital's most recently settled cost report. Hospitals can therefore increase payment by increasing charges at a faster rate than costs. Thus, we first examined how RCCs changed over time and found that indeed charges have been increasing faster than costs. If only some hospitals increase charges faster than costs, they might receive an unfair share of outlier payments at the expense of hospitals with RCCs that are stable over time. Thus, we next examined how the rate of decline in the RCC varied among different hospital groups, but we found similar declines in RCCs in almost all hospital groups. Then we examined the feasibility of predicting the current RCC more accurately than is done by the RCC from the last settled cost report.

It might also be possible for hospitals to increase payment for cost outliers by higher markups on services that are concentrated in outlier cases. Thus, variations in RCCs across services and changes over time in RCCs for groups of services are the last subjects discussed in this section.

National Trends

Table 3.1 shows trends in the ratio of operating costs to charges, capital costs to charges, and their sum. Throughout this period, operating RCCs have been declining between 2 and 3 percent a year. The year-to-year percentage decline in the capital RCC is unstable because of the small size of the capital RCC. The ratio of total (i.e., operating plus capital) costs to charges has been declining slightly more quickly than the operating RCC, also 2 to 3 percent annually.

In FY 1988 and earlier, a single national operating RCC was used in the cost outlier formula. Hospitals could increase reimbursement for cost outlier cases by increasing overall markups and the increase in markup had a cumulative effect. Outlier payments would be increased as long as the markup was not reduced. During this period, the absolute level of the RCC affected outlier payments.

The hospital's own operating RCC has been used to calculate cost outlier payments for operating costs since FY 1989. However, as explained above, the RCC

Table 3.1

Average Operating and Capital RCCs and Rate of Change (Case Weighted)

PPS Year	Operating RCC	% Change	Capital RCC	% Change	Sum RCC	% Change
3	0.646		0.071		0.717	
4	0.628	-2.87	0.067	-6.09	0.694	-3.18
5	0.616	-1.83	0.059	-11.95	0.675	-2.80
6	0.597	-3.10	0.058	-1.68	0.655	-2.98
7	0.584	-2.21	0.055	-3.79	0.639	-2.35

NOTE: Based on annual hospital sets. See Table 2.1 for sample size.

comes from an earlier cost report. Thus, hospitals could still increase reimbursement for cost outlier cases by increasing overall markups. Thus, since FY 1989, the annual rate of decline in RCC affects outlier payments rather than the absolute level of RCC, which mattered before FY 1989.

This policy change evidently had little net effect on the national RCC as the rates of change in the operating RCC in the last two years are comparable with those in the earlier period. Capital RCCs have been used to calculate cost outlier payments since the capital prospective payment system began in FY 1992, which is beyond the period of our data.

We have just seen that the rates of decline in both operating RCCs and the sum of operating and capital costs have been reasonably stable since PPS III. This means that HCFA can expect these declines to continue in the short run and can use this information to set cost outlier thresholds that bring total outlier payments closer to the policy goal.

Hospital Groups

Table 3.2 summarizes trends in operating RCCs for existing PPS hospitals based on a variety of hospital characteristics. The table concerns only operating RCCs because these are the ones that affected payment during this time period. The first line contains data on all the hospitals in the "consistent hospital set", i.e., current PPS hospitals for which we have data for each year from PPS III through PPS VII. The exclusion of other hospitals with good data for PPS VII explains why the PPS VII operating RCC in the first row is not exactly the same as the PPS VII operating RCC in Table 3.1.

We divided the time period in two at the end of PPS V—roughly when the use of the hospital-specific RCC to calculate outlier payments would start to affect hospital behavior, if indeed there was such an effect. As the first line in the table

Table 3.2

PPS 7 Average RCCs, and Average Annual Rate of Change (Case Weighted), by Hospital Characteristics

Hospital Characteristic	Operating RCC	Annual % Change PPS 3-5	Annual % Change PPS 5-7	No. of Hospitals	No. of PPS 7 Cases
All hospitals	0.5819	–2.57	–2.35	4,878	9,030,609
Ownership					
Proprietary	0.4686	–2.40	–2.34	700	1,048,644
Government	0.6448	–1.86	–2.12	1,375	1,323,462
Nonprofit	0.5873	–2.75	–2.39	2,803	6,658,503
Location					
Large urban	0.5558	–2.55	–2.67	1,274	3,518,580
Other urban	0.5834	–3.02	–2.04	1,270	3,471,550
Rural	0.6246	–1.90	–2.34	2,334	2,040,479
Disproportionate share	0.5539	–2.81	–1.87	1,312	3,257,709
Not disproportionate share	0.5977	–2.45	–2.59	3,566	5,772,900
No teaching	0.5848	–2.54	–2.36	3,838	5,147,145
Minor teaching	0.5787	–2.76	–2.40	866	3,152,028
Major teaching	0.5756	–2.00	–2.00	174	731,436
Bed size					
0–49	0.7210	–1.42	–1.99	1,248	516,495
50–99	0.6252	–1.86	–2.25	1,096	869,545
100–199	0.5676	–2.65	–2.43	1,126	1,865,989
200–299	0.5651	–2.93	–2.30	630	1,898,869
300–499	0.5660	–2.98	–2.16	582	2,533,388
500+	0.5742	–2.26	–2.85	196	1,346,323
Region					
New England	0.6697	–2.91	–1.08	203	472,835
Mid-Atlantic	0.6055	–2.41	0.07	507	1,575,224
S. Atlantic	0.5307	–2.72	–2.78	674	1,415,909
E. N. Central	0.6196	–2.18	–3.39	765	1,696,444
E. S. Central	0.5374	–2.87	–1.93	424	754,972
W. N. Central	0.6325	–1.73	–2.80	717	780,780
W. S. Central	0.5566	–3.33	–1.92	699	1,006,589
Mountain	0.5660	–3.06	–3.99	312	355,868
Pacific	0.5361	–2.80	–4.21	577	971,988
Percent Medicare					
1st quartile	0.5873	–2.08	–1.90	1,215	2,636,871
2nd quartile	0.5809	–2.70	–2.49	1,239	2,808,636
3rd quartile	0.5763	–2.97	–2.62	1,203	2,130,201
4th quartile	0.5824	–2.65	–2.46	1,221	1,454,901

NOTE: Based on consistent hospital set.

shows and consistent with Table 3.1, the rate of decline in the operating RCC was only slightly lower in the later half of the period than in the earlier.

The first set of hospital groups is defined based on hospital ownership. Some have hypothesized that proprietary hospitals would be more willing or able than other hospitals to modify their charge structure to increase outlier reimbursement. Proprietary hospitals have had lower RCCs than other hospitals throughout this period. Thus, they had an advantage in receiving cost outlier payments before the FY 1989 change in outlier policy. However, since PPS V the rate of decline in the operating RCC for proprietary hospitals has been almost identical to that for other hospitals. The FY 1989 change in outlier policy removed the unfair advantage that proprietary hospitals had because of their lower RCC and they did not act any more vigorously than other hospital groups to restore this advantage by further lowering their RCC.

Many of the hospital characteristics in the table show substantial variation in average level of RCC. But as we have just discussed, the current policy accounts for this variation when it calculates cost outlier payments. The only hospital groups that are relatively disadvantaged now are those that do not regularly decrease their RCC (i.e., increase their markup). As Table 3.2 shows, RCCs for almost all groups are declining by roughly 2 to 3 percent annually. The greatest variation is found across census divisions. In the Mid-Atlantic states, there was almost no change in the RCC in the PPS V to VII period. The three Mid-Atlantic states were actually quite different during this period, with New Jersey showing a substantial annual increase in RCC, Pennsylvania a decrease, and New York a slight increase. The largest declines in RCCs occurred in the Mountain and Pacific states.

The last characteristic in the table is the percentage of the hospital's discharges that are insured by Medicare, with hospitals divided into quartiles. We hypothesized that hospitals with more Medicare discharges might be more attentive to outlier rules and thus have a greater decline in RCC. Although the hospitals in the quartile with the smallest percentage of Medicare discharges have a slightly smaller rate of decline in the RCC than other hospitals, there is no consistent correlation. In work not reported in detail, we examined similar data controlling for geographic area (large urban, other urban, and rural) but also found no consistent relationship between percentage of Medicare discharges and decline in the RCC.

Predicting RCCs

The RCC from the last settled cost report covering a period typically one or two years earlier is used as an estimate of the same hospital's current RCC in calculating cost outlier payments. Table 3.3 shows the correlation between the

operating RCCs for the same hospital from successive years. For example, the correlation between the operating RCCs for PPS III and PPS IV was 0.87. For one-year intervals, the correlations range from 0.87 to 0.93. For periods 2 years apart, the correlations range from 0.79 to 0.87. Table 3.4 shows similar data for the sum RCC, which will become more important in determining outlier payments as the phase-in of the capital PPS is completed.

The R-square of a regression of the current RCC on an old RCC is, of course, just the square of the correlation coefficients shown in Tables 3.3 and 3.4. Thus, the old cost report is a good, but far from perfect, predictor of the current RCC. If we could improve on this prediction of RCC, it would improve provider equity because hospitals would get a more appropriate share of cost outlier payments.

Although most hospital groups are experiencing similar declines in RCCs, individual hospitals vary substantially in the extent to which they change their RCCs. For example, the median hospital's sum (of operating and capital) RCC changed by –2.0 percent from PPS VI to PPS VII. However, the inter-quartile range varied from –7.1 percent to a positive 3.9 percent. Similar ranges were seen in other years and for the operating RCC.

Table 3.3

Pearson Correlation Coefficient Across Years in Operating RCCs (Hospital Weighted)

	PPS 3	PPS 4	PPS 5	PPS 6	PPS 7
PPS 3	1.00				
PPS 4	0.87	1.00			
PPS 5	0.79	0.90	1.00		
PPS 6	0.76	0.85	0.93	1.00	
PPS 7	0.72	0.82	0.87	0.90	1.00

NOTE: Based on 4,878 hospitals in consistent hospital set. All correlations are statistically significant ($p < .001$).

Table 3.4

Pearson Correlation Coefficient Across Years in Sum of Operating and Capital RCCs (Hospital Weighted)

	PPS 3	PPS 4	PPS 5	PPS 6	PPS 7
PPS 3	1.00				
PPS 4	0.86	1.00			
PPS 5	0.77	0.90	1.00		
PPS 6	0.74	0.85	0.93	1.00	
PPS 7	0.71	0.82	0.86	0.89	1.00

NOTE: Based on 4,878 hospitals in consistent hospital set. All correlations are statistically significant ($p < .001$).

If we could reliably predict the change in RCC for an individual hospital, then we could use this prediction to produce an updated RCC for use in the cost outlier payment formula. As one would infer from the data in Table 3.2, hospital characteristics are of little help in predicting the change in RCC. Simultaneously using all of the categories in Table 3.2 to predict the annual rate of change in either operating or sum RCC resulted in R-squares of less than 3 percent.

An alternative prediction can be derived by using time series models to predict the current RCC based on multiple previous values. Unfortunately, just as was the case with hospital characteristics, values of the RCC earlier than the previous year (or equivalently earlier changes in the RCC), offer very little improvement in prediction over the previous RCC and a constant trend, although some models meet criteria for statistical significance. We tried various combinations of such explanatory variables to predict the RCC, but all lacked substantial explanatory power beyond that of the previous RCC. For the operating and sum RCCs, respectively, Tables 3.5 and 3.6 show the correlation between the change in RCC in successive time periods at the same hospital. The correlations are too small to be of practical use. Most of the correlations are negative, indicating that a year with a particularly large increase in markups at a hospital is likely to be followed by one with a lower than average increase.

Table 3.5

Pearson Correlation Coefficients of Annual Rate of Change in Operating RCCs (Hospital Weighted)

	PPS 3 to PPS 4	PPS 4 to PPS 5	PPS 5 to PPS 6	PPS 6 to PPS 7
PPS 3 to PPS 4	1.00			
PPS 4 to PPS 5	–0.15*	1.00		
PPS 5 to PPS 6	–0.06*	–0.00	1.00	
PPS 6 to PPS 7	0.04*	–0.01	–0.15*	1.00

NOTE: Based on 4,878 hospitals in consistent hospital set.
*Statistically significant ($p < .01$).

Table 3.6

Pearson Correlation Coefficients of Annual Rate of Change of Sum of Operating and Capital RCCs (Hospital Weighted)

	PPS 3 to PPS 4	PPS 4 to PPS 5	PPS 5 to PPS 6	PPS 6 to PPS 7
PPS 3 to PPS 4	1.00			
PPS 4 to PPS 5	–0.07*	1.00		
PPS 5 to PPS 6	–0.06*	–0.12*	1.00	
PPS 6 to PPS 7	0.04*	–0.03	–0.14*	1.00

NOTE: Based on 4,878 hospitals in consistent hospital set.
*Statistically significant ($p < .01$).

Types of Service

If cost outliers receive a different bundle of services than nonoutlier cases, then it would be possible for hospitals to increase payment for cost outliers by higher markups on services that are concentrated in outlier cases. Table 3.7 shows that the service bundles are different. Operating room charges constitute 4.6 percent of cost outlier charges, but 7.1 percent of all Medicare charges. Pharmacy charges constitute 21.9 percent of cost outlier charges versus 15.0 percent of all Medicare charges. The table lists each ancillary department that was responsible for at least 5 percent of charges for either outlier cases or all cases. It also provides subtotals for all ancillary services and for all accommodation services.

Cost outlier cases typically receive a higher percentage of ancillary charges and a lower percentage of accommodation charges. As the last column of the table shows, the RCCs for ancillary services are lower than the RCCs for accommodation services. The implication of this pair of facts is that the average cost of outlier cases is overestimated in the cost outlier payment formula and thus cost outlier payments per case are higher than intended by policy. One way to see this is to note that the RCC for any group of cases can be calculated as a weighted sum of each ancillary department and accommodation RCC, each weighted by the

Table 3.7

Percentage of Charges in Each Department for Cost Outliers and All Cases and Median PPS 7 Operating RCC

	Cost Outliers	All Cases	Difference	Median Operating RCC (PPS 7)
Operating room	4.63	7.10	–2.47	0.65
Pharmacy	21.90	14.98	6.92	0.37
Laboratory	14.17	16.07	–1.90	0.48
Radiology	4.45	5.92	–1.47	0.55
Supplies	12.06	11.29	0.77	0.41
Inhalation	11.47	6.62	4.85	0.37
Other	7.24	6.33	0.91	0.36 to 1.00
All ancillary	(75.92)	(68.31)	(7.61)	0.46
Regular accommodations	10.08	23.33	–13.25	1.17
Special care	14.00	8.36	5.64	1.22
All accommodations	(24.08)	(31.69)	(–7.61)	1.20
Total	100.00	100.00	0.00	0.62

NOTE: Based on 4,767 hospitals for which reimbursement and case-level cost data were available.

percentage of charges in that category.[1] The RCC calculated for the typical bundle of services is higher than the RCC for outlier cases.

Cost outlier cases and typical cases also use differential amounts of the services of individual ancillary departments. In general, cost outlier cases use more services with slightly lower RCCs than the average ancillary department (e.g., pharmacy and inhalation therapy) and less of departments with slightly higher RCCs (e.g., operating room, laboratory, and radiology). However, because the differences in RCCs across these ancillary departments is relatively small, the effect of these differences in service bundles on the estimated cost outlier RCC is much smaller than the effect of the difference for total ancillary and accommodation services.

Outlier cases have a much smaller percentage of charges for routine accommodations (10.1 percent) than typical cases (23.3 percent). This difference is partially offset by the fact that outliers have a higher percentage of charges for special care (14.0 percent vs. 8.4 percent). Because the RCCs for routine and special care accommodation are so similar, it is primarily the difference in the sum of these two categories that affects the estimated cost of cost outliers.

Table 3.8 shows that charges for ancillary services increased much faster than ancillary operating costs and consequently the ancillary operating RCC declined steadily. In contrast, the accommodation operating RCC actually increased from PPS V to PPS VII. Table 3.9 shows similar data for RCCs based on the sum of operating and capital costs. This difference in the rates of change of ancillary and accommodation RCCs means that the overestimates of the cost of cost outliers have been increasing over time.

Table 3.8

Average Ancillary and Per Diem Operating RCCs and Rate of Change (Case Weighted)

PPS Year	Ancillary RCC	% Change	Per Diem RCC	% Change	Operating RCC	% Change
3	0.515		0.946		0.646	
4	0.492	-4.56	0.947	-0.14	0.628	-2.87
5	0.476	-3.21	0.972	-2.64	0.616	-1.83
6	0.455	-4.38	0.977	0.52	0.597	-3.10
7	0.442	-2.84	0.987	1.02	0.584	-2.21

NOTE: Based on annual hospital sets. See Table 2.1 for sample sizes.

[1]This assumes only that the estimate of cost from the usual departmental methodology is a good estimate for the subset of cases.

Table 3.9

Average Ancillary and Per Diem RCCs and Rate of Change (Case Weighted)[a]

PPS Year	Ancillary RCC	% Change	Per Diem RCC	% Change	Sum RCC	% Change
3	0.562		1.069		0.717	
4	0.536	–4.71	0.066	–0.27	0.694	–3.18
5	0.515	–3.93	0.081	–1.38	0.675	–2.80
6	0.493	–4.21	0.087	0.60	0.655	–2.98
7	0.478	–3.00	0.096	1.85	0.639	–2.35

NOTE: Based on annual hospital sets. See Table 2.1 for sample sizes.

[a]Each RCC includes both capital and operating costs.

In the next section we examine the implications of these findings about RCCs for cost outlier policy.

4. Effect of RCC Inaccuracy on Payment

In this section, we first show how inaccuracies in the RCC affect the estimated cost of cases and the distribution of cost outlier payments under current policy. The previous section showed the existence of problems hypothesized to afflict estimation of the cost of cost outlier cases: RCCs are declining over time and the RCC for an outlier bundle of services is lower than the RCC for a typical case. Thus, we know the direction of the effect: The cost of cost outliers will be overestimated and cost outlier cases will be overpaid relative to policy intent. In this section, we demonstrate the magnitude of this effect and its implications for payments. Then we evaluate the effect of two possible changes to cost outlier calculations designed to ameliorate problems with the RCC.

Effect of RCC Problems on Payments Under Current Policy

Estimates of Cost per Case

Table 4.1 shows the cost of cases, classified by their outlier status, estimated in various ways. All costs include both operating and capital components. The column headed "Departmental RCC" contains our best estimate of the average cost of each type of case. Although problems with this method were discussed in Section 2, we believe it is better than the others used in the table, because it accounts for systematic variations in markup across departments and accommodation costs and because it is based on cost report data that are contemporaneous with the case.

Table 4.1

Estimates of Cost, by Method and Type of Case

Type of Case	Departmental RCC	Current RCC	2 RCCs	2 RCCs, Deflated
All	6,209	6,563	6,355	6,101
Non-outlier	5,412	5,648	5,490	5,270
Day only	23,156	22,720	23,786	22,834
Cost only	36,173	45,290	39,702	38,113
Both, pay day	43,941	45,816	46,555	44,693
Both, pay cost	56,800	68,550	62,963	60,444

The column headed "Current RCC" gives our approximation to the estimated cost that is used to determine cost outlier status and payment amount under current policy. This approximation is the RCC from PPS VI times covered charges for the case. This method overestimates the cost of the average case ($6,563 versus $6,209, an increase of 5.7 percent). However, it overestimates the cost of cases paid under the cost outlier formula by much more: Cases that exceed the cost outlier threshold, but do not exceed the day outlier threshold (labeled "Cost only" in the table) have their cost overestimated by 25.2 percent; cases that exceed both thresholds have their cost overestimated by 20.7 percent. The average for both cost outlier categories is 22.9 percent.

The overestimate of the cost of cost outlier cases by the current RCC formula effectively changes the meaning of the cost outlier threshold and marginal cost factor. It thereby causes individual cost outlier cases to be paid much more than is intended by policy. The payment amount is calculated by taking the difference between the estimated cost for the case (after standardization) and the cost outlier threshold and multiplying this difference by the marginal cost factor. The overestimate of costs means that the actual cost of a case when it becomes eligible for cost outlier payment is much lower than the stated threshold. For the average cost outlier case, the actual cost outlier threshold is 81.3 (= 100/1.229) percent of the stated threshold.

More important, the overestimate of costs changes the meaning of the marginal cost factor. This factor was originally intended to reflect the ratio between short-run marginal cost and average cost of the case. It can also be interpreted as the fraction of the excess costs that are insured.

The marginal cost factor balances the benefits of insurance against moral hazard.[1] The result of an overestimate of cost outlier case costs is that the balance is shifted much more toward the provision of insurance and away from decreasing moral hazard. The actual insurance percentage is the multiplier used for payment times the ratio of estimated cost to actual cost for the case. Thus, under current policy, the actual insurance percentage is typically 0.922 (= 0.75 * 1.229). Thus, current policy typically provides reimbursement for 92.2 percent of services in excess of the actual cost threshold rather than the intended 75 percent.

The "2 RCCs" column shows the cost that would be estimated for each case type if separate RCCs were to be used for ancillary services and for accommodation services. The RCCs come from the PPS VI cost report just as for the "Current RCC" column. Using these two RCCs greatly reduces the overestimate of cost

[1]Keeler et al. (1988) describe in more detail how the insurance fraction is used in this tradeoff.

outlier case costs—from 22.9 percent to 10.3 percent. A substantial fraction of the overestimate of costs by the current policy is due to the mix of ancillary and accommodation services in current cost outlier cases. If separate RCCs were used to standardize charges in the cost outlier formula, the effective insurance fraction would be reduced from 0.922 to 0.827.

An implication of the substantial improvement in cost measurement from using two RCCs is that the inaccuracy in cost measurement under current policy contravenes another aspect of current policy, in addition to the balance between insurance and moral hazard. To maximize insurance, within each DRG, the identity of cost outlier cases and the amount of payment should depend only on case cost. But the effect of the current measurement scheme is that cases face different cost outlier thresholds depending on the mix of ancillary and accommodation services required by the patient. Further, after controlling for case costs, the amount of the cost outlier payment depends on the service mix.

Case cost estimates are affected by the secular decline in RCC as well as by the differential markups between ancillary and accommodation charges. We saw in the last section that no predictions of the rate of decline in RCC at individual hospitals were much better than the mean rate of decline. Multiplying the RCC at each hospital by the same rate of decline is equivalent to multiplying all the numbers in the "Current RCC" column by that rate and this can do nothing about the differential overprediction of the cost of cost outlier cases. Since we found that most of the decline is in the ancillary RCC, we show in the last column the cost estimated when the ancillary RCC from PPS VI is first multiplied by 0.96 to reflect its expected 4 percent decline and the accommodation RCC is unchanged. This estimate reduces the estimated cost of cost outlier cases so the total overprediction becomes only 6 percent. In addition, it underestimates the cost of the average case by only 1.7 percent.

Current plans call for the elimination of day outlier payments. If these plans are put into effect, cases that are now paid the day outlier amount and that exceed the cost outlier threshold will be paid under the cost outlier formula. As one can see from the "Both, pay day" row of Table 4.1, using two RCCs slightly increases the estimated cost of these cases compared to the current method. This is because a larger proportion of charges are for accommodations, which have a larger RCC than other services. Thus, these cases would be entitled to larger cost outlier payments under the two-RCC rule than under the current rule. Although using the ancillary deflator and two RCCs reduces the estimated cost below the estimate from the current method, the estimated cost remains above that from the departmental RCC method.

Distribution of Cost Outlier Payments

The current cost outlier payment formula overestimates the cost of a typical cost outlier case because of the differential markup of ancillary and per diem services and the temporal decline in RCCs, especially the RCC for ancillary services. How much do these problems affect the distribution of cost outlier payments across hospitals? Table 4.2 shows the relationship between the amount of cost outlier payments received by a hospital in our simulation and these two sources of inaccuracy in its RCC. Because we simulated a fully phased-in capital PPS, we use the sum of operating and capital outlier payments and the sum of capital and operating RCCs.

Each row in Table 4.2 covers a set of hospitals defined by the percentage of reimbursement that they received from cost outlier payments, rounded to an integer. Thus, the first row covers the 2,414 hospitals that received less than a half of one percent of their reimbursement through cost outlier payment. These hospitals had higher than average ancillary RCCs in both PPS VI and PPS VII, and a much smaller than average decline in ancillary RCC from PPS VI to PPS VII. As one would expect from the way payments are made and as may be seen by examining all rows of Table 4.2, the amount of cost outlier payments is much less related to the level of the PPS VI ancillary RCC than to the decline in RCC from PPS VI to PPS VII.

The last three columns of Table 4.2 show the relationship between the amount of cost outlier payments received by a hospital in our simulation and differential markups of ancillary and per diem services. We choose to present this in the markup form (i.e., the percentage by which charges exceed cost) rather than RCC because the difference in the markups seemed more intuitively meaningful than the difference in RCCs. The strong positive correlation between the percentage of cost outlier payments and the difference in markups between ancillary and accommodation services is immediately apparent.

We have seen that the problems with the RCC interfere with management of cost outlier policy and that the effect of current policy differs from its stated intent. Further, the data in Table 4.2 show that the hospitals that get the most outlier payment have higher than average errors in their RCCs from both differential markups and stronger than average trends in the ancillary RCC. Next, we examine the extent to which improved cost estimates change reimbursement amounts.

Table 4.2

Relationship Between Ancillary RCC, Markups, and Cost Outlier Reimbursement Under Current Policy

% of Reimbursement from Cost Outliers	Ancillary RCC			Ancillary Markup	Per Diem Markup	Difference	No. of Hospitals	No. of Cases
	PPS 6	PPS 7	% Change					
0	0.494	0.488	–0.09	123.6	–0.9	124.5	2,414	452,895
1	0.465	0.454	–2.32	137.6	5.3	132.3	657	346,671
2	0.470	0.450	–4.13	139.2	4.6	134.6	473	268,094
3	0.463	0.445	–3.82	138.3	–0.5	138.9	343	217,935
4	0.462	0.445	–4.22	138.0	–4.6	142.6	258	181,957
5	0.462	0.427	–7.67	155.0	–1.3	156.3	178	111,793
6-7	0.463	0.438	–5.28	143.6	–6.5	150.2	201	118,841
8 +	0.425	0.401	–5.90	178.7	–6.2	184.9	243	125,685
Total	0.469	0.454	–3.37	138.8	0.0	138.8	4,767	1,823,871

Alternative Policies

We simulated two alternatives to the current payment of cost outliers. In one alternative we estimated the cost of the case using separate RCCs for ancillary and per diem charges. Just as in the two-RCC method used in Table 4.1, we multiplied ancillary charges by the ancillary RCC calculated from the PPS VI cost report and multiplied accommodation charges by the accommodation RCC from the same PPS VI time period. In the other alternative, to estimate case cost, we multiplied the ancillary RCC by 0.96 to account for deflation and used the same accommodation RCC. In both alternatives, the new estimate of cost was then treated just as in the current cost outlier formula.[2]

All the simulations pay approximately the same total reimbursement amount. To accomplish this we reduced the constant in the cost outlier threshold formula to account for the fact that the alternatives lower the estimated cost for the case. The outlier threshold constant was $27,100 for the current policy, $21,200 for the "2 RCCs" case, and $19,600 when the ancillary RCC was deflated (labeled "2 RCCs, deflated" in the tables). The threshold is the maximum of twice the DRG payment and the constant.

Outcomes of Alternatives

Table 4.3 provides summary statistics for each simulation. As we expected, improving the measurement of cost outlier case costs decreases the amount of outlier payment per outlier and increases the number of outlier cases. The rows labeled "Average outlier payment per case" show the per case payment amounts for each type of outlier. Using two RCCs shifts funds from "Day only" cases to cases that exceed both thresholds. Exactly the same day outlier thresholds were used for both runs. What happened was that the cost outlier formula using two RCCs identified more day outliers as cost outliers.[3] The reimbursement line of the table shows that, as intended, total reimbursement is similar in all three simulations.

---

[2]The estimated cost is adjusted using payment factors for teaching and disproportionate share, and the potential cost outlier payment is calculated as 0.75 times the difference between the adjusted cost and a threshold.

[3]Out of all cases that exceed the day outlier threshold, the percentage of cases that also exceed the cost outlier threshold was 39.3 percent in the current method, 54.7 percent in the two-RCC case, and 58.3 percent in the "2 RCCs, deflated" case. In New York state, which has an exceptionally large number of day outlier cases, the percentage of day outlier cases that were also cost outliers doubled. The New York numbers are: 17.4, 30.8, and 34.5, respectively. New York actually experienced a small increase in its outlier payments from the improvement in cost estimation. We expect that the increase would be substantial in the absence of day outlier payments.

Table 4.3

Summary Statistics Comparing Current Policy to Outlier Alternatives

Statistic	Current RCC	2 RCCs	2 RCCs, Deflated
Percent outlier cases	2.70	2.91	3.02
Average outlier payment per outlier ($)	9,338	8,652	8,396
Average outlier payment per case ($)			
Day only	47	31	29
Both, pay day	41	49	51
Both, pay cost	103	112	113
Cost only	61	60	61
All outliers	252	252	254
Average reimbursement ($)	5,953	5,952	5,953
Average cost	6,209	6,209	6,209
Average profit ($)	–257	–257	–256

Many hospitals have no or very few cost outliers and our alternative polices have little effect on these hospitals. The two-RCC policy changes reimbursement from its current amounts by less than half of one percent for 77 percent of hospitals. However, 62 hospitals gain more than 2 percent of revenue and 92 hospitals lose more than 2 percent of revenue from this policy. The statistics for the policy with deflator are very similar.

Although total reimbursement for most hospitals will change very little, we still wish to know if the hospitals that receive a lot of cost outlier reimbursement under current policy do so because of errors in cost measurement. Table 4.4 shows outlier payments for groups of hospitals defined by the amount of cost outlier payments received by the hospital in our simulation of current policy. These are the same hospital groups used in Table 4.2 and number of hospitals and cases for each row may be found in that table. The first three columns of the table show the average payment per case from the cost outlier formula in our three simulations and the last three columns show the total outlier payment per case. Because cases change from cost outlier to day outlier between simulations (and vice versa), the last three columns are a better measure of the net effect of the policy change. The average hospital in the last group of 243 hospitals in the table would lose about $104 (from $759 to $655) per case in outlier payments (or 14 percent) if separate RCCs were used for ancillary and accommodation charges. The next group would lose only one dollar per case. All other groups of hospitals would actually gain outlier payments. This suggests that under current policy only a few hospitals gain an unfair advantage because of their RCCs.

Table 4.4

Outlier Payments for Alternative Policies, by Percentage of Reimbursement from Cost Outliers Under Current Policy

% Outlier Reimbursement	Cost Outlier Payment per Case			Total Outlier Payment per Case		
	Current RCC	2 RCCs	2 RCCs, Deflated	Current RCC	2 RCCs	2 RCCs, Deflated
0	6	15	18	125	130	132
1	52	71	75	144	155	157
2	110	136	140	186	202	204
3	166	188	190	247	260	262
4	228	254	256	313	326	327
5	298	319	320	364	375	376
6-7	391	401	402	465	464	463
8+	710	610	609	759	655	653
Total	163	173	175	251	253	254

Table 4.5 arranges hospitals according to their profit per case under the current method. The first row concerns all the hospitals with the lowest per case Medicare profit; these hospitals care for 10 percent of cases. These hospitals are getting the largest amount of total outlier payments under current policy ($394 per case) but are still losing $2,169 per case. Going to two RCCs increases their outlier payments, but by only $31 per case ($394 to $425), or 8 percent. The hospitals in the lower half of the profit distribution are net gainers, and the hospitals in the higher half of the profit distribution are net losers. Thus, going to separate RCCs slightly increases the correlation between cost and reimbursement under PPS and, because the error being eliminated is imprecise measurement, it improves the equity of PPS.

Table 4.5

Outlier Payments and Profit per Case for Alternative Policies, by Profit in Base Case

Profit Percentile	Outlier Payment per Case			Profit per Case		
	Current RCC	2 RCCs	2 RCCs, Deflated	Current RCC	2 RCCs	2 RCCs, Deflated
0 to 10	394	425	429	-2,169	-2,136	-2,133
10 to 25	290	309	311	-1,148	-1,129	-1,126
25 to 50	243	244	246	-548	-548	-546
50 to 75	182	173	174	20	12	13
75 to 90	188	181	181	599	593	592
90 to 100	346	320	320	1,745	1,706	1,706
All hospitals	252	252	254	-257	-257	-256

Why is the improvement in the correlation between cost and reimbursement so small? Table 4.6 continues our examination of the hospital groupings based on percentage of reimbursement from cost outlier payments. It shows the average profit per case under our three simulations. Despite the errors in measurement, Medicare profit per case is strongly negatively correlated with percentage of payments from cost outliers under the current system. Thus, although the measurement of per case loss under the current cost outlier policy is far from perfect, it does identify hospitals that are faring very poorly under PPS. The change to separate RCCs of course makes their situation worse.

Table 4.7 shows the average profit per case for various groups of hospitals. There are few large changes. As we saw in Section 3, errors in the RCC are found in most groups of hospitals and thus no one hospital group would either gain or lose substantially from improved measurement of costs.

Table 4.6

Profit per Case for Alternative Policies, by Percentage of Reimbursement from Cost Outliers Under Current Policy

% Outlier Reimbursement	Current RCC	2 RCCs	2 RCCs, Deflated
0	300	306	308
1	-32	-21	-18
2	-241	-224	-222
3	-418	-405	-403
4	-651	-635	-635
5	-657	-645	-646
6-7	-1,028	-1,030	-1,031
8+	-1,116	-1,243	-1,245

Table 4.7

Average Profit per Case, by Hospital Characteristics for Simulated Policies

Hospital Characteristic	Base Policy	2 RCCs	2 RCCs, Deflated
Location			
Rural	–132	–133	–131
Small urban	–396	–396	–396
Large urban	–189	–190	–188
Region			
New England	–172	–172	–168
Mid-Atlantic	195	199	202
S. Atlantic	–565	–561	–560
E. N. Central	–449	–461	–461
E. S. Central	–207	–222	–221
W. N. Central	–341	–334	–335
W. S. Central	–453	–451	–450
Mountain	59	66	66
Pacific	–87	–83	–82
Bed size			
0–49	–234	–231	–229
50–99	–142	–140	–138
100–199	–297	–297	–278
200–299	–421	–418	–416
300–499	–222	–228	–227
500+	–120	–119	–121
CMI < 1	7	10	11
1.00 ≤CMI < 1.25	–284	–282	–278
1.25 ≤CMI < 1.50	–328	–324	–321
1.50 ≤ CMI	–148	–160	–163
Teaching			
None	–403	–402	–399
Minor	–286	–279	–278
Major	855	814	811
Disproportionate share			
Yes	74	65	65
No	–445	–440	–439
Type of control			
Government	–66	–57	–57
Nonprofit	–252	–249	–248
Proprietary	–506	–542	–539
Total	–257	–257	–256

5. Conclusions

Throughout the period from PPS III through PPS VII, RCCs declined at a rate of 2 to 3 percent a year. The hospital's own operating RCC has been used to calculate cost outlier payments for operating costs since FY 1989. A single national operating RCC was used in earlier years. Both before and after this change, hospitals could increase reimbursement for cost outlier cases by increasing overall markups. Before the change, increases in markups had a cumulative effect, increasing outlier payments as long as the markup was not reduced. After the policy change, a markup affects outlier payments only until the cost report for the period in which the markup occurs is settled. This policy change evidently had little net effect on the national RCC as the rates of change in the last two years of our study period are clearly comparable with the earlier period. It is reasonable to assume that this rate of decline will continue in the short run. This assumption can be used to set cost outlier thresholds that attain the goal for the total amount of outlier payments. If this is done, the RCC decline should be monitored to verify the accuracy of the thresholds.

An earlier year's RCC is a good, but far from perfect, predictor of the current RCC for a hospital. For one-year intervals, the correlations range from 0.87 to 0.93. For periods two years apart, the correlations range from 0.79 to 0.87. We tried various models to improve prediction. Although the models were often statistically significant, they did not produce much more accurate predictions than the previous RCC deflated by a national rate of decline.

Cost outlier cases typically have a higher percentage of ancillary charges and a lower percentage of accommodation charges and the RCCs for ancillary services tend to be much lower than the RCCs for accommodation services. Further ancillary RCCs are declining while accommodation charges appear to be changing proportionally to costs. Thus, the average cost of outlier cases is overestimated in the cost outlier payment formula and therefore cost outlier payments per case are higher than intended by policy. It is possible (and we would judge likely) that the difference between the two RCCs is more a response to the policies of private payers than to Medicare outlier payment policy. No matter what its cause, the result is that the difference interferes with the attainment of policy goals.

The inaccurate estimate of the cost of cost outlier cases contravenes current policy intent in two important ways. First, it changes the fraction of the excess costs

that are insured from the intended 75 percent to 92 percent. Second, cases with the same cost and DRG face different cost outlier thresholds, and therefore receive different payment amounts, depending on the mix of ancillary and accommodation services required by the patient.

It would be possible to improve the measurement of the cost of cost outlier cases by using separate RCCs for ancillary and accommodation charges. Under current policy, we estimate that cost outlier cases are overestimated by 23 percent. Using two RCCs reduces the overestimate to 10.3 percent. Accounting for the greater temporal rate of decline of ancillary RCCs further reduces the overestimate to 6 percent.

The improvement in cost measurement would increase provider equity. A few hospitals obtain additional cost outlier payments because of their pricing structure. There were 92 hospitals in our simulation that lost more than 2 percent of revenue by a change to using two RCCs. The 243 hospitals that received more than 8 percent of Medicare revenue from cost outliers would lose an average of $104 per case. These losses are then redistributed across all hospitals in a more accurate relationship to the actual cost of their cases.

This improvement in cost measurement would produce a modest improvement in the fit between cost and reimbursement. The improvement is quite modest because many of the hospitals that would lose under the new policy already have substantially lower than average profit per case. Changes in reimbursement for the usual demographic groups of hospitals are generally small, because inaccuracies in the RCC appear in all groups.

ProPAC has suggested using a multiple of 0.80 instead of 0.75 in the cost outlier payment formula. Under the current single RCC, this is equivalent to reimbursing an average of 98.3 percent of expenses beyond the effective cost threshold. For many cases the payment would exceed long-run marginal cost, thus giving hospitals an incentive to provide additional care that is not cost-effective. Therefore, it would seem wise not to increase the multiplier unless one simultaneously went to a two-RCC model.

Although the improved cost measurement has only modest effects, the effects are all in the right direction. Further the cost of the improvement seems very small. Thus, although not urgent, it seems like the right thing to do. If day outliers are eliminated as planned and the outlier pool remains at 5 to 6 percent, then the accuracy of cost outlier payments will become even more important.

References

Ashby, Jack, *The Accuracy of Cost Measures Derived from the Medicare Cost Report*, ProPAC Intermural Report I-93-01, Washington, D.C., March 1993.

Carter, Grace M., and Donna O. Farley, *Improving Medicare's Policy for Payment of Unusual Hospital Cases*, RAND, R-4216-HCFA, 1992.

Carter, Grace M., and Glenn A. Melnick, *How Services and Costs Vary by Day of Stay for Medicare Hospital Stays*, RAND, R-3870-ProPAC, March 1990.

Carter, Grace M., and Jeannette Rogowski, "How Pricing Policies, Coding, and Recalibration Method Affect DRG Weights," *Health Care Financing Review*, Vol. 14, No. 2, Winter 1992, pp. 83–96.

Carter, Grace M., and J. David Rumpel, *Payment Rates for Unusual Medicare Hospital Cases*, RAND, R-4208-HCFA, 1992.

Carter, Grace M., and J. David Rumpel, *The Interaction Between Payment Adjustors and the Size of the Outlier Pool Under Medicare's Prospective Payment System*, RAND, MR-192-HCFA, 1993.

Federal Register, "Inpatient Hospital Prospective Payment System and FY 1993 Rates ," Vol. 57, No. 170, September 1, 1992, pp. 39746–40021.

Federal Register, "Prospective Payment System for Inpatient Hospital Capital Related Costs: Final Rule," Vol. 56, No. 169, August 30, 1991, pp. 43358–43524.

Hospital Association of New York State, "Analysis of the Health Care Financing Administration's Proposal to Change Outlier Policy," June 15, 1992.

Keeler, Emmett B., Grace M. Carter, and Sally Trude, "Insurance Aspects of DRG Outlier Payments," *Journal of Health Economics*, Vol. 7, 1988, pp. 193–214.

Newhouse, Joseph P., Shan Cretin, and Christina J. Witsberger, "Predicting Hospital Accounting Costs," *Health Care Financing Review*, Vol. 11, No. 1, Fall 1988, pp. 25–33.

Prospective Payment Assessment Commission (ProPAC), *Report and Recommendations to the Congress*, , Washington, D.C., March 1993.