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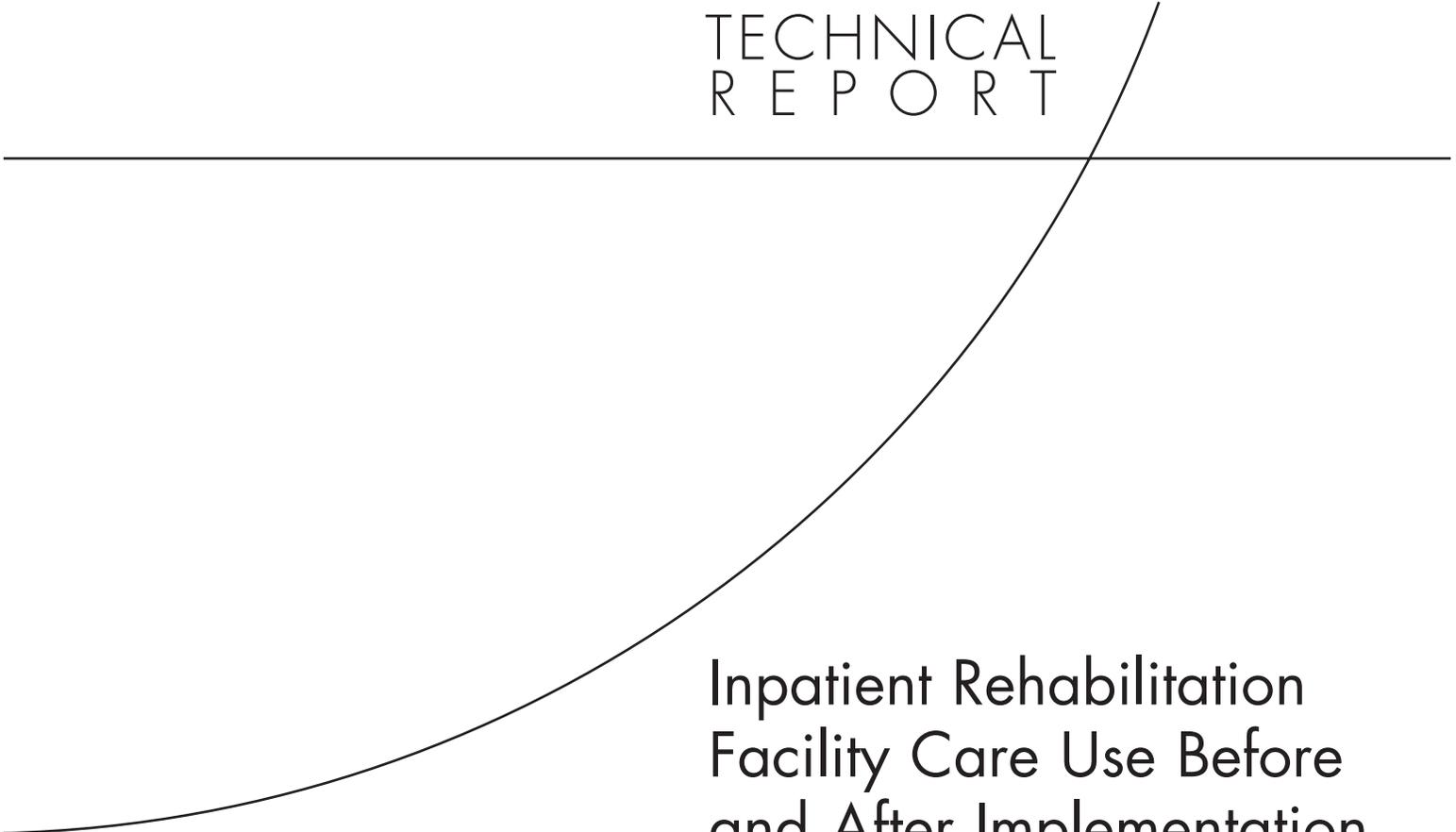
Inpatient Rehabilitation Facility Care Use Before and After Implementation of the IRF Prospective Payment System

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Preface

Since the inception of the Inpatient Rehabilitation Facility Prospective Payment System (IRF PPS) in 2002, the RAND Corporation has been contracted by the Centers for Medicare and Medicaid Services (CMS) to support its efforts to monitor the effect of the IRF PPS. To date, RAND has provided a number of analyses and reports on patient access to and utilization of IRF services before and after the implementation of the IRF PPS. Our reports address the Congressional mandate for a study of IRF patient access to care.

This report focuses specifically on how the implementation of the IRF PPS has affected the characteristics and resource use of patients seen in IRFs and IRF practice patterns. This report was prepared for CMS, but should also be of interest to individuals in the health care and policy-making arenas who are concerned about Medicare beneficiaries' access to care.

This work was sponsored by CMS under contract 500-2004-00033c.[1] Comments or inquiries should be sent to the first author of this report, Melinda Beeuwkes Buntin (Buntin@rand.org). We would like to thank reviewers Dan Relles and Korbin Liu, and our project officer Jeanette Kranacs for helpful comments and suggestions. The research was conducted in RAND Health, a division of the RAND Corporation. A profile of RAND Health, abstracts of its publications, and ordering information can be found at www.rand.org/health.

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Acronyms

CMG	Case mix group
CMI	Case mix index
DSH	Disproportionate share
HHA	Home Health Agency
IME	Indirect Medical Education
IRF	Inpatient Rehabilitation Facility
IRF PAI	Inpatient Rehabilitation Facility Patient Assessment Instrument
IRF PPS	Inpatient Rehabilitation Facility Prospective Payment System
LOS	Length of stay
MDS	Minimum Data Set
PTC	Payment-to-cost
RIC	Rehabilitation Impairment Category
SNF	Skilled Nursing Facility

Chapter I. Background and Executive Summary

The Medicare program began to phase in the Inpatient Rehabilitation Facility Prospective Payment System (IRF PPS) on January 1, 2002. IRFs are specialized hospitals or hospital units that provide intensive rehabilitation (generally three or more hours a day of therapy) in an inpatient setting. Under the IRF PPS, Medicare pays facilities a predetermined rate per discharge that varies by case mix group (CMG). The CMG depends on the patient's age, impairment, functional status (motor and cognitive) at admission, and comorbidities. In addition, facilities receive special rates for patients who die in the hospital, short-stay transfer patients, atypically short-stay patients, and high cost outliers. The rate also varies across facilities based on area wages, the share of a facility's patients that are low income, and rural location. Previously, inpatient rehabilitation facilities were paid using a historical cost-based system.

The shift from cost-based to prospective payment gives facilities incentives to provide care efficiently, since they can keep any difference between the prospectively set payment amounts and their costs. However, it also gives facilities incentives to change their care and practice patterns in other ways and to change their coding practices to increase revenue. Changes could take the form of adjustments to the way patients are assessed and their diagnoses and functional status are coded, changes in treatment intensity and length of stay, changes in transfer policies, and changes in admissions policies. In addition, some changes coinciding with the new PPS could be due to other Medicare rules or other changes taking place in the health care system. These changes, no matter what their cause, could have adverse or beneficial effects on patients and/or cause unwarranted increases in Medicare expenditures.

In this chapter we describe changes in incentives due to the implementation of the prospective payment system, and then briefly summarize the work presented in detail in the following chapters on monitoring use of IRF care. Two related project reports describe changes in the use of post-acute care generally and probe whether there are real changes in the severity of patients seen in IRFs (Beeuwkes Buntin et al., 2005; Carter G and Paddock SM, 2005).

1.1 Payment System Changes

Before looking at the results of monitoring IRFs' responses to the IRF PPS, it is important to understand how the payment system works and particularly the incentives provided by the payment system. The Balanced Budget Act of 1997, as amended by the Balanced Budget Refinement Act of 1999 and the Benefits Improvement Act of 2000 provided for a per discharge PPS. IRFs began to be paid under the prospective payment system on the first day of their fiscal year following January 1, 2002. Thus, some facilities fell under the system immediately, while the payment system was effective for others as late as December 2002. Regardless of fiscal year, however, IRFs were required to submit patient assessment forms beginning on January 1, 2002.

The IRF PPS payment system assigns cases to CMGs in order to establish payment amounts. Each CMG has a relative weight reflecting the average cost per case for Medicare patients assigned to the CMG relative to the average cost per case for all Medicare patients receiving IRF care. To determine payment, the standard rate (adjusted for the IRF's geographic location and proportion of low-income patients) is multiplied by the CMG relative weight. Payments are increased by an outlier supplement for very expensive cases. Also, short-stay transfer cases are paid on a per diem basis, where the amount of the per diem depends on CMG.

The data used to assign CMGs to each IRF patient come from the IRF Patient Assessment Instrument (PAI). In order to assign a CMG, each case is first classified into one of 21 Rehabilitation Impairment Categories (RICs). Most RICs are based on particular body structures and/or causes of impairment.

Each RIC is subdivided into CMGs based on functional independence and age. Functional independence is determined by the response to 17 questions on the IRF PAI. The sum of 12 items is used to create a motor score, and the remaining five items are summed for a cognitive score. The values of motor and cognitive scores and patient age determine the patient's CMG assignment within RIC. The CMG assignment rules were derived in order to maximize the ability to predict cost under the constraint that payment for care of a patient with a lower score (less independence) is never less than for care of an otherwise similar patient with a higher score.

Comorbidities are used to split most CMGs into four payment subgroups: three comorbidity tiers and a subgroup with no relevant comorbidity. Comorbidity tier affects the relative weight used for payment in the CMGs. Tier 1 comorbidities are the most costly and have the highest relative weight within the CMG followed in order by tiers 2 and 3. The least expensive subgroup, which is the one with the lowest weight within each CMG, consists of patients with no relevant comorbidity. Patients that have comorbidities in more than one tier are assigned to the most expensive of those tiers. Multiple comorbidities in the same or lower tiers do not affect payment.

Payment CMGs are calculated during bill processing and depend on the discharge destination shown on the bill, the length of stay, and the admission CMG previously assigned. The payment CMG is the same as the admission CMG for cases with a stay more than three days in the hospital and who are discharged alive. Transfer cases who stay 3 or fewer days also remain in the admission CMG. Non-transfer cases who stay 3 or fewer days and cases who die in the hospital are assigned to one of 5 special payment CMGs.

One goal of the IRF PPS is to enhance access to IRF care by compensating IRFs based on their case mix. Prior to the IRF PPS, payment for inpatient rehabilitation care for Medicare beneficiaries had been made under the Tax Equity and Fiscal Responsibility Act (TEFRA) of 1982 (as amended by subsequent legislation). TEFRA capped per discharge payments to an inpatient rehabilitation facility at a facility-specific maximum that was determined using the IRF's base year of operation from which facility-specific costs were estimated. Under TEFRA, there was no adjustment to payments due to changes in a hospital's case mix the base year. Updates to the rates did not keep up with inflation, thus allowing new hospitals to obtain larger payments than existing hospitals. The lack of case mix adjustment under TEFRA created incentives for providers to preferentially admit relatively less expensive cases, thus raising concerns that TEFRA limited beneficiary access. The IRF PPS was expected to enhance access by providing greater levels of reimbursement for those with greater clinical needs (Stineman, 2002). Another goal of the IRF PPS is to control Medicare's inpatient rehabilitation expenditures. Cases who did not fulfill an entire course of rehabilitation, such as short stays and transfers, were fully compensated under TEFRA. IRFs took advantage of

incentives under TEFRA to maximize payment. This led to increased utilization and cost during the base year(s), as well as afterward, relative to pre-TEFRA years, thus resulting in increased expenditures for the Medicare program (Chan et al., 1997). By 1995, payments exceeded costs by 7 percent in freestanding rehabilitation facilities and 4 percent in rehabilitation units (MedPAC, 1998).

1.2 Provider Responses to PPS

The implementation of prospective payment can trigger a range of effects among providers (Ellis and McGuire, 1996). Providers can succumb to *stinting* on the amount of care delivered, for example by reducing therapy intensity. Providers can engage in *selection behavior*, such as changing their admission policies so as to restrict access for patients not likely to be profitable and increase admission rates for patients who are likely to be profitable. Providers can alter their *coding practices* for patient functional status in order to increase payments without changing their case mix; this coding could occur in the form of deliberate upcoding or in response to changes in coding instructions, better training of coding staff, and incentives under the new payment system to thoroughly code patients' limitations. On the positive side, providers might respond to prospective payment by becoming more *efficient* and produce equivalent health outcomes with fewer inputs. Providers who experienced fiscal pressure under the former payment system might be able to admit patients who are more *medically complex* or who have lower functional status than before.

Provider responses to prospective payment across a variety of care settings have been documented that highlight the potential for stinting. In a large, nationally representative sample of Medicare beneficiaries from 297 hospitals, Kahn et al. (1992) found that the length of stay (LOS) after implementation of the PPS for acute care hospital inpatient services dropped significantly for all of the conditions studied despite patients being sicker at admission post-PPS versus pre-PPS and that there was greater instability among patients at discharge following implementation of the PPS. Neu and Harrison (1988) found that this observed decrease in the average length of an acute care stay was accompanied by increases in Skilled Nursing Facility (SNF) and Home Health Agency (HHA) utilization following an acute care stay, indicating the potential for a shift of care that had been previously provided by the acute care hospital to other settings. The

effect of the Balanced Budget Act (BBA) of 1997 on post-acute care has also been examined. Angelelli et al. (2002) found that the lengths of stay and readmission rates of the costliest, most medically complex patients discharged to nursing facilities in Ohio post-BBA versus pre-BBA were quite steady over time, while Yip et al. (2002) found decreases in the intensity and duration of physical and occupational therapies among Medicare beneficiaries in three southern California SNFs. White (2003) similarly concluded that the proportion of patients in freestanding SNFs receiving high levels of therapy declined after the SNF PPS was implemented.

Selection behavior effects have been found as well. In a small sample of Medicare beneficiaries in three southern California SNFs following implementation of the SNF PPS, Yip et al. (2002) found that patients admitted post-PPS had conditions with better-defined (i.e., more predictable) care protocols, though patients had worse scores on health-related quality of life and functional status but better scores on emotional health. Newhouse (1989) found that acute PPS discharges for which the payment was relatively less generous increasingly were admitted to "last resort" public hospitals under the acute PPS.

Coding change has been identified under prospective payment implementation. One-half of the increase in the case mix index of Medicare patients at acute care hospitals in FYs 1987 and 1988 was attributed to changes in coding and administrative practices, resulting in increased Medicare expenditures (Carter, Newhouse, and Relles, 1991). Coding changes were expected following the IRF PPS since providers did not previously have an incentive to thoroughly code patient comorbidities; comorbidities garner additional payment under the IRF PPS that did not exist under the TEFRA system. The IRF PAI used under the IRF PPS to collect patient admission and discharge information on functional status, was slightly modified from the FIM™ Instrument (Uniform Data System for Medical Rehabilitation, 1997) that was used prior to the IRF PPS, which could also cause coding change.

1.3 Monitoring the IRF PPS

The goals of the IRF PPS and the theoretical and observed effects of prospective payment led to the analyses described in this report. It focuses on two areas: changes in beneficiary access to and use of IRF care and responses to specific incentives created by

the payment system. In monitoring access to care it is important to describe trends in the use of IRF care, monitor the types of beneficiaries accessing IRF care, and look for evidence that payment changes affect beneficiary access to IRFs. As mentioned above, the shift from cost-based to prospective payment gives facilities incentives to provide care efficiently, since they can keep any difference between the prospectively set payment amounts and their costs. However, it also gives facilities incentives to selectively treat patients who are expected to have below-average costs within a payment category and to change their coding practices. It was important to monitor, therefore, IRF changes in utilization patterns, responses to special payments for atypical patients, resource use in IRFs, and coding changes. This report also addresses the Congressional mandate for a study of IRF patient access to care.

1.4 IRF Utilization Patterns

Patterns of utilization within IRFs were examined for evidence of changes. Patterns in IRF care observed in the analysis of 2002 data were largely consistent with the incentives created by the IRF PPS and with trends previously observed from 1996 through 1999. There was an increase in the number of IRFs caring for Medicare patients and a larger increase in the number of Medicare beneficiaries seen in IRFs between 1999 and 2002 in both absolute terms and on a per eligible beneficiary basis. There was also a shift in the composition and/or *coding* of patients seen in IRFs after the implementation of the IRF PPS. A greater proportion of patients were coded as having comorbidities and motor and cognitive functioning scores declined.[2] More details can be found in Chapter 3 of this report.

1.5 Unusual Cases

Specific types of patients with atypical stays were examined to see if prospective payment might shift patients across sites. Under the IRF PPS, typical cases are defined as those who stay more than 3 days, receive a full course of inpatient rehabilitation, and are discharged to the community. Special payment rules apply to most unusual cases who deviate from this pattern. There are anticipated behavioral changes in response to these rules that might occur under the IRF PPS if an IRF tries to maximize net revenue. The

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[2] Patients are coded into tiers based on their comorbidities. Tier 1 is the most expensive tier. A greater ability to function independently is captured in higher functioning scores.

incentives are specific to the payment policies for unusual cases and may interact with other incentives to reduce costs and increase revenues.

For the most part, IRF facilities responded in anticipated ways to the financial incentives created by the various policies for very short-stay cases and interrupted stays.[3] In particular, there is evidence of:

- A reduction in non-transfer stays lasting fewer than 3 days and an increase in non-transfer stays lasting 4-5 days. The proportion of non-transfer cases considered very short-stay cases declined about 10 percent.
- A reduction in the proportion of interrupted stays lasting fewer than 3 days and an increase in the proportion lasting 4-5 days.
- A substantial increase in short-stay transfers that was largely offset by a decline in longer stay transfers so that there was only a small increase in the overall transfer rate. We assume that the increase in short-stay transfer rates largely reflects the overall trend toward shorter stays.
- There was an increase in the transfer rates to acute care hospitals but an unexpected decline in transfer rates to SNFs and nursing homes.

Freestanding hospitals showed stronger behavioral responses than units to the incentives created by the payment policies for very short stays and interrupted stays. For interrupted stays, the payment-to-cost ratio for freestanding hospitals was 1.00 compared to 0.88 for units of acute care hospitals.

Overall, outlier payments were 3.0 percent of total payments, which was the percentage offset used to establish the initial outlier threshold. Consistent with having lower costs per discharge, freestanding hospitals received 1.2 percent of total payments as outlier payments compared to 4.0 percent for units of acute care hospitals. More details can be found in Chapter 4 of this report.

1.6 Resource Use

Also mentioned above, providers can respond to prospective payment by becoming more *efficient* and/or by *stinting* on care since they can keep differences

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[3] A per diem rate applies to a *short-stay transfer*--a patient with a length of stay that is less than the mean length of stay for the CMG minus 0.5 days who is transferred to another IRF, an acute care hospital, a long-term care hospital, or a Medicare or Medicaid-certified nursing home. Long-stay transfers are paid as a typical case. One CMG payment is made for an *interrupted stay*, which occurs when a patient is discharged and returns to the same IRF within 3 consecutive calendar days. Precise estimates of changes in transfer rates, and therefore also of atypically short-stay cases, are problematic because of inconsistencies in the definitions used to report transfers and the under-reporting of short-stay cases in the 1999 baseline data.

between payments and costs as profit. These changes can be manifest in changes in resource use including changes in IRF LOS, costs (including therapy costs), and payment-to-cost ratios.

Length of stay in IRFs has been declining at least since 1998. There was a particularly large decline in the number of cases with extremely long LOS and an increase in the percentage of cases in most payment groups discharged at the average LOS. The rate of decline increased throughout this period and average LOS declined 5.8 percent from 2001 to 2002, the first year of the PPS. Average LOS declined within each RIC between 1999 and 2002, the two years for which case mix data were available. The rate of decline in LOS varied across groups of hospitals. In general, hospitals that had a relatively long LOS in 1999 had greater percentage declines between 1999 and 2002, thus increasing the uniformity of IRF LOS across the country and across types of hospitals.

The average cost per case increased 1.6 percent between 1999 and 2002. Since LOS declined by 13 percent over this period, the cost per day increased by 16.6 percent. This exceeds the three-year rate of increase in the hospital market basket of 10.9 percent. Therapy costs per day increased at a lower rate (10.6 percent) than other costs in the same period, thus decreasing the percentage of costs devoted to therapy from 24.4 percent to 23.2 percent.

The rate of change in average case costs, daily costs, and payment-to-cost ratios varied across groups of hospitals. In 1999, freestanding cases cost on average $187 more than units but in 2002 they cost $105 less. If all hospitals had been paid based on 100 percent of the PPS rates throughout all of 2002, PPS payments during 2002 would have been 14 percent higher than cost. This is due to the lack of cost growth per case since 1999, the increase in the payment rate by the CMS actuary to account for payment trends under TEFRA, and changes in coding. Payment- to-cost (PTC) ratios varied across groups of hospitals, with freestanding and proprietary hospitals having PTCs of 1.18. In contrast, units had a PTC ratio of only 1.11. Despite the fact that freestanding hospitals had lower costs in 2002 than units, they had longer average LOS. Therefore, it remains possible that the PTC ratio of units was affected in part by accounting practices left over from the TEFRA era; TEFRA cost-based payments were determined through a

cost allocation process and hospitals had an incentive to shift costs from their acute care services, paid under the acute prospective payment system, to the rehabilitation units.

The PTC ratios for other groups of IRFs show the effectiveness of the payment adjustments, with only small variations between rural and urban areas, and by low-income patient, or disproportionate share (DSH), categories. Although payment largely followed costs by RIC and tier, variations in the PTC ratio across these categories show the need to refine the payment parameters of the PPS. There also was a positive correlation between PTC ratio and hospital Case Mix Index (CMI) quartile. In addition to demonstrating that the current weights are inappropriate for the coding practices prevalent in 2002, this may indicate that coding practices varied across hospitals with those in the highest CMI quartile responding most completely to the PPS incentives, or even upcoding. More details can be found in Chapter 5 of this report.

1.7 Limitations

It is important that all of the changes associated with the shift to the IRF PPS be studied in the context of changes in overall patient care use, costs and outcomes. For example, declines in lengths of stay may indicate increases in treatment efficiency if patient outcomes remain steady. Similarly, increases in payments to IRFs could theoretically be offset by decreases in the use of other types of care, such as home health care, following discharge from IRFs. In addition, it should be noted that these analyses reflect the latest data available, but that they cover only the early stages of the IRF PPS implementation. Therefore, it is important to continuously monitor the impact of the implementation of the IRF PPS as additional data, including data on Medicare costs and outcomes, become available.

Chapter II. Data

In the analyses described in the following chapters, we examined characteristics of IRF discharges between 1998 and 2002. The 1998 and 1999 data were previously used to develop most parameters of the IRF PPS. The 2002 data are from the first year of the implementation of the PPS. We used bills (or equivalently MEDPAR) for each of the 5 study years. For 1998, 1999, and 2002, we also used additional case mix data. Each of these data sets and the role they play in our analyses are described further below.

2.1 Data Sources

2.1.1 Medicare Bills

The inpatient bills are submitted to the Fiscal Intermediaries by the IRFs. We used the bills after standard analytic file processing. These bills contain provider number, beneficiary number, age, admission date, and discharge date. We calculated LOS as discharge date minus admission date, using 1 as the minimum LOS. The bills contain charges for ancillary services, which we aggregated to MEDPAR departmental charges. We then used cost-to-charge ratios and a routine per diem calculated from the cost reports to estimate the cost of each case. To estimate 2002 costs, we drew hospital cost reports from the public use files dated September 2003. For each discharge we tried to use the cost report that contained the day of discharge. When this was not available (as it was not for 38 percent of the 2002 discharges), we used the cost report that was closest in time to the day of discharge and inflated the per diem payments.

During the public comment period on the proposed rule updating the IRF PPS effective October 1, 2005, HealthSouth, a large chain organization, notified CMS that its IRFs did not include any home office costs in its cost reports for cost reporting periods beginning on or after October 1, 2001 and before October 1, 2003. Home offices of chain organizations such as Health South usually furnish central management and administrative services such as centralized accounting, purchasing, personnel services, management, and other services to support patient care services furnished by their member providers. The reasonable costs of these services are normally included in the providers' cost report and reimbursed as part of the providers' costs. Home office costs

for HealthSouth providers are about 13 percent of total costs. Since the omission of these costs would distort the findings from analyses involving 2002 costs, we adjusted the 2002 costs by an adjustment factor. To derive the adjustment factor, we updated the latest available IRF cost report data (generally, cost reports beginning in FY2003 that did not include home office costs) to FY2004 using the estimated rate of increase in the hospital market basket. We obtained FY 2004 home office cost data from CMS for individual HealthSouth IRFs and added the home office costs to the estimated FY2004 IRF costs. The adjustment factor is the ratio of estimated costs including home office costs to estimated costs excluding home office costs. We then applied this adjustment factor to the 2002 cost per case that we had estimated using the 2002 cost report data that did not include home office costs. The FY2004 HealthSouth home office cost statement has information on home office costs allocated to 92 of the 98 HealthSouth IRFs in our analysis file. We used the average adjustment factor for the six IRFs for which we were not able to compute a facility-specific adjustment factor. For further information on this issue, see the IRF PPS final rule for FY2006 (CMS, 2005).

The bills also contain discharge destination, which is used to determine whether the stay ended with a transfer or an in-hospital death. A flag on the bill is used to determine whether the hospital was paid under PPS at the time of the discharge. For cases paid under the PPS, the CMG and comorbidity tier are found on the bill.

The bills for CY 2002 were received in October 2003 and thus our bill file should be essentially complete for all years from 2000 through 2002.

2.1.2 Case Mix Data

For 1998 and 1999 we used case mix data from the linked files that we had created for our IRF PPS implementation work (Carter et al., 2002). For 2002 we used the IRF PAI as the source of case mix data.

IRFs submit each patient's IRF PAI record electronically to the national database using the Inpatient Rehabilitation Validation and Entry System (IRVEN) or vendor purchased software. The receiving system validates the provider's identity and checks certain items on the record for valid codes. In particular, it checks that the submitted

CMG and tier are consistent with information on impairment, age, functional status, and comorbidities found on the IRF PAI.[4]

In this analysis we used the IRF PAI impairment group code at admission (item i21a), the list of up to 10 comorbidities in IRF PAI item 24, and the functional independence measures at admission in items 39Aa thru 39Ra. The IRF PAI file that we used was drawn from the national file during November 2003 and should be complete for discharges in CY 2002.

2.1.3 Matched Bill and Case Mix Data

As described in our implementation report, we attempted to match each 1998 and 1999 MEDPAR record from a participating provider to a case mix record using demographic variables. For 2002, we also matched within provider (after cleaning this field on the IRF PAI), using admission, discharge, transfer, and return dates and the beneficiaries' encrypted identifier. We used patient demographics (age, sex, zip code) only in cases where the identifiers did not match.

For cases paid under PPS, we used only records where the bill CMG is consistent with the IRF PAI CMG.

2.1.4 Facility-Specific Payment Adjustments

We estimated payment under the PPS for cases in CY 2002. We used the wage index from the final rule for the first year of the PPS (CMS, 2001). We took the low-income adjustment and urban/rural status from CMS's PRICER for the relevant period -- the FY 02 PRICER for cases discharged before October 1 and the FY 03 PRICER for cases in the last calendar quarter. We also used the cost-to-charge ratio on the PRICER to determine outlier payments.

2.1.5 Derived Variables

The RIC is determined from the second and third character on the IRF PAI's CMG. Cases who experience atypically short stays (non-transfer cases with LOS <= 3 days) and in-hospital deaths are assigned to RIC 50 or 51. Tier is determined from the first character of the same CMG variable, but is not assigned for cases in RICs 50 and 51.

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[4] We have independently verified that the CMGs on the IRF PAI are essentially always consistent with the underlying data and that, when the bill contains a CMG, the CMG on the IRF PAI *is* practically always consistent with the CMG on the bill.

The IRF PPS contains an interrupted stay rule. If a patient is discharged from an IRF and then returns to the same IRF in three days (the day of discharge or either of the following two calendar days), only a single payment will be made for both parts of the stay. Separate bills for each part of interrupted stays were appropriate during the pre-PPS portion of 2002 and earlier. We "bundled" multiple bills for records that would meet the interrupted stay rule of the PPS into a single simulated stay for all admissions from 1998 through 2002. We took the admission date for the stay from the first bill in the bundle. We took the discharge date and discharge destination for the stay from the last bill in the bundle. We calculated LOS and cost for the bundle as the sum of the LOS and costs for all discharges in the bundle. For cases matched to a case mix record, we used data from the case mix record matched to the earliest bill in the bundle.

In-hospital deaths are defined as those with a discharge destination of 20. Because of under-reporting of transfers and changes in the discharge destination codes in 2002, we did not use the discharge destination codes on the IRF bill to identify transfers.[5] Instead, we defined a case as a transfer if there is a post-IRF bill for the beneficiary for a stay that starts on the day of the IRF discharge or there is a Minimum Data Set (MDS) record for a nursing home stay indicating that the beneficiary was in a nursing home on the day of the IRF discharge.

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[5] Prior to October 2002, the following discharge destinations were relevant to defining a transfer case:
02 = to other short-term general hospital
03 = to skilled nursing facility
04 = to intermediate care facility
05 = to another type of institution for inpatient care (including distinct parts). This code was used prior to 1/1/2002 to include transfers to rehabilitation facilities and long-term hospitals.
61 = to a swing bed
Effective January 1, 2002, PM A-01-86 added to new patient status codes:
62 = to another rehabilitation facility
63 = to a long-term care hospital
IRF-PPS implementing instructions provided that patient status codes 02, 03, 61, 62 and 63 are to be used to identify transfer cases. Before a new patient status code 64 was implemented effective 10/1/02 to identify Medicaid-only facilities, IRFs were to use 03 if the beneficiary was transferred to a nursing home that accepts payment under Medicare and/or Medicaid and 04 if the beneficiary was transferred to a to a nursing facility that does not accept either Medicare or Medicaid. The 04 code does not constitute a transfer under IRF-PPS.

2.1.6 Facility Characteristics

We report some findings by facility characteristics. There are a handful of IRFs whose characteristics changed over the study period that would move them into a different category for a particular characteristic. We held their categories constant across our analyses. Generally, we used 2002 cost report data to categorize each IRF by key characteristics (e.g., type of ownership, average daily census, and DSH ratio). For example, a non-profit hospital in 1999 that had a change of ownership and became proprietary in 2001 would be included in the proprietary category in our longitudinal analyses.

2.2 Sample Selection and Sample Size

2.2.1 Longitudinal Analyses

For the longitudinal sample, we use all bills paid by Medicare with only two exceptions. First, we drop all cases in Maryland because that state is not under the PPS. Second, as described in more detail above, we treat all discharges in an interrupted stay bundle as if they constituted a single discharge. Table 2.1 provides the number of cases in the longitudinal analyses in each year.

Table 2.1
Number of Cases in Each Year in the Longitudinal Analyses

Year	Number of bundled Medicare bills
1998	366,145
1999	385,457
2000	410,732
2001	442,379
2002	471,984

2.2.2 Case Mix Data

For the analyses of case mix data, we are restricted to cases with matched case mix data and bill data for 1998, 1999, and 2002. Our bill records show that 473,645 bills for inpatient care of Medicare patients were submitted from IRFs during CY 2002.[6] As shown in Table 2.2, we eliminated 1,661 records that would not be paid under the PPS because they were part of interrupted stays. This produces the same 471,984 cases shown as bundles in Table 2.1.

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[6] This number excludes two duplicate bills and 49 bills that overlapped another bill.

We matched 436,822 of the remaining bills to an IRF PAI record where the IRF PAI data were consistent and the bill data were consistent with the IRF PAI (92.5 percent of cases) resulting in the 436,822 records that are used for most analyses. Some analyses eliminate in-hospital deaths and atypical short stays.

In Chapter 5 we analyze the estimated cost of the 2002 cases. As shown in the bottom section of Table 2.2, we were missing cost data for 11,315 of the bundled cases (2.4 percent). For analyses that use both case mix data and cost, we could use only 426,622 cases. To simulate PPS payments, the 2002 cases also needed to have covered charges that were greater than zero.

Table 2.2
Counts of IRF PPS Discharges During CY 2002 Excluded from Sample and Remaining Sample, by Reason for Exclusion

Reason for Exclusion	Excluded Records	Remaining Sample
Total bills	0	473,645
Interrupted stays not paid under PPS	1,661	471,984
No good match to IRF PAI	35,299	436,822
In-hospital death	948	435,676
Atypical short stays	9,695	425,981
Sample Excluding Atypical RICs		425,981
All Bundles		471,984
Missing cost data	11,315	460,669
No good match to IRF PAI	34,047	426,622
No covered charges	1,036	425,586
Missing payment variables	10,417	415,169

For 1998 and 1999, we used the final analysis sample described in our implementation report (Carter et al., 2002). In that paper we note that units are under-represented in the matched sample and freestanding hospitals are over-represented. Table 2.3 shows, separately for units and freestanding hospitals, the number of bundles in the population of IRF discharges in 1999 and in our case mix sample. We have only 55 percent of unit cases, but 83 percent of freestanding cases.

There are certain aspects of case mix and resource use that are strongly correlated with being a unit. To avoid having the unrepresentativeness of our sample confound our findings regarding how care patterns changed between 1999 and 2002, we used several strategies. When possible, we used the bill data that contain all cases. Often we present case mix data separately for units and freestanding hospitals. Finally, we sometimes used weights as if we had a sample with 2 strata -- units and freestanding. Although we did not have a random sample, in cases where we could check accuracy (e.g., LOS), we

found that the weighted estimates of population parameters are more accurate than the unweighted estimates. The sample weights used in these analyses are shown in the last column of Table 2.3.

Table 2.3
Number of 1999 Bundled Discharges in Population and Sample with Case Mix Data, by Unit and Freestanding

Type of facility	Population	Sample	% of Sample	Sample weight
Unit	258,326	142,337	55.10	1.164
Freestanding	127,131	104,890	82.51	0.777
Total	385,457	247,227	64.14	1.000

Chapter III: Overall Utilization Patterns

Patterns observed in our analysis of the 2002 IRF data are consistent with the incentives created by the IRF PPS and with trends previously observed from 1996 through 1999. There was an increase in the number of IRFs caring for Medicare patients and a large increase the number of Medicare beneficiaries seen in IRFs between 1999 and 2002. There was also a shift in the composition of patients seen in IRFs after the implementation of the IRF PPS. A greater proportion of patients were coded as having comorbidities and motor and cognitive functioning scores declined. The CMI increased by approximately 4 percent between 1999 and 2002.

3.1 Overview

In this chapter we describe findings about changes in care patterns and patient classification under the IRF PPS. We used the data from patient assessments and bills described in Chapter 2 to examine patterns in the use of IRF care before and after the implementation of the new payment system. Specifically, we examined trends in LOS, CMG assignments, and comorbidities. We also looked at trends in the factors that are used to assign CMGs, namely, patients' impairments and functional status (motor and cognitive scores). In addition, we assessed the overall case mix of IRF patients in 1999, before the new payment system was implemented, and in 2002 when facilities were being introduced to the new system.

3.2 Methods

We compared the number and composition of discharges in the years prior to the IRF PPS to those in 2002. We examined the trends in these data over time, mostly in terms of percentage increases and decreases. We also looked at trends in data submitted by hospitals under the PPS in 2002, and trends in data submitted by hospitals not yet paid under the PPS.

As described in Chapter 2, our 1996 through 1999 data cover only a sample of facilities. A comparison of the sample with the population showed that the sample was biased in two ways. First it over-represented freestanding hospitals and it under-represented very short stays (Carter et al., 2002). To avoid confusing changes in the sample with real changes in the cases cared for in IRFs, we repeated many analyses separately for freestanding hospitals and for units. In addition, we calculated the overall case mix index (CMI) for IRF patients seen in 2002 and compared it to the CMI in 1999.

A CMI is the average of the case weights assigned to some specified set of patients (cases). The case weights are relative weights -- i.e., they provide expected cost of each CMG relative to other CMGs. In the IRF PPS the weights were calculated from the matched data set for 1999. They were normalized so that each weight gives the cost of a case in the CMG relative to the average case in the data set. In calculating the CMI, short-stay transfer cases are counted as only a fraction of a case. Thus, our 1999 national CMI was 1.0 when short-stay cases are counted as only a fraction of a case. The methods and formulas used to calculate the CMI are described in Appendix 1.

3.3 Results

Overall, changes observed in the data were consistent with IRF PPS incentives and/or with ongoing trends in IRF care. There was a slight increase in the number of IRFs caring for Medicare patients and a larger increase in the number of Medicare beneficiaries seen in IRFs over the period examined. There was also a shift in the composition of patients seen in IRFs. After the implementation of the IRF PPS a greater number of patients were coded as having comorbidities and as having poor motor and cognitive functioning. The overall CMI increased by approximately 4 percent. Each of these changes is described in greater detail below.

3.3.1 Volume. Table 3.1 shows the increase in the number of IRFs serving Medicare patients and in the number of Medicare discharges from IRFs over the period 1996 through 2002. The number of IRFs grew by 11.5 percent over this period, while the number of bundled discharges grew by 39 percent. The annual growth rate in the number of patients served between 1999 and 2002 is slightly larger than that seen in earlier years. The number of bundled discharges per 100,000 fee-for-service (FFS) enrollees increased in each year from 1996 to 2002, with the rate of increase lowest in 2001 and 2002.

3.3.2 Composition. Figure 3.1 shows the distribution of IRF patients across RICs in 1999 and 2002. Atypical short stays and in-hospital deaths are excluded from this composition analyses. The proportion of cases in RIC 1, the stroke RIC, decreased markedly while the proportion in RIC 8, the lower extremity joint replacement RIC, and RIC 14, the cardiac RIC, increased. Table 3.2 shows that these patterns held for both freestanding and unit facilities. Table 3.2 also shows that this shift was generally more pronounced for cases paid under the IRF PPS. Some of these RICs, specifically 18 (major multiple traumas with brain or spinal cord injury), 19 (Guillian Barre), and 21 (burns), are very small. Thus, changes in these RICs should be interpreted with caution.

Table 3.1
Increases in the Volume of IRF Facilities and Bundled Discharges,1996-2002
(Excluding Maryland Hospitals) Versus Increases in the Fee-For-Service Discharges

Year	Facilities		Bundled Discharges		# Discharges per 100,000 FFS Enrollees	
	N	Annual % increase	N	Annual % increase	N	Annual % increase
1996	1078		340,424		1000.394	
1997	1121	4.0	355,162	4.3	1064.507	6.4
1998	1153	2.9	366,145	3.1	1118.341	5.1
1999	1163	0.9	385,457	5.3	1183.327	5.8
2000	1169	0.5	410,732	6.6	1243.738	5.1
2001	1196	2.3	442,379	7.7	1298.785	4.4
2002	1202	0.5	471,984	6.7	1344.875	3.5

Note: Maryland hospitals excluded.

Figure 3.1
Percent of IRF Cases by RIC, 1999 vs. 2002
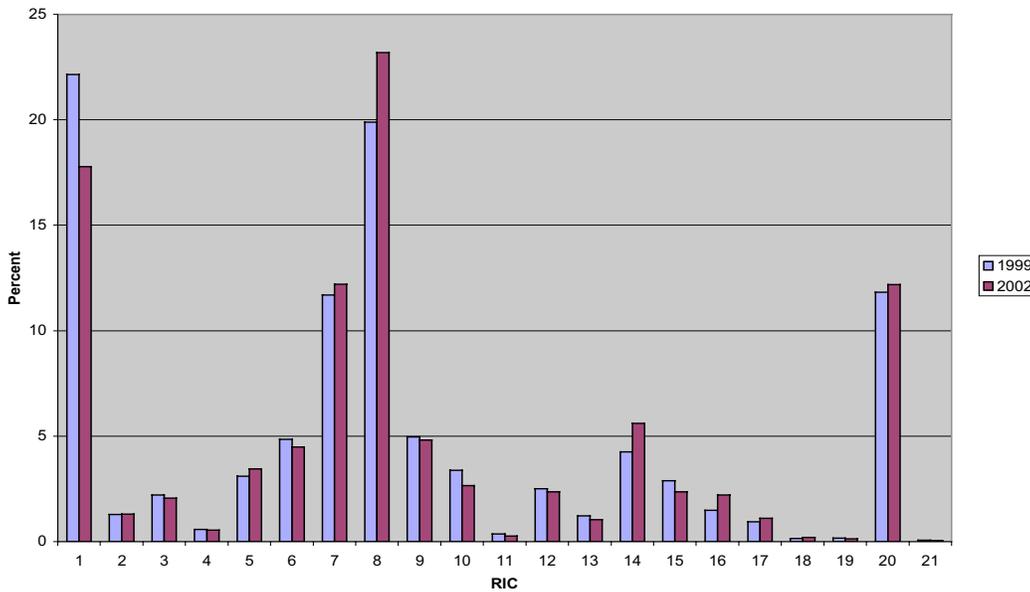
Figures 3.2 and 3.3 show that there was a strong shift towards lower motor and cognitive scores across RICs between 1999 and 2002. The mean motor score decreased from 42.8 to 40.2 between 1999 and 2002 and mean motor scores decreased in every RIC. Mean cognitive scores decreased in every RIC except for RIC 2, traumatic brain injury. Interestingly, however, the decreases in the cognitive scores occurred across all RICs except for RIC 2 for which the mean cognitive score held steady, rather than increasing in only RICs

Table 3.2
Distribution of Cases Across RICs for All Cases in 1999 and 2002, and for IRF PPS Cases in 2002: by Freestanding/Unit Status

RIC	Number of Cases 1999 All Cases	Number of Cases 2002 All Cases	Number of Cases 2002 PPS Cases	Percent of Cases -- All 1999 All Cases	Percent of Cases -- All 2002 All Cases	Percent of Cases -- All 2002 PPS Cases	Percent of Cases -- Freestanding 1999 All Cases	Percent of Cases -- Freestanding 2002 All Cases	Percent of Cases -- Freestanding 2002 PPS Cases	Percent of Cases -- Units 1999 All Cases	Percent of Cases -- Units 2002 All Cases	Percent of Cases -- Units 2002 PPS Cases
1	54846	75762	54333	22.1	17.8	17.5	20.1	15.7	15.6	23.6	19.0	18.8
2	3186	5587	4069	1.3	1.3	1.3	1.4	1.3	1.3	1.2	1.3	1.3
3	5463	8786	6456	2.2	2.1	2.1	1.9	1.7	1.7	2.5	2.3	2.4
4	1448	2320	1655	0.6	0.5	0.5	0.6	0.5	0.5	0.5	0.6	0.6
5	7682	14642	10154	3.1	3.4	3.3	2.4	2.5	2.3	3.6	4.0	4.0
6	12019	19132	14089	4.9	4.5	4.5	5.0	4.0	4.0	4.7	4.8	4.9
7	28984	52019	37558	11.7	12.2	12.1	11.6	11.5	11.6	11.8	12.6	12.5
8	49283	98771	72087	19.9	23.2	23.2	18.4	21.7	21.7	21.0	24.0	24.3
9	12312	20557	15822	5.0	4.8	5.1	5.6	6.2	6.5	4.5	4.0	4.1
10	8380	11318	7838	3.4	2.7	2.5	3.1	2.4	2.4	3.6	2.8	2.6
11	918	1144	794	0.4	0.3	0.3	0.4	0.3	0.3	0.4	0.3	0.3
12	6219	10034	6697	2.5	2.4	2.2	3.6	1.9	1.8	1.7	2.6	2.4
13	3016	4444	3163	1.2	1.0	1.0	1.7	1.1	1.1	0.8	1.0	1.0
14	10542	23893	18641	4.3	5.6	6.0	4.6	7.2	7.5	4.0	4.7	4.9
15	7147	10052	7706	2.9	2.4	2.5	4.3	3.7	3.8	1.9	1.6	1.5
16	3697	9415	6788	1.5	2.2	2.2	1.9	2.6	2.4	1.2	2.0	2.0
17	2334	4713	3405	0.9	1.1	1.1	0.9	1.1	1.1	1.0	1.1	1.1
18	379	855	655	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2
19	414	566	382	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1
20	29315	51948	38542	11.8	12.2	12.4	12.2	14.0	14.3	11.5	11.1	11.0
21	164	220	144	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1
Total	247748	426178	310978	100	100	100	100	100	100	100	100	100

for which cognitive functioning affects payment.[7] Table 3.3 shows the overall decline in motor and cognitive score: the decreases in motor and cognitive scores were less pronounced in units. 1999 data for Figures 3.2 and 3.3 and Table 3.3 come from Carter et al. (2003).

Figure 3.2
Mean Motor Score by RIC, 1999 vs. 2002
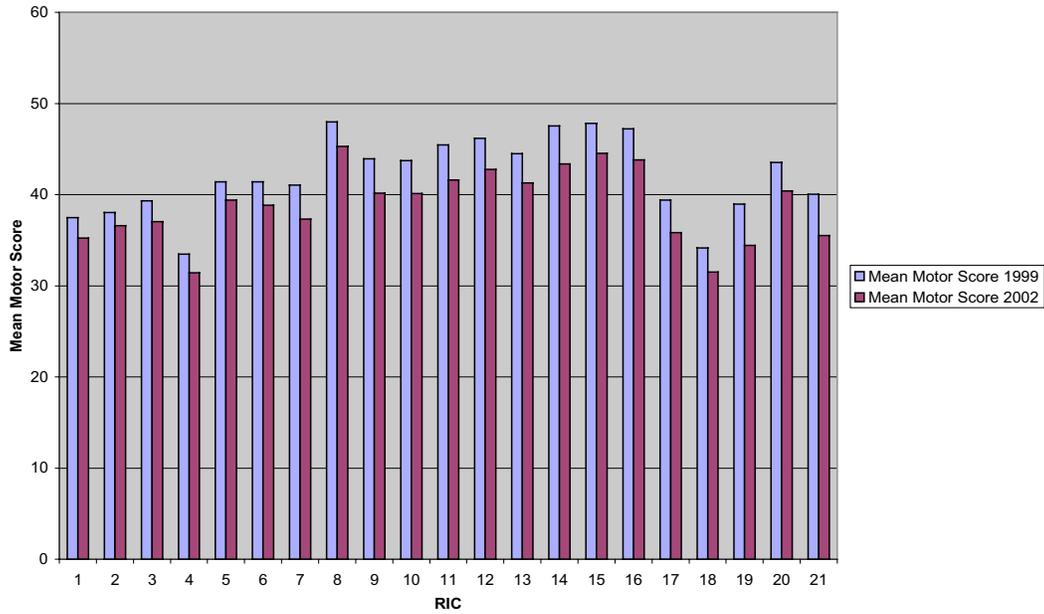
Figure 3.3
Mean Cognitive Score by RIC, 1999 vs. 2002

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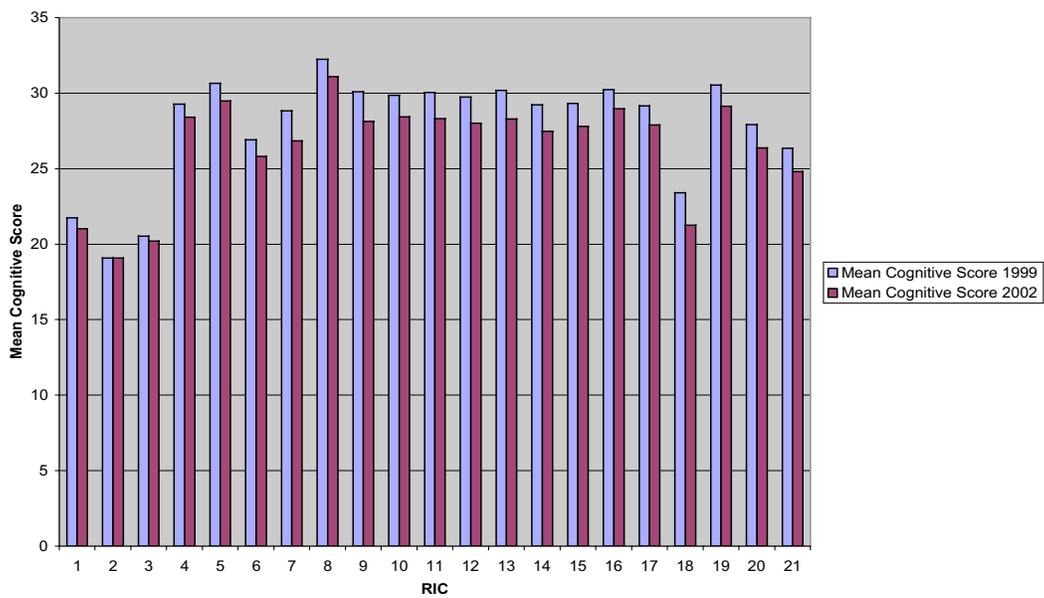
[7] The RICs in which cognitive score is a factor in payment are: 1, 2, 5, 8, 12, and 18.

Table 3.3
Mean Motor and Cognitive Scores for All Cases in 1999 and 2002, and for IRF PPS Cases

	All Cases						Freestanding						Units					
	Mean Motor Score			Mean Cognitive Score			Mean Motor Score			Mean Cognitive Score			Mean Motor Score			Mean Cognitive Score		
RIC	1999 All Cases	2002 All Cases	2002 PPS Cases	1999 All Cases	2002 All Cases	2002 PPS Cases	1999 All Cases	2002 All Cases	2002 PPS Cases	1999 All Cases	2002 All Cases	2002 PPS Cases	1999 All Cases	2002 All Cases	2002 PPS Cases	1999 All Cases	2002 All Cases	2002 PPS Cases
1	37.5	35.2	34.9	21.8	21.0	20.8	36.8	32.1	31.7	20.7	19.0	18.7	37.9	36.7	36.8	22.4	22.0	22.0
2	38.0	36.6	36.2	19.1	19.1	18.9	37.2	34.1	33.6	18.5	17.4	17.2	38.7	38.1	38.0	19.6	20.1	20.0
3	39.3	37.0	36.9	20.5	20.2	20.0	38.1	34.5	34.1	19.3	18.2	17.8	40.0	38.2	38.3	21.2	21.1	21.1
4	33.5	31.4	31.2	29.3	28.4	28.6	33.5	27.9	27.5	29.3	28.1	28.1	33.4	33.5	33.7	29.2	28.6	28.9
5	41.4	39.4	39.3	30.7	29.5	29.4	40.8	36.7	36.5	30.3	28.9	28.6	41.7	40.4	40.4	30.8	29.7	29.7
6	41.4	38.8	38.6	26.9	25.8	25.6	41.4	36.7	36.6	26.3	24.6	24.4	41.4	39.9	39.7	27.4	26.4	26.3
7	41.1	37.3	36.9	28.8	26.8	26.5	40.7	34.8	34.2	28.2	25.5	25.1	41.3	38.6	38.6	29.3	27.5	27.5
8	48.0	45.3	45.0	32.2	31.1	30.9	48.5	43.9	43.4	32.1	30.4	30.2	47.7	46.0	46.0	32.3	31.4	31.4
9	43.9	40.2	39.6	30.1	28.1	27.8	44.2	37.9	37.5	29.7	26.7	26.4	43.7	42.2	42.1	30.4	29.4	29.4
10	43.7	40.1	39.8	29.9	28.4	28.3	44.3	38.7	38.4	29.5	27.6	27.3	43.4	40.8	40.7	30.1	28.9	28.9
11	45.4	41.6	41.3	30.1	28.3	28.0	45.3	38.7	38.5	29.8	26.3	26.0	45.6	43.4	43.3	30.3	29.5	29.4
12	46.2	42.8	42.3	29.7	28.0	27.6	46.3	40.0	39.5	29.7	26.2	26.0	46.0	44.0	43.7	29.7	28.7	28.5
13	44.5	41.3	40.7	30.2	28.3	27.9	45.0	39.5	38.9	30.2	27.0	26.6	43.7	42.4	42.2	30.3	29.1	29.1
14	47.6	43.4	43.2	29.2	27.5	27.2	48.1	41.4	41.1	29.0	26.1	25.7	47.1	45.1	45.5	29.5	28.7	28.8
15	47.8	44.5	44.5	29.3	27.8	27.5	48.4	44.1	43.9	29.2	27.2	26.8	46.8	45.1	45.6	29.6	28.6	28.7
16	47.2	43.8	43.6	30.2	29.0	28.7	47.9	42.7	42.1	30.3	28.4	27.9	46.5	44.7	44.8	30.2	29.4	29.4
17	39.4	35.8	35.3	29.2	27.9	27.6	39.4	33.2	32.6	28.8	26.7	26.4	39.4	37.4	37.2	29.4	28.6	28.5
18	34.2	31.5	31.3	23.4	21.3	21.0	34.0	30.1	30.1	23.9	20.0	19.9	34.3	32.8	32.7	23.1	22.5	22.3
19	38.9	34.4	34.0	30.5	29.1	28.8	39.8	32.3	32.5	30.4	27.9	28.0	38.5	35.6	35.1	30.6	29.8	29.3
20	43.5	40.4	40.1	27.9	26.4	26.0	43.7	38.4	38.0	27.4	24.9	24.6	43.4	41.9	42.0	28.3	27.4	27.4
21	40.1	35.5	34.3	26.3	24.8	24.2	41.2	32.3	31.4	25.9	24.5	24.0	38.8	37.0	35.9	26.8	24.9	24.3
Total	42.8	40.2	40.0	27.7	26.8	26.6	43.0	38.4	38.0	27.3	25.6	25.3	42.7	41.3	41.4	28.0	27.5	27.4

These decreases in motor and cognitive scores affected the proportion of patients grouped into each CMG in all RICs. Figure 3.4 graphically illustrates the shift within the stroke RIC from lower-weighted CMGs on the left-hand side of the chart to higher-weighted CMGs on the right-hand side of the chart.

In addition to lower motor and cognitive scores, more patients were coded as having comorbidities that qualified them for higher tier payments. Table 3.4 shows that the proportion of patients in each of the 3 tiers increased, and it increased in most combinations of RIC and tier. The proportion of patients not classified into a comorbidity tier fell from 81 percent in 1999 to 75 percent in 2002. Figure 3.5 shows that the increase in the proportion of patients in comorbidity tiers was most pronounced in freestanding hospitals. This pattern was expected, since we thought that units would have better coding practices in the pre-PPS period. Thus, a significant portion of this increase in tier assignments may be due to better coding and adherence to Medicare rules.

3.3.3 Case Mix. Table 3.5 shows the net results of these changes in the composition of patients seen in IRFs and in length of stay. For the sample of hospitals that were in both our 1999 and 2002 matched data sets the CMI increased more – 5.8 percent.

Figure 3.4
Cumulative Distribution of All Cases in RIC 1 (Stroke) by CMG, 1999 vs. 2002
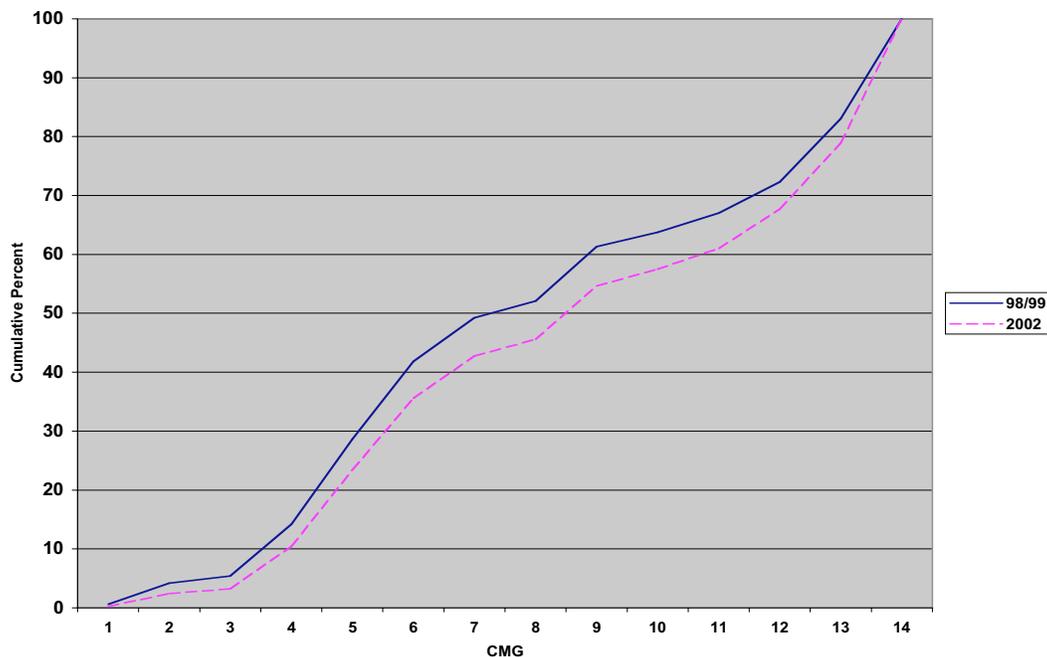
Table 3.4
Percent of Cases by RIC in Each Comorbidity Tier: All Cases in 1999 and 2002, and for IRF PPS Cases in 2002

RIC	Tier 1 1999 All Cases	Tier 1 2002 All Cases	Tier 1 2002 PPS Cases	Tier 2 1999 All Cases	Tier 2 2002 All Cases	Tier 2 2002 PPS Cases	Tier 3 1999 All Cases	Tier 3 2002 All Cases	Tier 3 2002 PPS Cases	None 1999 All Cases	None 2002 All Cases	None 2002 PPS Cases
1	0.6	1.6	1.9	2.9	4.2	4.5	11.3	14.3	14.7	85.2	79.9	78.8
2	2.4	3.5	3.9	14.7	15.8	16.6	18.0	17.4	17.7	64.9	63.2	61.7
3	1.2	3.0	3.1	14.7	18.1	18.5	23.8	23.4	24.1	60.3	55.4	54.3
4	3.0	4.7	4.9	10.2	13.2	13.3	11.9	11.9	12.2	74.9	70.3	69.6
5	0.7	1.5	1.6	7.7	9.0	9.4	10.7	13.5	14.0	81.0	76.0	75.0
6	0.7	2.1	2.4	10.9	15.3	15.6	13.8	15.2	15.0	74.6	67.3	67.1
7	0.2	1.4	1.7	4.3	6.9	7.4	7.6	10.3	10.6	87.8	81.4	80.3
8	0.1	0.5	0.6	3.5	4.1	4.4	5.0	8.6	9.1	91.4	86.8	85.9
9	0.3	1.2	1.4	4.7	7.4	7.8	9.0	13.4	13.7	86.0	78.0	77.1
10	0.4	1.5	1.8	9.8	18.5	18.9	31.5	30.1	31.3	58.2	50.0	48.0
11	0.1	1.4	1.5	16.1	25.8	27.6	41.4	35.7	36.0	42.4	37.2	34.9
12	0.3	1.2	1.4	4.3	8.0	8.4	8.3	16.3	16.9	87.2	74.4	73.3
13	0.3	1.2	1.4	5.8	11.2	11.2	10.1	17.6	17.6	83.8	70.0	69.7
14	1.1	2.6	3.0	10.6	13.9	14.4	16.0	23.6	24.1	72.3	59.9	58.6
15	0.4	1.8	2.1	8.5	14.5	15.0	6.9	12.7	12.6	84.2	71.0	70.3
16	0.3	0.7	0.9	5.4	5.9	6.1	8.5	12.6	12.9	85.8	80.8	80.1
17	1.3	2.3	2.7	4.5	8.7	9.2	10.1	12.5	12.5	84.1	76.5	75.5
18	3.7	11.0	11.6	14.2	16.4	16.6	11.6	13.7	13.6	70.4	58.9	58.2
19	1.7	5.7	6.8	13.3	14.3	16.0	15.0	14.3	14.4	70.0	65.7	62.8
20	1.7	4.4	4.8	13.3	18.3	18.8	21.4	22.2	22.4	63.6	55.1	53.9
21	1.8	8.6	9.0	11.0	20.5	21.5	19.5	12.7	12.5	67.7	58.2	56.9
Total	0.6	1.8	2.0	6.4	9.0	9.5	11.9	14.6	15.0	81.0	74.5	73.4

Figure 3.5
Comorbidity Tier Assignments for All Hospitals, for All Cases in 1999 and 2002, and for IRF PPS Cases in 2002: by Freestanding/Unit Status
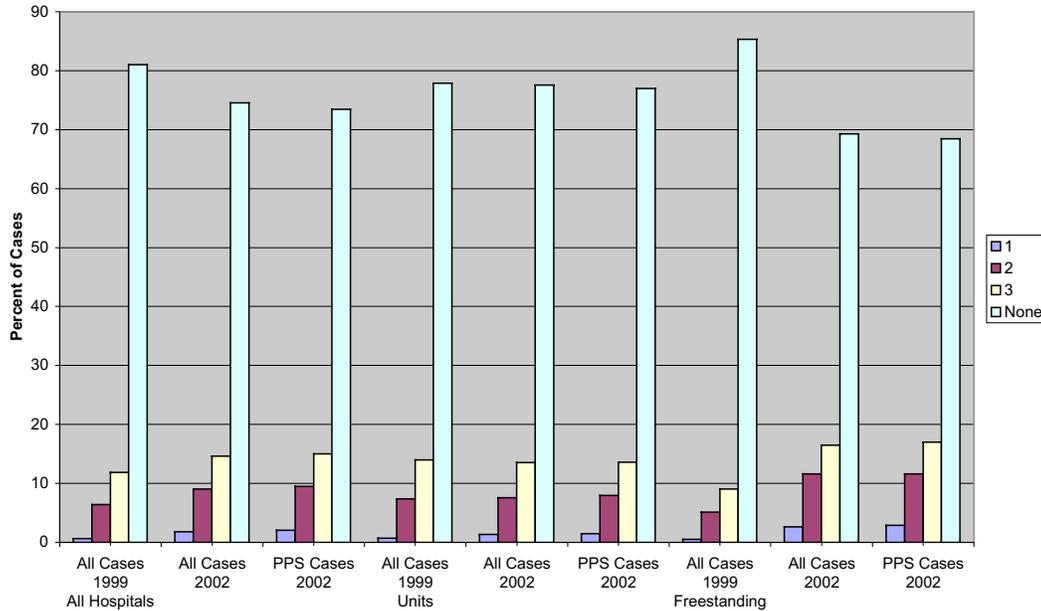
Table 3.5
Change in Case Mix Index (CMI) Between 1999 and 2002

	Number of Facilities		Number of Discharges		Number of Equivalent Cases		Case Mix Index		% Increase in CMI
	1999	2002	1999	2002	1999	2002	1999	2002	
All Facilities in Sample	694	1120	247,319	434,815	234,169	404,590	1.0000	1.0434	4.3%
Facilities in Both Years' Data	632	632	235,638	301,545	223,201	280,692	1.0002	1.0579	5.8%

In addition, in analyzing the non-sample data from 1999, we found that case mix was actually lower than in the sample, predominantly because many cases with LOS of 3 days or less were not reported in the case mix data used for our IRF PPS implementation work, but also because the sample underestimates units and these have a lower case mix. In the formula that was used to set the payment rate, therefore, the rate was increased by 1.0 percent to account for the non-representativeness of our sample. This is approximately equivalent to a 1 percent reduction in case mix or a true national CMI for 1999 of 1.00.[8]

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[8] We did not estimate the adjusted national case mix index, because it is the weighted average with short-stay transfers counted as only a fraction of a case. To know the fraction of short-stay transfers we would have needed to predict the CMG that non-sample patients would fall into. However, we did not feel we could accurately predict CMG without any information on functional status.

3.3.4 Demographics. Table 3.6 shows the percent of cases by demographic category for the bundled discharges having functional status scores in 1999 and 2002. There is a slightly greater prevalence of older cases in 1999 versus 2002. There are decreases in each age category above 80 years of age in 2002. In contrast, the median age of Medicare enrollees held almost steady between 1999 and 2002, with a median age of 74.6 years in 1999 and 74.7 in 2002.[9] The distribution of cases by race category shows an increase in the number of non-white cases (86.7 percent in 1999 versus 84.6 percent in 2002), which is a percentage point larger than the increase in non-white cases among all Medicare beneficiaries during that time.[10] The percent of married and female cases remains steady through time.

Table 3.6
Percent of Cases in Each Demographic Category by
Year for the Sample, 1999 and 2002

	1999	2002
Sample size	254028	445167
Age		
<=44	1.55	1.33
45 to 64	6.92	7.64
65 to 69	12.72	13.29
70 to 74	18.72	18.63
75 to 79	23.11	22.91
80 to 84	19.42	19.95
85 to 89	12.31	11.58
90 to 94	4.34	3.91
>= 95	0.92	0.77
Race		
White	86.66	84.57
Black	9.81	9.25
Other	1.29	0.18
Asian	0.45	0.88
Hispanic	1.23	3.3
North American Native	0.14	0.29
Married	42.9	43.52
Gender		
Male	37.52	36.57
Female	62.48	63.43

3.4 Conclusions

While these trends are generally consistent with expectations about IRF responses to the new payment system, they reflect a combination of factors. These factors include

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[9] http://www.cms.hhs.gov/researchers/pubs/datacompendium/2003/03pg3132.pdf.
[10] http://www.cms.hhs.gov/MCBS/CMSsrc/1999/Summary1.pdf and CMSsrc/2002/Section1.pdf.

changes in coding, real changes in case mix, and other changes in incentives produced by the IRF PPS.

Coding may have changed under the PPS for a number of reasons mentioned above. First, the new IRF PAI manual changed the coding rules for some items and clarified the rules for some impairment codes and functional status items. Second, facilities might have increased their adherence to coding rules and improved the accuracy of their coding. This is particularly true for comorbidities. Third, some portion of the coding change is likely due to "upcoding" in order to maximize revenue.

In addition, the shift in the composition of patients that we saw may reflect a real change in patient case mix. This could be due to changes in the broader health care system, including discharge practices from acute care and the shift to a greater emphasis on post-acute and outpatient care. In fact, there has been a decrease in the number of stroke cases in the acute care population over time accompanied by an increase in the number of joint replacement cases, which corresponds to the shifts seen within rehabilitation cases during the same time window (Beeuwkes Buntin et al., 2005). It could also reflect technological or practice changes in rehabilitation. Finally, it could reflect the fact that some IRFs had been constrained by a low base cost under the previous TEFRA system and can now afford to admit more complex patients. Further work disentangling the effects of coding from real case mix change, see Carter and Paddock (2005).

Chapter IV. Unusual Cases

Under the IRF PPS, typical cases are defined as those who stay more than 3 days, receive a full course of inpatient rehabilitation, and are discharged to the community.[11] Special payment rules apply to unusual cases and there is a fear that these special rules may cause providers to shift patients between settings or change practice patterns to maximize payments. These payment rules are:

- *Very short-stay discharges* are all non-transfer discharges within 3 or fewer days of admission, including discharges of patients who died in the hospital within 3 days of admission. These discharges are assigned to a special CMG.[12]
- *Short-stay transfers* are patients with a length of stay that is no more than the mean length of stay for the CMG minus 0.5 days, and are transferred to another IRF, an acute care hospital, a long-term care hospital, or a nursing home that is certified by Medicare and/or Medicaid. A per diem payment applies to these discharges. It is based on the CMG payment for a typical case divided by the average length of stay for patients assigned to the CMG. Total payment equals the per diem payment multiplied by the number of days the patient was in the facility plus an additional half-day per diem payment. Long-stay transfers are paid as a typical case.
- *Interrupted stays* occur when patients are discharged and return to the same IRF within 3 consecutive calendar days. One CMG payment is made for these stays based on the assessment from the initial admission. The duration of the interrupted stay begins with the day of discharge from the IRF and ends on midnight of the third day. No DRG payment is made to the acute care hospital when the beneficiary is discharged and returns to the same IRF on the same day.
- *High cost outliers* receive additional payments. The additional payment equals 80 percent of the difference between the estimated cost for the case and the CMG payment plus an outlier threshold. Estimated cost is determined by applying a cost-to-charge ratio to the charges on the bill.

The chart below summarizes the incentives created by the payment policies for unusual cases. These are anticipated behavioral changes that might occur under the IRF PPS if the IRF tries to maximize net revenues. The incentives are specific to the payment policies for unusual cases and may interact with other incentives to reduce costs and increase revenues.

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[11] Medicare counts an inpatient day if a beneficiary is in the hospital at midnight. The day of admission is counted but the day of discharge is not counted unless the admission and discharge day are the same day. If a patient is admitted with the expectation that the patient will remain overnight, but is discharged or dies before midnight, the day is counted.

[12] Patients who expired in the hospital after 3 days are assigned to four other special CMGs based on their length of stay relative to other patients who expired and whether the case is assigned to an orthopedic RIC.

Summary of IRF PPS Payment Incentives for Unusual Cases

Special Payment Rule	IRF PPS Incentives
Very short-stay discharges	Reduce stays of 3 or fewer days and increase stays of 4 or more days in order to receive full CMG payment.
Transfers	Increase long-stay transfers to nursing homes in order to discharge the patient more rapidly and to acute care hospitals to shift costs.
Interrupted stays	Increase interrupted stays lasting 1 or more days as a means of shifting costs to acute care hospitals; reduce relative proportion of 0-3 day interruptions in order to receive two CMG payments instead of a single bundled payment.

Our analysis of 2002 cases found that IRF facilities responded in anticipated ways to the financial incentives created by the policies for very short stays and for interrupted stays.

- There was a reduction in non-transfer stays lasting fewer than 3 days and an increase in non-transfer stays lasting 4-5 days (Section 4.2).

- There was a reduction in the proportion of interrupted stays lasting fewer than 3 days and an increase in the proportion lasting 4-5 days (Section 4.3).

However, there was an unanticipated increase in short-stay transfer rates and a decline in long-stay transfers that are paid as typical cases. While transfer rates to acute care hospitals increased, there was a decline in transfers to SNFs (Section 4.4).

Outlier payments were 3.0 percent of total payments, which is the percentage used to establish the initial outlier threshold (Section 4.5).

In the remainder of this chapter, we discuss the financial incentives created by the policies for unusual cases and the results of our analyses in greater detail. We conclude with discussion of our findings and conclusions (Section 4.6).

4.1 Very Short-Stay Discharges

As defined above, very short-stay discharges are defined as all non-transfer discharges within 3 or fewer days of admission, including discharges of patients who expired in the hospital within 3 days of admission. These discharges are assigned to a unique CMG (CMG 5001) with a relative weight of 0.1651 and no comorbidity tiers. Under the IRF PPS, hospitals have an incentive to decrease the number of discharges within this category and increase the number of discharges with LOS of 4 or 5 days. In doing so, they will receive a substantially higher full CMG payment for a shorter than average length of stay.

To monitor the behavioral changes associated with very short-stay discharges, we examined non-transfer discharges involving 3 or fewer days for 1999 through 2002 that would have been assigned to CMG 5001 under the IRF PPS. Since functional status is not needed to classify patients into CMG 5001, we used all bundled discharges in the analysis. We focused only on patients who were discharged alive and did not include those who died within 3 days of admission to the IRF.[13] We found that the proportion of very short-stay discharges was relatively stable in the years 1999-2001 but declined about 18 percent in 2002 (Table 4.1). In 1999, 2.6 percent of patients discharged alive would have been assigned to CMG 5001 compared to 2.2 percent in 2002. The decline is evident for stays lasting 1 or 2 or 3 days and is not limited to only those lasting 3 days. Improvement in reporting of transfers may bias our results. As discussed below, there was improvement in the reporting of transfers under the IRF-PPS, so that transfer cases in the pre-PPS period are under-reported relative to the post-PPS period. This would mean that there might be an overstatement of CMG 5001 cases in the pre-PPS period relative to 2002 and that the decline in CMG 5001 cases may be overestimated.

Table 4.1 Very Short-Stay Cases Discharged Alive by Length of Stay 1999-2002

	1999	2000	2001	2002	1999	2000	2001	2002
Length of Stay	N Cases	N Cases	N Cases	N Cases	% of Total Cases	% of Total Cases	% of Total Cases	% of Total Cases
1 Day	1,679	1,758	1,727	1,240	0.44%	0.43%	0.39%	0.28%
2 Days	2,637	2,987	3,238	2,255	0.68%	0.73%	0.73%	0.52%
3 Days	5,674	6,294	7,066	5,903	1.47%	1.53%	1.60%	1.35%
Total Very Short Stay	9,990	11,039	12,031	9,696	2.59%	2.69%	2.72%	2.22%
Total Cases	385,457	410,732	442,379	436,822				

4.2 Interrupted Stays

4.2.1 Interrupted Stay Policy and Incentives

The IRF PPS defines an interrupted stay as a stay in which the beneficiary is discharged and returns to the same IRF within 3 consecutive calendar days. The duration of the interrupted stay begins with the day of discharge from the IRF and ends on midnight of the third day. Thus, if the beneficiary is away from the IRF 2 nights or less, the interrupted stay payment rules apply

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[13] Less than 0.1 percent of patients die within 3 days of admission.

and one CMG payment is made for both portions of the stay. If the interruption involves a same day admission and discharge from an acute care hospital, no DRG payment is made to the acute care hospital and the IRF is expected to assume the costs of the same-day acute care services. However, a DRG payment is made if the beneficiary remains overnight at the acute care hospital.

Under the TEFRA system, an IRF, particularly if it was under financial pressure from its TEFRA limit, had an incentive to discharge and re-admit a patient in order to reduce IRF costs and receive "credit" for two discharges. The incentives under the IRF PPS are similar but contain two added incentives: to shift interruptions involving acute care services from same day to overnight stays so that the costs of the services are shifted from the IRF to the acute care hospital and to increase the proportion of interruptions involving at 3 or more nights away from the IRF so that two separate payments will be made for each portion of the stay. Monitoring trends in the same day policies is problematic since pre-PPS policies were not clear regarding how a same day admission and discharge from acute care services should have been billed.

4.2.2 Methods

To obtain an understanding of the trends that have occurred under IRF PPS, we compared the distribution of 0-10 day interruptions in the 1999-2002 bill data (Table 4.2). For the 1999-2001 stays, we used only the IRF bills to identify interruptions. That is, we counted a bundle each time there was an IRF discharge and readmission to the same facility within 10 days. We found that identifying interruptions in the 2002 data was somewhat problematic and indicative of potential billing problems for these cases. In theory, interruptions that are bundled under the IRF PPS interrupted stay policy should be identifiable only in the IRF PAI since a single bill should be submitted that covers both portions of the stay. However, we also found multiple IRF bills that indicated an interrupted stay that either did not match an IRF PAI or was not reported as an interrupted stay on the IRF PAI. We have included in our counts all interruptions in 2002 that were either reported on the IRF PAI or indicated by multiple bills, regardless of what was reported on the IRF PAI. The discharge counts are independent of the IRF PPS bundling rules, so that those cases with 0-2 nights away as well as other interruptions are counted as two discharges in the table. Only the first discharge and readmission are shown for cases involving multiple interruptions.

Table 4.2
Distribution of Interrupted Stays: 1999-2002

| No. of Nights Away From IRF | Interruptions By No. of Nights Away from IRF | | | | | | | |
| | % of Total Discharges | | | | % of Total Interruptions with 0-10 nights away | | | |
	1999	2000	2001	2002	1999	2000	2001	2002
0	0.3%	0.3%	0.3%	0.1%	4.3%	3.7%	4.2%	1.8%
1	0.7%	0.7%	0.7%	0.3%	9.6%	9.2%	9.2%	4.3%
2	0.9%	0.8%	0.8%	0.3%	12.1%	11.6%	11.6%	5.8%
3	1.0%	0.9%	1.0%	1.0%	13.3%	12.9%	13.5%	16.4%
4	1.0%	1.0%	0.9%	1.0%	13.3%	13.4%	13.3%	16.3%
5	0.9%	0.9%	0.9%	0.8%	11.8%	12.4%	12.4%	13.8%
6	0.8%	0.8%	0.8%	0.7%	11.0%	10.9%	10.8%	11.8%
7	0.7%	0.7%	0.6%	0.6%	8.8%	9.0%	8.7%	10.3%
8	0.5%	0.5%	0.5%	0.5%	6.3%	7.0%	7.1%	8.2%
9	0.4%	0.4%	0.4%	0.4%	5.3%	5.3%	5.1%	6.5%
10	0.3%	0.3%	0.3%	0.3%	4.2%	4.3%	4.2%	4.9%
0-2 nights bundles	1.9%	1.8%	1.8%	0.7%	26.0%	24.6%	24.9%	11.9%
0-10 nights interruptions	6.5%	6.5%	6.3%	5.9%	100.0%	100.0%	100.0%	100.0%
Total Discharges	393,069	418,249	450,534	460,928				

Note: Each interruption is counted as two discharges.

4.2.3 Volume Trends

Overall, there has been a slight downward trend in the proportion of discharges involving 0-10 nights away from the IRF and readmission to the same facility, from 6.5 percent in 1999 to 5.8 percent in 2002. The distribution of the interruptions has shifted consistent with the PPS bundling incentives. The proportion of interruptions involving two or fewer nights has been cut in half, declining from about 26 percent of all 0-10 night interruptions in the pre-PPS years to about 12 percent in 2002. The anticipated shift between same day and one-night interruptions is not evident; the proportions of same day, one night and two night interruptions all declined.

We looked at the distribution of interruptions by type of provider to determine if there are differences in interrupted stays by key provider characteristics (Table 4.3). Freestanding hospitals have a higher percentage of interrupted stays lasting up to 10 days (6.7 percent) than units of acute care hospitals (5.5 percent). However, freestanding rehabilitation hospitals have relatively fewer interruptions lasting less than three nights. Interruptions lasting less than three nights constituted 6.8 percent of the interruptions in freestanding hospitals compared to 13.6 percent in units.

Rural hospitals have relatively fewer interruptions (5.0 percent) than urban hospitals (6.0 percent), and a higher proportion of these interruptions are for less than three nights. The pattern

Table 4.3
Distribution of 2002 Interrupted Stays by Hospital Characteristics

No. of Nights Away from IRF	All IRFs	Type of Facility		Location		Type of Ownership*		
		Freestanding	**Units**	**Urban**	**Rural**	**Non-Profit**	**Proprietary**	**Government**
	% of total discharges							
0	0.1%	0.0%	0.2%	0.1%	0.1%	0.1%	0.1%	0.2%
1	0.3%	0.2%	0.3%	0.2%	0.3%	0.3%	0.2%	0.4%
2	0.3%	0.2%	0.4%	0.3%	0.3%	0.4%	0.2%	0.4%
3	1.0%	1.1%	0.9%	1.0%	0.8%	1.0%	1.0%	0.9%
4	1.0%	1.2%	0.9%	1.0%	0.7%	0.9%	1.1%	0.9%
5	0.8%	1.0%	0.7%	0.8%	0.7%	0.8%	0.8%	0.7%
6	0.7%	0.9%	0.6%	0.7%	0.5%	0.7%	0.8%	0.6%
7	0.6%	0.7%	0.5%	0.6%	0.5%	0.6%	0.7%	0.5%
8	0.5%	0.6%	0.4%	0.5%	0.4%	0.5%	0.5%	0.4%
9	0.4%	0.5%	0.3%	0.4%	0.3%	0.4%	0.4%	0.3%
10	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.2%
0-2 nights	0.7%	0.4%	0.9%	0.7%	0.8%	0.8%	0.4%	1.1%
0-10 nights	5.9%	6.7%	5.5%	6.0%	5.1%	5.8%	6.2%	5.6%
Total Discharges	100.0%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
No. of Nights Away from IRF	**% of interruptions with 0-10 nights away from IRF**							
0	1.8%	0.2%	2.8%	1.8%	2.1%	2.0%	0.9%	3.8%
1	4.3%	2.2%	5.6%	4.1%	6.3%	4.9%	2.4%	7.5%
2	5.8%	3.3%	7.4%	5.7%	6.6%	7.0%	3.3%	7.4%
3	16.4%	16.5%	16.3%	16.4%	16.4%	16.4%	16.5%	15.7%
4	16.3%	17.6%	15.4%	16.5%	14.0%	15.6%	17.4%	16.4%
5	13.8%	14.6%	13.3%	13.8%	14.5%	14.1%	13.6%	12.7%
6	11.8%	13.0%	10.9%	11.9%	10.4%	11.4%	12.7%	10.3%
7	10.3%	11.1%	9.8%	10.4%	9.5%	9.6%	11.6%	9.7%
8	8.2%	9.1%	7.6%	8.1%	8.8%	8.0%	8.8%	6.5%
9	6.5%	7.1%	6.1%	6.6%	5.9%	6.3%	7.1%	5.5%
10	4.9%	5.1%	4.8%	4.9%	5.2%	4.6%	5.6%	4.4%
0-2 nights away	11.9%	5.8%	15.8%	11.6%	15.0%	13.9%	6.6%	18.8%
0-10 nights away	100%	100%	100%	100%	100%	100%	100%	100%

*Missing type of ownership for 575 discharges.
Note: Each interrupted stay is counted as two discharges.

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of interrupted stays also varies by type of ownership. Proprietary hospitals have a somewhat higher proportion of interruptions than non-profits (6.2 percent vs. 5. 8 percent) but a smaller proportion of these last less than 3 nights (6.8 percent vs. 13.6 percent).

4.2.4 Cost Trends

RAND's implementation report estimated payment-to-cost ratios for interrupted stays under the bundling policies using sample 1998/1999 claims with all the data necessary for simulation (Carter et al., 2002). The simulation suggested that the bundling policy would underpay cases with interruptions lasting less than three nights by about 30 percent. To evaluate how the bundled discharges have actually fared under IRF PPS, we simulated payment-to-cost ratios for the 2002 bundled discharges for which we had the IRF PAI data needed to determine payment. We show in Table 4.4 the number of bundles, length of stay for rehabilitation (that includes both portions of the stay), and the estimated payment-to-cost ratio assuming all stays had been paid under IRF PPS federal rates in 2002. The simulation indicates the expected underpayment has not materialized. On average, the payment-to-cost ratio for cases receiving a bundled payment is 0.93, considerably higher than the 0.70 projected using the 1998/1999 sample data. Nevertheless, there are differences within hospital classes. Despite longer lengths of stay, bundled discharges are paid on average at about cost in freestanding hospitals (1.0) and proprietary hospitals (.98) but are on average unprofitable in units (.88), non-profit (.87), and government (.93) facilities.

4.3 Short-Stay Transfers

4.3.1 Transfer Policy and Incentives

Short-stay transfers are patients who are transferred to another IRF, an acute care hospital, a long-term care hospital, or a nursing home that is certified by the Medicare and/or Medicaid program with an IRF LOS that is less than the mean LOS for the CMG. The short-stay transfer policy applies to patients who did not complete the full course of rehabilitation and is intended to match payment with the resources required for the stay and to reduce the incentive for premature discharge. Total payment for the stay equals the per diem payment multiplied by the number of days the patient was in the facility plus an additional half-day per diem payment, not to exceed the CMG payment for a typical case.

Table 4.4
LOS and PTC Ratios for 2002 Bundled Stays by Hospital Characteristics

	All Cases			Non Profit			Proprietary			Government		
Nights Away	**N Bundles**	**Length of Stay**	**PTC Ratio**	**N Bundles**	**Length of Stay**	**PTC Ratio**	**N Bundles**	**Length of Stay**	**PTC Ratio**	**N Bundles**	**Length of Stay**	**PTC Ratio**
0	102	19.7	0.99	38	18.8	0.97	59	20	0.98	5	23.8	1.17
1	1,141	20.4	0.90	574	19.1	0.86	486	21.7	0.97	81	21.3	0.76
2	1,221	19.9	0.90	660	19.0	0.84	489	21	1.00	72	20.9	0.85
Total Bundles 0-2 nights away	2,464	20	0.93	1,272	19.23	0.89	1,034	21	0.98	158	21.1	0.93

	Urban Hospitals			Rural Hospitals			Freestanding Hospitals			Units		
Nights Away	**N Bundles**	**Length of Stay**	**PTC Ratio**	**N Bundles**	**Length of Stay**	**PTC Ratio**	**N Bundles**	**Length of Stay**	**PTC Ratio**	**N Bundles**	**Length of Stay**	**PTC Ratio**
0	96	20.1	0.99	6	14.1	1.12	52	20	1.03	50	19.5	0.96
1	1,063	20.4	0.91	78	19.9	0.79	502	21.9	0.97	639	19.2	0.85
2	1,118	20	0.90	103	18.4	0.88	495	21.3	0.99	726	18.9	0.84
Total Bundles 0-2 nights away	2,277	20.17	0.93	187	17.47	0.93	1,049	21.07	1.00	1,415	19.2	0.88

Note: Discharges are counted consistent with IRF PPS rules.

The per discharge payment applicable to long-stay transfers is likely to create an incentive to increase the number of long-stay transfers to both SNFs and acute care hospitals. The higher SNF transfer rate will occur because the IRF has an incentive to discharge patients as soon as they no longer benefit from a hospital-level rehabilitation program; some of these patients will not be ready for discharge to the community and will be transferred to a Medicare or Medicaid-certified facility. Similarly, we would also expect the acute care transfer rate to increase since IRFs will have an incentive to transfer patients who have acute care needs, particularly if the acute need is likely to persist more than 3 days.

4.3.2 Methods

Our trend analysis of short-stay transfers is limited to the sample of hospitals with functional status data since we must know the CMG LOS in order to determine whether a case is a short-stay transfer. mparisons of transfer rates using the IRF bills are problematic for two reasons. First, transfers were under-reported in 1999, when the discharge destination had no effect on payment. As might be expected, when we compared the 2002 transfer rates determined from the IRF bills with those that are identified using Medicare bills for the discharge destinations that are included in the short-stay transfer definition and MDS records for nursing home stays, we found some improvement in the coding between 1999 and 2002, which would affect our comparisons. However, the IRF bills still reflected lower short-stay transfer rates than the post-IRF Medicare bills and MDS data (15.1 percent vs. 15.9 percent) (Carter and Paddock, 2005).   Second, using the IRF bills for the pre-PPS years (as well as part of the initial PPS year) is problematic because the IRF bills for the pre-PPS years do not differentiate between transfers to another rehabilitation facility or long-term hospital and discharges to other institutions such as non-Medicare/Medicaid certified facilities that are not defined as transfers under the IRF PPS. To address the under-reporting and comparability issues, we defined a case as a transfer if there was a post-IRF Medicare bill for the beneficiary for which the stay starts on the day of IRF discharge or if there is an MDS record indicating the beneficiary was in a nursing home on the day of IRF discharge.

4.3.3 Findings

Taking the post-IRF Medicare data as our best measure of actual change in transfer cases, Table 4.5 shows that the overall transfer rate was similar for a matched set of facilities between

1999 and 2002. However, short-stay transfers increased by 15 percent while long-stay transfers decreased 27 percent.

When we look at all transfers (both short- and long-stay) to any type of hospital (acute care, rehabilitation, long-term), we find that the overall hospital transfer rate increased 17.5 percent from 7.4 percent to 8.7 percent between 1999 and 2002 (Table 4.6). The percentage of short-stay transfers to hospitals increased from 5.9 percent to 7.8 percent. The percentage change in short-stay transfers to hospitals increased 36.7 percent for freestanding hospitals compared to 27.5 percent for units. All transfers to SNFs and nursing homes declined from 13.2 percent to 12.0 percent of bundled discharges. The reduction occurred in the long-stay transfers to SNFs and nursing homes. While the overall short-stay transfer rates to SNFs and nursing homes was about the same in 1999 and 2002, the percentage of transfers from freestanding hospitals increased 18.6 percent from 5.3 percent to 6.3 percent while the percentage from units decreased 3.6 percent from 9.5 percent to 9.1 percent.

Table 4.5
Distribution of Cases in 1999 and 2002

Type of Case	Percent of Bundled Discharges		Percentage Change
	1999	2002	
Short-stay Transfers	13.6%	15.6%	14.9%
Other Transfers	7.0%	5.1%	-27.0%
Total Transfers	20.6%	20.7%	0.6%
Non-transfers	79.4%	79.3%	-0.2%
Total Transfers	100%	100%	0.0%

Table 4.6
Distribution of in 1999 and 2002 Transfers by Discharge Destination and Freestanding Unit Status

Type of Hospital	Total Bundled Discharges with Functional Status Data		All Transfers*				Short Stay Transfers*			
			To Hospital		To SNF		To Hospital		To SNF	
	1999	2002	1999	2002	1999	2002	1999	2002	1999	2002
All	236,699	297,726	7.4%	8.7%	13.2%	12.0%	5.9%	7.8%	7.7%	7.8%
Free-standing	103,045	137,928	7.8%	9.0%	12.3%	11.9%	5.9%	8.0%	5.3%	6.3%
Unit	133,654	159,798	7.1%	8.4%	13.8%	12.0%	5.9%	7.5%	9.5%	9.1%

4.4 High Cost Outliers

4.4.1 Outlier Policy

The IRF PPS protects hospitals from substantial financial losses on atypically expensive discharges through a high cost outlier policy. A case qualifies for an outlier payment equal to 80 percent of its estimated cost in excess of the standard IRF PPS payment plus an outlier threshold. That is, the following formula is used for payment:

Outlier payment$_i$ = .80 x (Estimated cost$_i$ – (IRF PPS std. payment$_i$ + outlier threshold)).

The FY2002-FY2004 standardized outlier payment threshold is \$11,211.[14] It is adjusted for each IRF to account for the facility's wage adjustment, DSH adjustment, and if applicable, rural adjustment. In determining whether a case qualifies for a cost outlier payment, the estimated cost of the stay is determined by applying an overall Medicare facility-specific cost-to-charge ratio to the billed charges.

The cost outlier policy adopted in the IRF PPS final rule provided estimated outlier payments equal to 3 percent of total estimated IRF PPS payments. One question is whether actual outlier payments under the IRF PPS are substantially different from 3 percent of total payments. There are two potentially offsetting factors that might affect outlier payments. First, behavioral changes associated with implementation of the IRF PPS are likely to reduce outlier payments. Coding improvements leading to case mix increases would result in higher standard payments, and lower lengths of stay and elimination of unnecessary services would reduce costs per case. Second, the use of the cost-to-charge ratio to estimate costs assumes that charges increase in relation to costs. Industry-wide, hospital charges have been increasing more rapidly than costs and some hospitals have had excessive charge increases. The PRICER used to pay for Medicare stays under the IRF PPS in 2002 used a cost-to-charge ratio from the facility's most recently settled cost report -- which may have been several years old. Applying an outdated cost-to-charge ratio to current billed charges overestimates the costs of an inpatient stay and produces higher outlier payments.

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[14] 66 FR (August 7, 2001), 41362.

4.4.2 Methods

To determine actual 2002 IRF PPS outlier payments, we simulated IRF PPS payments using the cost-to-charge ratios and other payment parameters in the public use PRICER for FY02 (discharges occurring 1/1/02-9/30/02) and FY03 (discharges occurring 10/1/02-12/31/02). Since actual outlier payments are sensitive to a number of factors, we examined the percentage of total payments attributable to outlier payments using only the sample hospitals used to set the FY2002 threshold, only those discharges that were actually paid under the IRF PPS taking into account the federal/hospital-specific blend, and all 2002 discharges. In the latter simulation, we assumed all discharges were paid 100 percent of the federal rate throughout 2002. In all simulations, the outlier percentage was very close to 3 percent of total IRF PPS payments; therefore, we present only the results for the simulation assuming all 2002 discharges were paid 100 percent of the federal rate in Table 4.7.

There were 415,169 cases in 2002 for which we have the IRF PAI and PRICER information needed to simulate payment under the IRF PPS. We bundled the bills for pre-PPS discharges involving interrupted stays for fewer than three nights, and we applied the payment parameters in the FY02 PRICER if available; if the facility was not paid under the IRF PPS until FY03, we used the payment parameters from the FY03 PRICER.[15]

4.4.3 Findings

Of the 2002 discharges in our simulation, we estimate 5.0 percent (n = 20,672) would have qualified for additional payment as a high cost outlier. The average payment per outlier case was $7,503 and aggregate outlier payments were 3.0 percent of total payments. The outlier percentages for urban and rural facilities were 3.1 percent and 1.6 percent, respectively.

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[15] Both PRICER programs were released as part of the rulemaking process and would have been updated by the Medicare intermediaries as needed throughout the year. During FY02 and FY03, intermediaries were required to use the most recently settled cost report and to update the cost-to-charge ratio each time a cost report settlement was made. Thus, a different cost-to-charge ratio may have been used to actually determine the estimated costs for a case than is reported in the public use PRICER. Since the cost-to-charge ratios to simulate 2002 payments were taken from most recently settled cost reports (which we assume were for FY2001 and earlier), we have made no adjustments to account for the underreporting of HealthSouth home office costs in FY2002 and FY2003. We found some highly aberrant cost-to-charge ratios (plus or minus 3 std deviations from the geometric mean cost-to-charge ratio) that we assume the intermediary would have detected and corrected. We included the cases for these facilities but substituted the more recent PRICER cost-to-charge ratio when available and the mean cost-to-charge ratio for urban or rural hospitals, as applicable, where it was not.

Table 4.7
Simulated IRF-PPS Payments for All 2002 Bills Assuming 100% Federal Rate by Hospital Characteristics

Category	N Facilities	N Cases	Average Std Pay	Average Outlier Pay	Average Total Fed Pay	N outlier cases	Outlier Pay Per Outlier Case	Outlier Pay as % Total Pay
All facilities	1072	415,169	$12,185.69	$373.59	$12,559	$20,672.00	$7,503.04	2.97
Geographical Area								
Urban	903	375,184	$12,181.14	$391.60	$12,573	$19,172.00	$7,663.33	3.11
Rural	169	39,985	$12,228.46	$204.61	$12,433	$1,500.00	$5,454.31	1.65
Census Region								
New England	37	19,494	$14,074.31	$203.07	$14,277	$551.00	$7,184.63	1.42
Middle Atlantic	150	77,225	$12,118.94	$458.00	$12,577	$3,591.00	$9,849.33	3.64
South Atlantic	140	72,125	$12,161.56	$283.83	$12,445	$3,187.00	$6,423.35	2.28
East North Central	182	62,207	$11,878.91	$138.78	$12,018	$1,627.00	$5,306.26	1.15
East South Central	63	31,435	$12,031.28	$285.14	$12,316	$1,389.00	$6,453.19	2.32
West North Central	97	25,384	$11,286.75	$320.21	$11,607	$1,318.00	$6,167.05	2.76
West South Central	230	82,076	$11,479.67	$415.22	$11,895	$5,551.00	$6,139.34	3.49
Mountain	63	20,573	$11,821.14	$378.26	$12,199	$1,066.00	$7,300.12	3.10
Pacific	110	24,650	$15,523.82	$1,124.44	$16,648	$2,392.00	$11,587.59	6.75
Type of Hospital								
Freestanding	201	154,503	$12,784.10	$161.47	$12,946	$4,283.00	$5,824.97	1.25
Unit	871	260,666	$11,831.01	$499.31	$12,330	$16,389.00	$7,941.57	4.05
Ownership								
Non-Profit	678	243,523	$11,925.99	$370.32	$12,296	$11,747.00	$7,676.96	3.01
Proprietary	277	138,634	$12,624.54	$353.54	$12,978	$7,040.00	$6,961.98	2.72
Government	117	33,012	$12,258.56	$481.92	$12,740	$1,885.00	$8,439.87	3.78

There were considerable regional differences in the outlier percentages, ranging from 6.8 percent of total payments in the Pacific region to 1.4 percent in the New England region. Outlier payments represented 1.2 percent of total payments to freestanding facilities compared to 4.0 percent to rehabilitation units.

We summarize outlier payments by RIC and comorbidity tier in Table 4.8. Outlier payments represented more than 5 percent of total payments in five RICs: RIC 4 (Traumatic Spinal Cord Injury), 7.0 percent; RIC 11 (Amputation, Other), 5.3 percent; RIC 18 (Major Multiple Trauma, No Spinal or Brain Injury), 5.2 percent, RIC 19 (Major Multiple Trauma With Spinal or Brain Injury), 5.1 percent and RIC 21 (Burns), 24.3 percent. The outlier percentages increased across the comorbidity tiers. The outlier percentage was 2.5 percent for discharges with no comorbidities compared to 6.0 percent for discharges with Tier 1 comorbidities.

4.5 Discussion and Conclusions

For the most part, IRF facilities have responded in anticipated ways to the financial incentives created by the policies for very short-stay cases and interrupted stays.

In particular, they have responded with:

- A reduction in non-transfer stays lasting fewer than 3 days and an increase in non-transfer stays lasting 4-5 days. The proportion of non-transfer cases considered very short-stay cases declined about 18 percent.
- A reduction in the proportion of interrupted stays lasting fewer than 3 days and an increase in the proportion lasting 4-5 days.

However, there was an unexpected 14.9 percent increase in short-stay transfers between 1999 and 2002 and a 27.0 percent decline in longer stay transfers so that there was only a small increase in the overall transfer rate (0.6 percent). The increase in short-stay transfer rates relative to longer stay transfers largely results from the general decline in LOS, although coding changes also play a smaller part. Cases are being coded into CMGs with a longer average length of stay than their 1999 CMG so that cases who were long-stay transfers in 1999 are short-stay transfers in 2002. The 17.5 percent increase in transfers to acute care hospitals is not unexpected. However, with the increase in transfer rates to acute care hospitals, we would have expected to find a parallel increase in interrupted stays that are paid as separate discharges; contrary to expectations, we found that the overall rate of interruptions lasting 10 or fewer days declined, which indicates fewer of these patients return for additional IRF care. Additional analysis of what happens to patients who are transferred back to acute care hospitals -- both with respect to

their acute care services and where they receive care after their second post-acute discharge -- is needed to understand the implications of the increase in the acute care transfer rates.

Freestanding hospitals showed stronger behavioral responses than units to the incentives created by the payment policies for very short stays and interrupted stays. For interrupted stays, which our implementation report suggested would be underpaid about 30 percent, the payment-to-cost ratio for freestanding hospitals was 1.00 compared to .88 for units of acute care hospitals.

Overall, outlier payments were 3.0 percent of total payments, which is the percentage used to establish the initial outlier threshold and provides support for retaining the same threshold until more recent data become available. It appears that the behavioral responses to the IRF PPS were sufficient to offset increases in outlier payments attributable to using outdated cost-to-charge ratios to estimate costs. Consistent with having lower costs per discharge, freestanding hospitals received 1.2 percent of total payments as outlier payments compared to 4.0 percent for units of acute care hospitals. All other things being equal, outlier payments may decline in the future as IRFs continue efforts to reduce costs per case and cost-to-charge ratios reflect more current cost data.

Table 4.8
Simulated IRF-PPS Payments for All 2002 Bills Assuming 100% Federal Rate by RIC and Comorbidity Tier

Category	N Cases	Average Std Pay	Average Outlier Pay	Average Total Fed Pay	N outlier cases	Outlier Pay Per Outlier Case	Outlier Pay as % Total Pay
Comorbidity Tier							
None	311562	$11,372.94	$293.00	$11,665.94	13305	$6,861.17	2.5
1	7385	$18,104.86	$1,161.23	$19,266.09	722	$11,877.67	6.0
2	36832	$15,224.60	$677.40	$15,902.00	2898	$8,609.43	4.3
3	59390	$13,828.78	$510.00	$14,338.78	3747	$8,083.55	3.6
RIC							
1	71191	$16,849.77	$545.53	$17,395.30	4946	$7,852.15	3.1
2	5289	$15,599.43	$550.92	$16,150.34	352	$8,277.87	3.4
3	8288	$15,654.24	$728.93	$16,383.17	602	$10,035.55	4.4
4	2128	$19,166.60	$1,431.78	$20,598.38	244	$12,487.00	7.0
5	13728	$13,723.93	$603.69	$14,327.61	895	$9,259.66	4.2
6	18333	$13,264.45	$512.63	$13,777.08	1192	$7,884.32	3.7
7	49731	$12,435.66	$288.38	$12,724.05	2362	$6,071.82	2.3
8	94285	$8,591.52	$145.10	$8,736.62	2229	$6,137.57	1.7
9	19702	$11,382.89	$232.87	$11,615.76	765	$5,997.39	2.0
10	10688	$14,630.30	$663.13	$15,293.43	826	$8,580.53	4.3
11	1091	$13,361.76	$753.31	$14,115.07	89	$9,234.34	5.3
12	9557	$10,532.73	$299.89	$10,832.62	517	$5,543.58	2.8
13	4264	$11,840.32	$427.61	$12,267.93	262	$6,959.30	3.5
14	22850	$11,208.22	$297.14	$11,505.35	1085	$6,257.65	2.6
15	9591	$12,790.29	$443.61	$13,233.90	598	$7,114.83	3.4
16	9070	$10,205.61	$222.12	$10,427.73	347	$5,805.76	2.1
17	4501	$14,002.78	$437.12	$14,439.90	271	$7,260.12	3.0
18	800	$19,359.01	$1,053.93	$20,412.94	70	$12,044.96	5.2
19	530	$20,715.34	$1,103.93	$21,819.27	66	$8,864.90	5.1
20	49386	$12,305.57	$449.50	$12,755.08	2823	$7,863.69	3.5
21	196	$19,570.94	$6,280.80	$25,851.74	36	$34,195.47	24.3
50	9060	$2,032.58	$1.70	$2,034.29	6	$2,573.16	0.1
51	910	$10,215.25	$1,614.54	$11,829.79	89	$16,508.23	13.6

Chapter V. Resource Use

In this chapter we examine the resources used to care for IRF cases between 1998 and 2002. We begin by describing changes in LOS in the population and in the sample with case mix data. We then describe changes for groups of hospitals in resource use, including LOS, the cost of care and the cost of therapy. We conclude by examining PTC ratios for groups of hospitals during 2002.

Length of stay in IRFs has been declining at least since 1998. There was a particularly large decline in the number of cases with extremely long LOS and an increase in the percentage of cases in most payment groups discharged at the average LOS. Average LOS declined within each RIC between 1999 and 2002, the two years for which we have case mix data. The rate of decline in LOS varied across groups of hospitals. In general, hospitals that had longer LOS in 1999 had greater percentage declines between 1999 and 2002, thus increasing the uniformity of IRF LOS across the country and across types of hospitals.

 The average cost per case increased by 1.6 percent between 1999 and 2002. Since LOS declined, the cost per day increased by 16.6 percent. Therapy costs increased 10.6 percent per day in the same period, thus decreasing the percentage of costs devoted to therapy from 24.4 percent to 23.2 percent. We found that if all hospitals were 100 percent on the PPS throughout all of 2002, PPS payments during 2002 would have been 14 percent higher than cost. The rate of change in average case costs, PTC, daily costs, and PTC ratios varied across groups of hospitals.

The PTC ratios show the effectiveness of the payment adjustments, with only small variations between rural and urban areas, and by DSH categories. Although payment largely followed costs by RIC and tier, variations in the PTC ratio across these categories show the need to refine the payment parameters of the PPS.[16]

5.1 Distribution of Length of Stay of IRF Cases

5.1.1 Trends over Time

Table 5.1 shows average LOS in the IRF population in each year. Average LOS has been declining steadily throughout the period, but the rate of decline accelerated after 2000, particularly in freestanding IRFs. The total decline in average LOS from 1999 to 2002 was 1.9 days or 12.8 percent. The decline was greater in freestanding IRFs -- 2.8 days or 15.8 percent.

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[16] See Paddock et al. (2005) for findings regarding possible refinements to the IRF PPS facility adjustments.

The last line in the table shows that the average LOS of 2002 cases on the PPS was quite similar to that for all 2002 cases.

Table 5.1
Mean LOS of Bundled Discharges 1998-2002 by Type of Facility

	All IRFs		Units		Freestanding	
Year	Mean LOS	% change from previous year	Mean LOS	% change from previous year	Mean LOS	% change from previous year
1998	15.48		14.16		18.18	
1999	15.06	-2.69	13.75	-2.84	17.72	-2.52
2000	14.58	-3.18	13.28	-3.47	17.24	-2.69
2001	13.95	-4.35	12.72	-4.20	16.34	-5.24
2002	13.14	-5.81	12.16	-4.36	14.92	-8.68
2002 PPS	13.26	-4.93	12.08	-5.02	15.00	-8.19

Figure 5.1 gives the cumulative distribution of LOS in the IRF population in each year from 1998 through 2002. The horizontal axis is number of days and the vertical axis is the percent of the year's cases. For the 2002 line, the point corresponding to day x gives the percent of 2002 cases who had a LOS less than or equal to x. For example, almost 90 percent of 2002 cases had a LOS of 22 days or less. The other year's lines have a similar interpretation.

One can see from Figure 5.1 that LOS has been declining steadily in all ranges of LOS throughout this period. If we pick any LOS greater than 7, we can clearly see the lines are ascending: each year's point is higher than the previous year's point so each year there are a higher percent of cases with LOS at least that small.

There was a relatively large decline in the number of cases with long LOS. For example, in 1998, 24 percent of cases had LOS longer than 20 days, but by 2002 only 15 percent of cases had an LOS of more than 20 days. The decline in long LOS cases accelerated in 2000 and was greater between 2000 and 2002 than between 1998 and 2000.

Figure 5.1
Cumulative Distribution of LOS, by Year
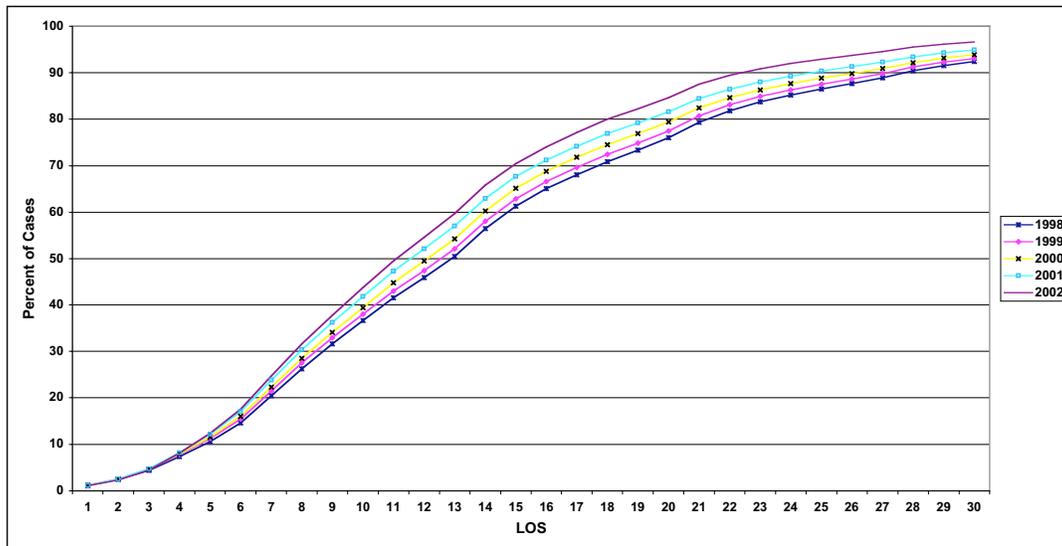
5.1.2 Changes in LOS within RIC

We saw in Chapter 3 that the distribution of RICs changed between 2002 and 1999. Since the RIC that increased the most has a shorter than average LOS, it is worthwhile to examine whether declines in LOS occurred within RIC as well as overall. As shown in Table 5.2, there was a substantial decline in LOS in each RIC except the extremely small burn RIC where LOS increased. There was also a shift in the LOS distribution, with a greater proportion of cases being discharged at the ALOS for the payment group. Overall, the proportion of cases discharged at the average LOS for their CMG increased from 5.3 percent in 1999 to 7.3 percent in 2002. In many RICs the average LOS became the modal LOS. There was also an increase, albeit a smaller one, in the proportion of cases discharged a day short of the average LOS and a decrease in the proportion discharged a day after the average LOS. These patterns are consistent with anecdotes about the average LOS being treated as a target or ceiling under the PPS. However, these patterns are not inconsistent with the general decrease in LOS so it is important to look at changes across the distribution. Figure 5.2 shows the shifts in the LOS distribution for the largest CMG within each of the three largest RICs. In each CMG, the distribution in the figure combines data from all 3 tiers as well as the cases with no relevant comorbidity. The

Table 5.2
Change in Mean Length of Stay Between 1999 and 2002 by RIC by Freestanding Unit Status

RIC	All IRFs			Units			Freestanding		
	1999	2002	% Change	1999	2002	% Change	1999	2002	% Change
1	19.4	17.5	-9.8	17.7	16.3	-7.9	23.4	20.0	-14.6
2	18.8	15.9	-15.4	16.4	14.4	-12.0	23.3	18.4	-20.9
3	17.4	14.9	-14.6	15.7	13.7	-12.5	22.1	17.5	-20.8
4	22.8	19.9	-12.8	20.2	17.2	-15.0	27.2	24.4	-10.0
5	15.9	13.9	-13.1	14.7	12.9	-11.8	19.8	16.4	-17.0
6	16.3	14.3	-12.4	14.7	13.4	-9.2	19.4	16.2	-16.3
7	15.3	14.1	-7.4	13.7	13.1	-4.5	18.6	16.2	-12.9
8	10.6	9.5	-10.6	9.8	9.0	-8.7	12.4	10.5	-15.5
9	14.4	13.3	-8.0	13.0	11.7	-10.0	16.9	15.1	-10.9
10	17.0	15.4	-9.8	15.9	14.5	-8.7	19.8	17.1	-13.5
11	15.3	14.3	-6.7	14.0	12.7	-9.3	17.6	16.9	-4.0
12	14.3	12.4	-13.2	12.3	11.5	-6.3	16.2	14.4	-11.1
13	15.0	13.1	-12.4	13.0	11.9	-8.3	17.0	15.1	-10.9
14	13.6	12.3	-9.6	12.6	11.2	-11.3	15.5	13.6	-12.0
15	15.8	13.5	-14.6	13.7	11.9	-13.4	17.6	14.6	-16.9
16	13.7	11.7	-15.1	12.0	10.7	-10.5	16.1	12.9	-19.7
17	16.7	15.3	-8.4	15.3	14.0	-8.0	19.6	17.5	-11.0
18	20.4	18.8	-7.6	18.3	16.9	-7.9	24.9	21.0	-15.6
19	22.2	20.8	-6.0	21.2	19.3	-9.0	25.0	23.7	-5.5
20	14.8	13.4	-9.8	13.3	12.1	-8.9	17.8	15.1	-15.0
21	20.6	21.5	4.0	20.6	21.6	5.0	20.7	21.2	2.1
50	2.6	2.5	-4.6	2.6	2.5	-3.6	2.5	2.4	-7.0
51	14.7	12.5	-15.2	12.5	11.6	-7.0	17.2	13.9	-19.5
Total	15.1	13.1	-13.2	13.8	12.2	-11.6	17.7	14.9	-15.8

Note: Data for 1999 All IRFs column is based on a weighted estimate from the case mix sample.

Figure 5.2
Lengths of Stay in 1999 vs. 2002, for Selected Large CMGs
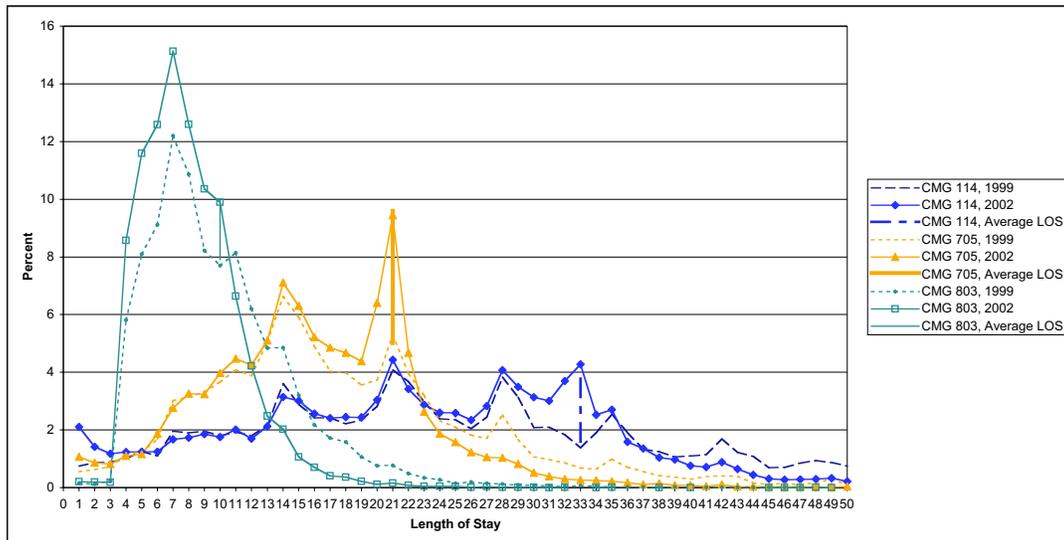
expected average LOS for that CMG was calculated from the tier specific averages published in the *Federal Register* and the distribution of the CMG by tiers.[17] This average is shown as a vertical line. In the largest stroke CMG (114) it is clear that rather than the LOS shifting to the left, the percent at or just below the average LOS increased and the percent more than two days above it decreased. The same is true of the largest hip fracture CMG (705). In the largest joint replacement CMG (803), however, it does not appear that there was a shift toward the average LOS. Rather, the number of cases discharged at the mode increased and fewer cases were discharged with stays longer than the average LOS. Overall, the shifts are small but consistent with expected reactions to the PPS.

Although we do not present details, the 2002 LOS for all PPS cases in each RIC was very similar to the LOS for all 2002 cases in that RIC. Consistent with the data in Table 5.1, the PPS LOS was very close to the non-PPS LOS -- typically 0.1 to 0.2 days longer.

The percentage decline between 1999 and 2002 was greater for freestanding hospitals than for units. However the average LOS during 2002 remained substantially higher in freestanding IRF than in units in almost all RICs.

5.2 Changes in Resource Use by Types of IRF

5.2.1 LOS and Case Cost

Table 5.3 gives data on the cases for whom we can estimate case cost using the departmental accounting method. The hospitals used in Table 5.3 provided 98.7 percent of all 1999 bundled cases and 97.6 percent of all 2002 bundled cases and thus we expect that all the means in the table adequately represent the entire population of Medicare IRF patients in these two years.[18]

The first line in Table 5.3 shows that average cost per case increased by 1.6 percent between 1999 and 2002. Since, as we saw above, LOS declined by a much greater percent (12.8 percent), the cost per day increased by 16.6 percent. This exceeds the three-year increase in the

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[17] The average LOS varies very little by tier in these CMGs, except for the few tier 1 cases. In the other tiers, and for the no tier cases, the average LOS for CMG 114 is either 32, 33 or 34; for CMG 705, it is either 21 or 23; for CMG 803 it is 10 or 11.

[18] IRFs that began operation in 2001 and 2002 are probably under-represented because cost report information may not yet be available for them. However, while these IRFs may be more costly than others, given the small number of cases in these facilities our results are highly unlikely to be affected.

Table 5.3
Comparison of Volume, Cost, and LOS for 1999 and 2002 for the IRF Population, by Provider Characteristics

Hospital Group	1999 data					2002 data					Percent change				
	Number of IRF	Number of cases	Avg. cost	Avg. LOS	Daily cost	Number of IRF	Number of cases	Avg. cost	Avg. LOS	Daily cost	Number of IRF	Number of cases	Avg. cost	Avg. LOS	Daily cost
All	1,137	380,513	$ 10,929	15.07	$ 725.37	1,139	460,669	$ 11,104	13.13	$ 845.66	0.2	21.1	1.6	-12.9	16.6
Provider in Both Years?															
No	112	17,662	$ 12,633	15.72	$ 803.60	114	28,060	$ 12,265	13.19	$ 929.81	1.8	58.9	-2.9	-16.1	15.7
Yes	1,025	362,851	$ 10,846	15.04	$ 721.38	1,025	432,609	$ 11,029	13.13	$ 840.18	0	19.2	1.7	-12.7	16.5
Area															
Urban	986	350,267	$ 10,903	15.14	$ 720.20	968	420,844	$ 11,088	13.19	$ 840.48	-1.8	20.1	1.7	-12.9	16.7
Rural	151	30,246	$ 11,236	14.24	$ 788.99	170	39,410	$ 11,313	12.41	$ 911.25	12.6	30.3	0.7	-12.8	15.5
Type of Hospital															
Unit	935	253,616	$ 10,867	13.71	$ 792.61	930	297,919	$ 11,141	12.15	$ 917.05	-0.5	17.5	2.5	-11.4	15.7
Freestanding	202	126,897	$ 11,054	17.78	$ 621.73	209	162,750	$ 11,036	14.93	$ 739.31	3.5	28.3	-0.2	-16	18.9
Ownership															
Government	106	24,642	$ 12,073	14.83	$ 814.01	113	33,294	$ 12,046	13.01	$ 925.82	6.6	35.1	-0.2	-12.3	13.7
Non-Profit	712	227,541	$ 10,856	14.03	$ 773.66	696	264,639	$ 11,037	12.23	$ 902.08	-2.2	16.3	1.7	-12.8	16.6
Proprietary	319	128,330	$ 10,839	16.95	$ 639.56	330	162,736	$ 11,020	14.61	$ 754.24	3.4	26.8	1.7	-13.8	17.9
Unit of Acute Hospital															
ADC less than 10 pts	299	35,697	$ 11,392	12.27	$ 928.42	289	43,308	$ 11,495	10.88	$ 1,056.19	-3.3	21.3	0.9	-11.3	13.8
ADC 10-24 pts	495	138,392	$ 10,513	13.42	$ 783.28	504	164,007	$ 10,890	12.00	$ 907.52	1.8	18.5	3.6	-10.6	15.9
ADC 25 or more pts	141	79,527	$ 11,247	14.86	$ 756.93	137	90,604	$ 11,427	13.02	$ 877.37	-2.8	13.9	1.6	-12.3	15.9
Freestanding Hospital															
ADC less than 25 pts	53	9,255	$ 15,276	17.16	$ 890.40	51	11,318	$ 13,643	13.91	$ 980.63	-3.8	22.3	-10.7	-18.9	10.1
ADC 25-49 pts	73	41,308	$ 10,412	17.48	$ 595.59	73	47,714	$ 10,782	14.79	$ 729.14	0	15.5	3.6	-15.4	22.4
ADC 50 or more pts	76	76,334	$ 10,889	18.02	$ 604.43	85	103,718	$ 10,868	15.10	$ 719.63	11.8	35.9	-0.2	-16.2	19.1
Census Region															
New England	40	17,330	$ 12,095	18.51	$ 653.38	39	20,763	$ 12,545	15.80	$ 794.05	-2.5	19.8	3.7	-14.7	21.5
Middle Atlantic	148	70,655	$ 10,835	15.26	$ 709.93	154	82,111	$ 10,788	12.91	$ 835.49	4.1	16.2	-0.4	-15.4	17.7
South Atlantic	145	65,798	$ 10,325	14.72	$ 701.29	140	77,824	$ 10,630	13.15	$ 808.51	-3.4	18.3	2.9	-10.7	15.3
East North Central	218	63,817	$ 10,840	13.76	$ 787.63	212	75,102	$ 10,948	11.98	$ 914.12	-2.8	17.7	1.0	-13.0	16.1
East South Central	57	29,096	$ 10,053	15.84	$ 634.74	63	34,255	$ 10,331	14.05	$ 735.14	10.5	17.7	2.8	-11.3	15.8
West North Central	100	23,875	$ 10,341	14.04	$ 736.46	97	27,366	$ 10,948	12.57	$ 871.30	-3.0	14.6	5.9	-10.5	18.3
West South Central	233	68,932	$ 11,258	15.90	$ 707.90	238	90,347	$ 10,978	13.40	$ 819.13	2.1	31.1	-2.5	-15.7	15.7
Mountain	75	18,449	$ 9,853	13.62	$ 723.65	77	24,956	$ 10,631	12.60	$ 843.91	2.7	35.3	7.9	-7.5	16.6
Pacific	121	22,561	$ 13,969	15.23	$ 917.47	118	27,530	$ 14,735	13.79	$ 1,068.44	-2.5	22.0	5.5	-9.4	16.5
DSH Patient Ratio															
Less than .10	586	200,252	$ 10,186	14.34	$ 710.14	581	242,419	$ 10,334	12.52	$ 825.23	-0.9	21.1	1.5	-12.7	16.2
.10-.19	361	125,419	$ 11,175	15.53	$ 719.52	335	144,193	$ 11,448	13.74	$ 833.03	-7.2	15	2.4	-11.5	15.8
.20-.29	110	36,395	$ 12,418	16.08	$ 772.12	104	42,011	$ 12,188	13.82	$ 881.89	-5.5	15.4	-1.9	-14.1	14.2
.30 or higher	77	18,192	$ 14,350	17.68	$ 811.65	66	20,091	$ 14,842	14.93	$ 994.36	-14.3	10.4	3.4	-15.6	22.5
Missing	3	255	$ 17,287	23.87	$ 724.31	53	11,955	$ 12,466	12.62	$ 987.72	1666.7	4588.2	-27.9	-47.1	36.4

Note: Table restricted to cases with case cost data.

market basket of 10.9 percent[19], suggesting approximately a 5.7 percent increase in real resources used per day. Thus, some of the savings from the decrease in LOS went to providing more resources during the time the patient was in the IRF.

The rest of the table is arranged to compare cases at hospitals with specific characteristics. In examining differences in cost and LOS across types of hospitals, it is important to remember that the differences may be due to differences in case mix and/or wage index. In discussing this table we will concentrate on the changes observed in each group, thus allowing the group in the earlier period to be its own control. Changes we see may be due to case mix changes, but are unlikely to be due to changes in input prices.

IRFs that ceased to care for Medicare beneficiaries under the same provider number had substantially higher costs in 1999 than continuing IRFs. Similarly, IRFs that started after 1999 cost more than other IRFs in 2002. Continuing IRFs had less of a decline in LOS (12.7 percent).

Rural hospitals had a greater increase in Medicare volume than urban hospitals, similar declines in LOS, and slightly lower increases in cost per day. There also were variations across the census divisions. The greatest increase in volume occurred in the West South Central and Mountain divisions. The largest declines in LOS occurred in New England, the Middle Atlantic, and West South Central, all of which had higher than average LOS in 1999. Similarly, the smallest decline in LOS occurred the Mountain Division, which had the shortest LOS in 1999. Thus, the changes resulted in more uniformity in LOS across the country. The Pacific Division, however, remained the most costly on both a per case and per day basis.

There were large differences in the changes made by units and freestanding IRFs during this period, and by types of IRF ownership. Freestanding hospitals had greater increases in volume, greater declines in LOS and a greater increase in daily cost. Despite the greater decline in LOS, the average LOS was longer in freestanding hospitals than in units in 2002. The differences between units and freestanding IRFs in daily cost decreased with units having a 24 percent greater daily cost than freestanding hospitals in 2002. Proprietary hospitals increased volume more than average, decreased LOS more than average, increased daily cost more than average and continued to have higher LOS and lower daily costs in 2002. These changes are

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[19] The market basket increase was calculated by us from the quarterly moving averages for 2000 through 2002 found in www.cms.hhs.gov/statistics/market-basket/excluded-capital.asp.

related to the changes by freestanding status, as two-thirds of proprietary cases and of freestanding cases are in facilities that are both freestanding and proprietary.

Facility size has a u-shaped relationship with the cost of a case. For both units and freestanding hospitals, the smaller facilities are the most expensive, especially in terms of daily cost. Larger freestanding facilities had the largest increase in volume. Among units, the smallest units had the largest increase in volume. This difference in growth pattern had little effect on the relative growth rate of daily cost in units and freestanding hospitals, however, because small IRFs where costs are greater had only a small change in market share within either group.[20]

The data by DSH patient ratio categories show clearly that, within each year, costs and LOS increase with the percentage of patients who are low income. (The statistics on changes within DSH ratio categories may be slightly confounded by the percentage of cases for whom DSH data are not available in 2002.)

5.2.2 Therapy Costs

Table 5.4 shows the percentage of costs that are due to therapy and the average daily therapy costs in 1999 and 2002. The average LOS is repeated from Table 5.3 for ease of comparison. Therapy accounted for 24.4 percent of 1999 costs and 23.2 percent of 2002 costs.[21] This decline in the proportion of costs due to therapy was 5.2 percent for all cases and 4.8 percent for IRFs that operated in both years. The decline is less than the decline in LOS so average daily therapy costs increased by 10.6 percent overall and 10.9 percent in hospitals present in both years.

Differences in therapy costs between urban and rural areas are not large and did not change much. There is a greater range across census divisions in the percentage of costs due to therapy in 2002 than in 1999. The regions where we estimate the lowest proportion of costs from therapy and lowest average therapy costs are New England and the Middle Atlantic in both years, and those with the highest proportion are the East North Central and West South Central. The Pacific Region, which had the highest daily cost in 1999, had the greatest percentage increase in daily therapy costs.

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[20] Small units cared for 14.1 percent of unit cases in 1999 and 14.5 percent of unit cases in 2002; small freestanding IRFs cared for 7.3 percent of freestanding cases in 1999 and 7.0 in 2002.

[21] The majority of non-therapy costs are for nursing care and other routine per diem services (meals, janitorial service, linen, etc.). However, non-therapy ancillaries (such as diagnostic tests, pharmacy) cost about 70 percent as much as therapy.

Table 5.4
Comparison of LOS, Percentage of Costs for Therapy, and Average Daily Therapy Cost for 1999 and 2002, by Provider Characteristics

Hospital Group	1999			2002			Percent change		
	Avg. LOS	% of cost from therapy	Avg. daily therapy cost	Avg. LOS	% of cost from therapy	Avg. daily therapy cost	Avg. LOS	% of cost from therapy	Avg. daily therapy cost
All	15.07	24.43%	$ 176.83	13.13	23.16%	$ 195.62	-12.8	-5.2	10.6
Provider in both years?									
No	15.72	23.28%	$ 185.22	13.18	21.02%	$ 195.27	-16.1	-9.7	5.4
Yes	15.04	24.49%	$ 176.40	13.13	23.32%	$ 195.64	-12.7	-4.8	10.9
Area									
Urban	15.14	24.35%	$ 174.98	13.19	23.08%	$ 193.74	-12.8	-5.2	10.7
Rural	14.24	25.28%	$ 199.36	12.41	24.00%	$ 218.74	-12.8	-5.1	9.7
Type of Hospital									
Unit	13.71	24.67%	$ 195.10	12.15	23.73%	$ 217.26	-11.4	-3.8	11.4
Freestanding	17.78	23.96%	$ 148.93	14.93	22.13%	$ 163.55	-16.0	-7.7	9.8
Ownership									
goverment	14.83	24.07%	$ 195.47	13.01	22.36%	$ 207.03	-12.3	-7.1	5.9
non-profit	14.03	24.41%	$ 188.51	12.23	23.19%	$ 208.83	-12.8	-5.0	10.8
proprietary	16.95	24.54%	$ 156.92	14.61	23.29%	$ 175.65	-13.8	-5.1	11.9
Unit of acute hospital									
ADC less than 10 pts.	12.27	24.02%	$ 222.47	10.88	22.05%	$ 232.93	-11.3	-8.2	4.7
ADC 10-24 pts.	13.42	25.77%	$ 201.93	12.01	24.63%	$ 223.59	-10.5	-4.4	10.7
ADC 25 or more pts.	14.86	23.14%	$ 173.89	13.01	22.97%	$ 200.31	-12.4	-0.8	15.2
Freestanding									
ADC less than 25	17.16	24.31%	$ 216.44	13.90	22.02%	$ 215.65	-19.0	-9.4	-0.4
ADC 25-49	17.48	25.57%	$ 152.29	14.79	22.28%	$ 162.44	-15.4	-12.9	6.7
ADC 50 or higher	18.02	23.06%	$ 139.26	15.10	22.07%	$ 158.84	-16.2	-4.3	14.1
Census Region									
New England	18.51	21.63%	$ 141.35	15.80	19.60%	$ 155.65	-14.7	-9.4	10.1
Middle Atlantic	15.26	20.97%	$ 147.46	12.90	20.06%	$ 166.33	-15.5	-4.3	12.8
South Atlantic	14.72	25.22%	$ 176.76	13.15	24.02%	$ 194.20	-10.7	-4.7	9.9
East North Central	13.76	25.12%	$ 197.19	11.98	23.58%	$ 215.51	-13.0	-6.2	9.3
East South Central	15.84	27.48%	$ 173.72	14.15	25.92%	$ 190.19	-10.7	-5.7	9.5
West North Central	14.04	26.33%	$ 195.11	12.57	25.01%	$ 217.88	-10.5	-5.0	11.7
West South Central	15.90	25.02%	$ 177.12	13.40	24.18%	$ 198.03	-15.7	-3.3	11.8
Mountain	13.62	24.61%	$ 177.64	12.60	21.38%	$ 180.45	-7.5	-13.1	1.6
Pacific	15.23	25.25%	$ 231.70	13.79	24.48%	$ 261.54	-9.4	-3.1	12.9
DSH Patient Ratio									
Less than .10	14.34	25.00%	$ 177.58	12.53	23.46%	$ 193.56	-12.6	-6.2	9.0
.10-.19	15.53	24.21%	$ 173.42	13.74	22.87%	$ 189.68	-11.6	-5.5	9.4
.20-.29	16.08	23.49%	$ 180.43	13.82	23.73%	$ 209.31	-14.1	1.0	16.0
.30 or higher	17.68	22.85%	$ 185.94	14.93	22.36%	$ 222.35	-15.6	-2.2	19.6
Missing	23.87	14.20%	$ 102.85	12.62	21.11%	$ 208.52	-47.1	48.7	102.7

Note; Sample is same as Table 5.3, except this table omits all cases from IRFs that charged for therapy for fewer than 67 percent of cases. This restriction omitted 13 hospitals with 4460 cases in 1999 and 4 hospitals with 1730 cases in 2002.

The differences across other categories in percentage of costs from therapy are not nearly as large as those for census divisions. Units had a higher percentage of costs for therapy in 1999 than freestanding facilities and this difference increased slightly in 2002. The proportion of costs from therapy were similar for non-profit and proprietary hospitals in both years, with local government-run hospitals having a slightly lower percentage. In 1999, the percentage of costs

from therapy declined with increasing low-income percentage, but by 2002 this relationship was no longer evident.

5.3 Payment-to-Cost Ratios in 2002

5.3.1 Facility Characteristics

We next present the ratio of average payment to average cost for 2002 cases. The sample differs from that in Table 5.3 in that it is restricted to cases with a good match to the IRF PAI and for whom we have all necessary payment parameters (wage index, rural status, DSH fraction, CCR, and covered charges) to calculate outlier payments.

The first row of Table 5.5 shows the average payment would have been $12,599 if all Medicare cases discharged during CY 2002 had been paid 100 percent under the PPS. The average weight per discharge was 0.97. The average bundled cost of $11,044 differs by less than one percent from that of the population in Table 5.3. However, in this table we are able to standardize costs with the parameters that are used for payment in the PPS -- case mix, area wage index, rural status, and DSH. This column allows comparison of relatively costliness across hospital groups after controlling for their patient mix and characteristics.

PPS payments are substantially higher than cost. This is not surprising given the lack of cost growth per case since 1999, the increase in the payment rate by the actuary to account for payment trends under TEFRA, and changes in coding which may have increased the weight per discharge. The average payment is estimated to exceed average cost by 14 percent as shown in the last column of Table 5.5, first row.

The remaining rows in the table compare groups of hospitals. The extra payment provided to rural hospitals in the PPS equalized differences in costs as the PTC ratio for rural hospitals only slightly lower than that for urban hospitals. Most census regions have PTC ratios similar to the national average -- with the 2 North Central regions having the lowest and the East South Central region having the highest. The Pacific region has the highest average bundled cost, but also the highest average case mix weight and consequently a PTC ratio close to average. Freestanding hospitals and proprietary hospitals have the highest PTC ratio, due in part to their lower than average costs and in part to their higher than average case weight. There is substantial overlap between these two groups –63 percent of freestanding IRFs are proprietary and 45 percent of proprietary IRFs are freestanding. The very smallest freestanding facilities and units have the lowest PTC ratios.

Table 5.5
PPS Payment, Average Case Weight, Cost, and Payment-to-Cost Ratios for All 2002 Cases, by Hospital Characteristics

Category	N Facilities	N Cases	N Equivalent Cases	Average Total Fed Pay	Average Case Weight	Average Bundled Cost	Average Standardized Cost	Payment to Cost Ratio
All facilities	1,072	415,169	386,520	$12,559	0.97	$11,044	$10,858	1.14
Geographical Area								
Urban	903	375,184	349,192	$12,573	0.98	$11,041	$10,853	1.14
Rural	169	39,985	37,328	$12,433	0.95	$11,074	$10,906	1.12
Census Region								
New England	37	19,494	18,130	$14,277	1.03	$12,394	$10,650	1.15
Middle Atlantic	150	77,225	71,996	$12,577	0.91	$10,706	$10,545	1.17
South Atlantic	140	72,125	67,548	$12,445	0.99	$10,586	$10,397	1.18
East North Central	182	62,207	56,597	$12,018	0.95	$10,814	$10,880	1.11
East South Central	63	31,435	29,293	$12,316	1.03	$10,348	$10,355	1.19
West North Central	97	25,384	23,414	$11,607	0.95	$11,015	$11,612	1.05
West South Central	230	82,076	77,219	$11,895	0.98	$10,948	$11,466	1.09
Mountain	63	20,573	19,167	$12,199	0.97	$10,527	$10,660	1.16
Pacific	110	24,650	22,782	$16,648	1.06	$14,619	$11,301	1.14
Type of Hospital								
Freestanding	201	154,503	143,764	$12,946	1.03	$10,930	$10,242	1.18
Unit	871	260,666	242,755	$12,330	0.94	$11,112	$11,223	1.11
Ownership								
Non-Profit	651	243,523	218,467	$12,231	0.94	$10,967	$10,998	1.12
Proprietary	319	138,634	141,519	$12,956	1.02	$10,996	$10,500	1.18
Government	102	33,012	26,533	$12,607	0.96	$11,933	$11,613	1.06
Unit of acute hospital								
ADC less than 10 pts.	297	42,647	39,653	$11,542	0.90	$11,409	$12,107	1.01
ADC 10-24 pts.	447	136,634	127,191	$12,265	0.94	$10,879	$11,077	1.13
ADC 25 or more pts.	127	81,385	75,912	$12,853	0.96	$11,346	$11,004	1.13
Freestanding hospital								
ADC less than 25	46	9,762	9,073	$12,492	0.97	$13,272	$13,369	0.94
ADC 25-49	72	46,952	43,547	$12,759	1.04	$10,733	$10,158	1.19
ADC 50 or higher	83	97,789	91,145	$13,080	1.04	$10,790	$9,971	1.21
DSH Patient Ratio								
Less than .10	573	239,079	222,922	$11,860	0.95	$10,324	$10,653	1.15
.10-.19	327	127,383	118,766	$12,907	1.00	$11,532	$11,078	1.12
.20-.29	101	32,097	29,637	$14,369	1.00	$12,701	$11,461	1.13
.30 or higher	71	16,610	15,194	$16,461	1.06	$14,456	$10,967	1.14
CMI Quartiles								
Q1	268	93,615	87,675	$10,492	0.80	$9,454	$10,474	1.11
Q2	268	96,844	90,262	$11,912	0.92	$10,729	$11,040	1.11
Q3	268	116,107	108,176	$12,632	1.01	$10,962	$10,842	1.15
Q4	268	108,603	100,407	$14,841	1.13	$12,783	$11,063	1.16
Residents to ADC ratio								
Non-teaching	961	368,195	343,066	$12,411	0.98	$10,854	$10,793	1.14
Less than .10	58	28,429	26,302	$13,539	0.97	$11,838	$10,843	1.14
.10-.19	34	14,442	13,390	$13,678	0.93	$13,373	$12,201	1.02
.20 or higher	19	4,103	3,761	$15,167	1.02	$14,419	$12,127	1.05

The last set of lines in the table, for DSH, CMI hospital quartiles, and teaching status, provide information about aspects of the payment system. The PTC ratios by DSH categories are roughly similar to the national average and exhibit no trend, suggesting that the relative payments for low-income percentage are appropriate. However, the strong increase in PTC ratios for the CMI quartiles indicates a need to recalibrate the weights.[22]

At the moment, there is no adjustment of PPS payments for the indirect cost of medical education (IME). The last section of the table shows that PTC ratios were lower for teaching hospitals, particularly those with more than 1 resident for every 10 patients, than for non-teaching hospitals. This may indicate a need to provide an IME adjustment in a refined PPS.

5.3.2 Case Characteristics

Table 5.6 shows information on PPS payments, case weights, costs, and PTC ratios by the tier and RIC assigned to the case. Although, as expected, costs are substantially higher for the small number of tier 1 cases than for others, the increase in payments more than offsets the higher tier 1 payment, and produces the highest PTC ratio of any tier group. The overpayment of tier 1 cases and the smaller relative overpayment of the other tier cases show the need to refine the definition of tier and recalibrate the weights. Average federal payment and average case weight are correlated at 0.98 across RICs showing that the basic effect of impairment on the payment system is appropriate. However, the data by RIC also show some variation in PTC and, therefore, the need to recalibrate the weights and possibly refine the CMGs. The smaller RICs tend to have the largest deviation from the average PTC ratios. Burns (RIC 21) and osteoarthritis (RIC 12) are relatively underpaid; major multiple trauma with brain or spinal cord injury (RIC 18) and non-traumatic brain injury (RIC 3) are among those relatively overpaid.

The largest RIC, RIC 8 (lower extremity joint replacement), is the lowest cost of the RICs with average payment, cost, and case weight being 70 percent of that of an average case. It is also one of the least well-paid RICs, but still has a PTC ratio of 1.11.

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[22] CMG relative weights were recalibrated for FY2006 along with other CMG refinements. For related RAND reports, see Carter (2005) and Relles (2005).

Table 5.6
Average Total Federal Payments, Case Weights, Bundled Costs, Standardized Cost and Payment-to-Cost Ratio in 2002 By Comorbidity Tier and RIC

Category	N Cases	N Equivalent Cases	Average Total Fed Pay	Average Case Weight	Average Bundled Cost	Average Standardized Cost	Payment- to-Cost Ratio
All Cases **Comorbidity Tier**							
None	311,562	292,824	$11,666	0.91	$10,356	$10,875	1.13
1	7,385	6,471	$19,266	1.45	$16,206	$10,738	1.19
2	36,832	33,118	$15,902	1.21	$13,912	$10,780	1.14
3	59,390	54,106	$14,339	1.11	$12,230	$10,828	1.17
RIC							
1	71,191	63,905	$17,395	1.34	$15,126	$11,049	1.15
2	5,289	4,646	$16,150	1.23	$13,838	$11,052	1.17
3	8,288	7,382	$16,383	1.22	$13,595	$11,019	1.21
4	2,128	1,863	$20,598	1.51	$18,046	$11,286	1.14
5	13,728	12,686	$14,328	1.09	$12,091	$11,036	1.18
6	18,333	17,011	$13,777	1.04	$12,113	$10,922	1.14
7	49,731	45,927	$12,724	1.00	$11,434	$10,839	1.11
8	94,285	92,228	$8,737	0.69	$7,837	$10,762	1.11
9	19,702	18,478	$11,616	0.92	$10,172	$10,686	1.14
10	10,688	9,729	$15,293	1.17	$13,505	$10,984	1.13
11	1,091	988	$14,115	1.05	$12,443	$10,756	1.13
12	9,557	9,017	$10,833	0.86	$10,112	$11,329	1.07
13	4,264	4,002	$12,268	0.94	$10,845	$11,046	1.13
14	22,850	20,828	$11,505	0.89	$10,078	$10,707	1.14
15	9,591	8,722	$13,234	1.01	$11,370	$10,588	1.16
16	9,070	8,594	$10,428	0.82	$9,299	$10,787	1.12
17	4,501	4,122	$14,440	1.12	$12,565	$10,937	1.15
18	800	707	$20,413	1.54	$16,432	$10,815	1.24
19	530	477	$21,819	1.65	$18,208	$11,202	1.20
20	49,386	45,055	$12,755	0.99	$11,090	$10,745	1.15
21	196	183	$25,852	1.53	$25,681	$11,837	1.01
50	9,060	9,060	$2,034	0.17	$2,261	$10,733	0.90
51	910	910	$11,830	0.81	$12,024	$10,829	0.98

5.4 Conclusions

Length of stay in IRFs has been declining at least since 1998. There was a particularly large decline in the number of cases with extremely long LOS and an increase in the percentage of cases in most payment groups discharged at the average LOS. The rate of decline increased throughout this period and average LOS declined 5.8 percent from 2001 to 2002, the first year of the PPS. Average LOS declined within each RIC between 1999 and 2002, the two years for which we have case mix data.

The rate of decline in LOS varied across groups of hospitals. In general, hospitals that had long LOS in 1999 had greater percentage declines between 1999 and 2002, thus increasing the uniformity of IRF LOS across the country and across types of hospitals. For example, freestanding hospitals' LOS decreased by 16 percent between 1999 and 2002, while units' LOS decreased only 11.4 percent. But freestanding LOS was higher in both years and closer to unit LOS in 2002 (14.9 vs. 12.2 days) than in 1999 (17.8 vs. 13.7 days).

The average cost per case increased 1.6 percent between 1999 and 2002. Since LOS declined by a much greater percent, the cost per day increased by 16.6 percent. This exceeds the three-year rate of increase in the market basket of 10.9 percent. Therapy costs increased 10.6 percent per day in the same period, thus decreasing the percentage of costs devoted to therapy from 24.4 percent to 23.2 percent.

The rate of change in average case costs and daily costs varied across groups of hospitals. Unlike LOS, case costs and daily costs did not become more uniform across hospital groups. For example, in 1999, freestanding cases cost almost $200 more than units; by 2002, freestanding cases cost about $615 less. If all hospitals were 100 percent on the PPS throughout all of 2002, PPS payments during 2002 would have been 14 percent higher than costs. This is the combined result of the lack of cost growth per case since 1999, the increase in the payment rate by the actuary to account for payment trends under TEFRA, and changes in coding. PTC ratios varied across groups of hospitals, with freestanding and proprietary hospitals having PTC ratios of 1.18.

The PTC ratios show the effectiveness of the payment adjustments, with only small variations between rural and urban areas, and by DSH categories. Although payment largely followed costs by RIC and tier, variations in the PTC ratio across these categories show the need

to refine the payment parameters of the PPS. There also was a positive correlation between PTC ratio and hospital CMI quartile. In addition to demonstrating that the current weights are inappropriate for the coding practices prevalent in 2002, this may indicate that coding practices varied across hospitals with those in the highest CMI quartile responding most completely to the PPS incentives, or even upcoding.[23]

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[23] For further discussion of coding changes, see Carter and Paddock (2005).

Appendix 1: CMI Calculation

A CMI is the average of the case weights assigned to some specified set of patients (cases). The case weights are relative weights -- i.e., they provide expected cost of each CMG relative to each other CMG. CMGs depend on patient age, impairment, functional status, tiers, length of stay and whether the patient died in the hospital. In the IRF PPS the weights were calculated from the matched data set for 1999. They were normalized so that each weight gives the cost of a case in the CMG relative to the average case in the data set. In calculating the average cost of a case, short-stay transfer cases are counted as only a fraction of a case. Thus, the CMI in the data set is 1.0 when short-stay cases are counted as only a fraction of a case.

We calculated the CMI used here from the CMG assigned by IRVEN and the discharge destination and LOS found on the hospital bill. However, one could calculate LOS from IRF PAI data and impute the discharge destination from the discharge setting found on the IRF PAI. The following values have been used in previous analyses:

- Values of i44a of (04, 05, 06, 07, 08, 09, 12, and 13) are transfers;
- Values of i44a of 11 is a patient who expired in the hospital; and
- All other values of i44a are deemed returned to community.

Using these data, the case mix index was calculated as described in the five steps below.

Step 1: Categorize cases into transfers, deaths, and other.
Step 2: Assign the final CMGs.
If the case is not a transfer and if the LOS is <=3 then assign the case to 5001,
If the case is a death case with LOS > 3 use impairment code (or admission CMG) and LOS to assign the case to one of 5101, 5102, 5103, or 5104. (Orthopedic is RIC 7, 8, or 9. 5101 is orthopedic with 3 < LOS <=13; 5102 is orthopedic with LOS >= 14; 5103 is non-orthopedic 3 < LOS <= 15; 5104 is orthopedic with LOS >=16.)
If neither of the above then assign the final CMG equal to the admission CMG (i.e., if the case is a transfer case with any LOS, or if LOS > 3 and either the case was deemed to have returned to the community or expired).
Step 3: Determine how much each case is counted in the CMI. For transfer cases only, compare the LOS of the case with the average LOS in the final CMG (same as the admission CMG) from Table 1 of the Addendum to the final regulations. Designate the case a short-stay transfer if and only if LOS + 0.5 < average LOS in CMG. If case i is a short- stay transfer, set x(i) = (LOS + 0.5)/average LOS in CMG. For cases who are not short-stay transfers, set x(i) = 1.
Step 4: Retrieve the weight for the final CMG from Table 1 of the Addendum. Put the weight for the ith case in w(i).
Step 5: Calculate the CMI as:
Sum(x(i)*w(i))/sum((x(i))) where the summation is over all cases with valid data in the data set.

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