The Effects of the DRG-Based Prospective Payment System on Quality of Care for Hospitalized Medicare Patients

Executive Summary

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PREFACE

This report constitutes the executive summary of a RAND study entitled "The Effects of the DRG-Based Prospective Payment System on Quality of Care for Hospitalized Medicare Patients," funded by the Health Care Financing Administration. It is the first of a series documenting the design, methods, and results of a four-year evaluation that began in 1985. The companion report (R-3931-HCFA) presents materials discussed in a peer-reviewed medical journal (see below) and a series of appendixes designed to supplement that material.

The study used a time series design to measure quality of care in 1981–1982, before the implementation of the prospective payment system (PPS), and in 1985–1986, after PPS implementation. Quality of care was judged using a clinically detailed review of the medical record and studying mortality, readmission, and use of nursing homes after hospital discharge. Data were collected for a nationally representative sample of Medicare patients at least 65 years old who were hospitalized with one of the study’s six study conditions: congestive heart failure, acute myocardial infarction, pneumonia, cerebrovascular accident, hip fracture, and depression.

Related publications from this study are listed below:


ACKNOWLEDGMENTS

We gratefully acknowledge the collaborative effort of the five Professional Review Organizations (PROs) that enabled this work to be completed. These included California Medical Review, Inc., California; Professional Foundation for Health Care, Inc., Florida; Professional Review Organization, Indiana; Keystone Peer Review Organization, Pennsylvania; and Texas Medical Foundation, Texas. Participants from the PROs included medical directors, physician consultants and reviewers, project directors, and review coordinators from each of the five study states. In particular, we appreciate the keen clinical insight of the PRO physician specialists with whom we consulted throughout this study. We also acknowledge the many contributions of Harry Savitt, Ph.D., Project Officer from the Office of Research and Demonstrations of the Health Care Financing Administration, U.S. Department of Health and Human Services, whose administrative skills, astute commentary, and continuing support helped us immeasurably. We thank Paul Eggers, Ph.D., who helped us acquire data for validation purposes that would otherwise have been impossible to obtain. Our policy advisory board (John C. Beck, M.D., Barbara J. Burns, Ph.D., Monroe T. Gilmour, M.D., Paul F. Griner, M.D., Charlene Harrington, RN, Ph.D., T. Reginald Harris, M.D., Rosalie A. Kane, DSW, Shirley Kellie, M.D., Judith R. Lave, Ph.D., Charles E. Lewis, M.D., Joseph Martin, Francis D. Moore, Jr., M.D., Richard N. Pierson, Jr., M.D., and James F. Rodgers, Ph.D.) provided astute advice and guidance. We acknowledge the important contributions of the 297 hospitals whose medical records we reviewed. Without the efforts of these individuals and institutions, this evaluation could not have been successfully completed. Finally, we recognize and thank Florence McGinty, without whose secretarial skills this report would not have been produced.
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I. INTRODUCTION

In an effort to control rising health care costs, the federal government, in 1983, established a prospective payment system (PPS) to reimburse hospitals for inpatient care of Medicare patients. PPS changed the way Medicare reimbursed hospitals from a cost or charge basis to a prospectively determined, fixed-price system in which hospitals are paid according to the diagnosis related group (DRG) into which a patient is classified. The fixed payment per patient provides financial incentives for hospitals to reduce both length of stay and intensity of care, giving rise to concerns that the quality of care may have declined under PPS.

In October 1985, The RAND Corporation began an evaluation of the impact of the DRG-based PPS system. The project was funded by the Health Care Financing Administration (HCFA) and was undertaken in collaboration with the Professional Review Organizations (PROs) in five states. The objective of this four-year study was to determine whether PPS cost-containment efforts have affected the quality of care received by hospitalized Medicare patients.
II. METHODS

Six conditions were selected for this evaluation: congestive heart failure, acute myocardial infarction, hip fracture, pneumonia, cerebrovascular accident, and depression. These conditions were selected because they occur frequently and, except for hip fracture and depression, cause a large number of deaths. In addition, well defined diagnostic criteria exist for these diseases, and their treatment was relatively stable from 1981 to 1986. Finally, for these diseases, the patient's medical record contains the information necessary to assess patient sickness at the time of hospital admission and the quality of hospital care. Hip fracture and depression were chosen to provide data about care for surgical and psychiatric conditions; these data supplement the information provided by the four medical conditions. The results of the depression analyses will be presented at a later time.

Five states were selected for study, each from a different geographic region of the nation: California, Florida, Indiana, Pennsylvania, and Texas. Each state was divided into 10 to 12 study areas, and we gathered data from a sample of four to eight areas in each state, for a total of 30 areas.

To evaluate the impact of PPS, we used a time series design in which we compared patients hospitalized before implementation of PPS (January 1981 to December 1982) with patients hospitalized in the same institutions following PPS implementation (July 1985 to June 1986). We collected 20 percent of the total patient sample in 1981, 30 percent in 1982, and 50 percent in the post-PPS time period.

Our sample is representative of patients nationally with respect to hospital size, teaching intensity, percentage of Medicare admissions, and size of the city in which the hospital is located. We oversampled city/county hospitals and hospitals with many Medicaid patients to better estimate the effect of PPS on poor patients.

STUDY SAMPLE

Of the 305 hospitals asked to participate, 297 actually did so. The planned study sample was 17,000 patients. To collect data on this number of patients, 21,925 medical records were selected for review. During medical record review, 5,167 patients did not meet clinical criteria for having the selected diseases (even though the record was coded as such), and these were excluded from the study. Hospitals
were unable to locate 870 records. The final study sample consisted of 16,758 patients.

**MEASURING QUALITY OF CARE**

We used both explicit and implicit measures to assess quality of care. With explicit measurement each patient's care was compared to predetermined criteria. With implicit measurement each patient's medical record was assigned a quality of care rating based on a physician's judgment of the adequacy of the care. A 10 percent subsample of the entire study sample of medical records underwent implicit review. The sample of medical records receiving implicit review was evaluated by physician specialists from each of the five study states.

**Explicit Measurement**

We developed disease-specific abstraction forms to collect explicit data from the patient's medical record about sickness at admission, process of care, inhospital outcomes, and patient status at discharge.

To develop the explicit abstraction form, we reviewed the literature on quality of care for patients hospitalized with each of the six diseases and developed recommendations on what information about sickness at admission and processes and outcomes of care should be abstracted. We then invited PRO-selected physicians from the five states to participate in a one-day panel meeting to advise us on which data to collect. In addition, we sought advice about whether the suggested information could be found in the medical records of patients with each disease in each state.

Following the panel meeting, we pilot-tested the abstraction forms on medical records from each of the participating states, to determine if items recommended for selection by the physician panel were actually contained in the medical record and to take note of the different styles of recording of information across states and types of hospitals (i.e., university, community, or rural). After analysis of the pilot study, we finalized six disease-specific abstraction forms.

After completing a section on exclusion criteria to verify the patient's eligibility for the study, data collectors used these abstraction forms to collect information about each patient's acute and chronic, morbid and comorbid conditions that were present at admission. We then collected process data that were applicable both to all patients and to a given patient's particular clinical situation. For example, we
collected information about the completeness of a fever workup only for patients with a temperature at or above a given level. We next collected clinical outcome data including information on death, diagnoses that were made during the hospitalization, and symptoms, signs, or abnormal laboratory values that occurred during the hospitalization. Finally, we obtained information from HCFA files on whether the patient died, was readmitted, or resided in a nursing home within 30 and 180 days of hospital admission.

Implicit Measurement

In developing disease-specific instruments for implicitly measuring quality of care, we first reviewed the literature on quality of care for patients hospitalized with each disease and the literature on how to do implicit review. We then invited PRO-selected physicians from the five study states to participate in six disease-specific panel meetings to discuss and test implicit measures of quality of care. Physicians were asked to detail the problems they had previously experienced in implicitly reviewing records for purposes of inhospital assessment (e.g., morbidity and mortality conferences) or PRO review. In addition, we sought advice about the way medical records might differ by type of hospital and geographic area so that the implicit review form for measuring quality of care could be developed for use in all kinds of acute care general hospitals in the United States.

From this work, we developed disease-specific Structured Implicit Review forms to guide physicians as they used the medical records to implicitly assess quality of care. For each item in each disease we developed guidelines to encourage consistency in the way the items were interpreted by physician reviewers. Physicians were asked to review medical records and to use their judgment to assess sickness at admission, processes of care, status at discharge, and inhospital outcomes. Our intent was to increase the reliability of implicit physician quality of care review while preserving the subtlety of physician judgment.

The Structured Implicit Review form specifies each part of hospital care to be judged (e.g., initial data gathering, technology use, and medication use), and provides guidelines for measuring care in each area. The basic principle underlying the guidelines is that adequate care in the United States is care that minimizes the risk of complications, maximizes the likelihood of a good outcome, and maximizes humane treatment of the patient at a level achievable by motivated practitioners under average conditions at average U.S. hospitals. Physician reviewers were asked to avoid adjusting ratings according to guesses about the size or type of hospital in which a patient was treated.
DATA COLLECTOR TRAINING, ABSTRACTION, AND MONITORING

An initial group of nurses and medical records personnel experienced with the gathering of clinical data was selected by the PROs to perform explicit data collection. Using medical records, the group was then screened for abstraction skills. After demonstrating adequate skills, 52 data collectors were invited to participate in a 14-day intensive training session at RAND. Data collectors were taught how to identify the proper medical record for abstraction and how to abstract data from the record. They were also trained in the collection of additional data, such as adding supplemental clinical information verbatim in the margins of the abstraction forms and attaching photocopies of specified pieces of data to the forms (e.g., chest X-ray reports, admission histories and physicals, and discharge summaries).

During the period of data collection, abstractors were monitored and feedback was given to data collectors who were identified as having problems. Additional fieldwork was supervised by a project manager who was familiar with the hospital in which the abstraction took place. In addition, each completed abstraction form was reviewed by both a physician and a nonphysician to assess internal consistency and to verify that the data collector’s coding was consistent with the supporting clinical data attached to the form. Records with discrepancies that could not be resolved during the review process were returned for reabstraction.

During the period of data collection, the research team conducted supplementary training sessions in the field, monitored the quality of data collection through regular field visits, scheduled phone calls, and staffed a physician telephone hotline.

ANALYSIS

For each disease, we studied outcomes before and after adjustment for patient sickness at admission. Specifically, we measured mortality inhospital, 30 days after admission, and 180 days after admission, as well as inhospital nonfatal complications. In addition, we measured length of stay, discharge destination, nursing home stay six months after discharge, and readmission rates pre- and post-PPS.

To develop disease-specific sickness-at-admission scales, we used logistic regression of death 30 and 180 days after admission on sickness-at-admission variables. We collected an average of 73 sickness variables per disease, but our final sickness-at-admission scales predicting mortality within 30 days of admission are, on average,
weighted sums of 19 variables. These scales explain about 25 percent of the variance in mortality for patients with acute myocardial infarction, pneumonia, or cerebrovascular accident.

We used clinical judgment and Likert scales to construct five detailed explicit process scales and one overall process scale. The scales measured physician cognitive diagnostic process, nurse cognitive process, technical diagnostic process, technical therapeutic process, monitoring with telemetry, and the intensive care unit. Compliance was high for most of the approximately 100 criteria per disease, but significant differences in mortality were apparent for patients receiving good as compared with poor process of care. The positive relationship between measures of process and outcome helped to validate our explicit process scales. We also found a positive relationship between process and outcomes with our implicit measures. In addition, we demonstrated a strong relationship between our explicit measures of process of care and quality of care as measured by implicit review of the medical record by physicians.

To summarize the changes in quality of care associated with the implementation of PPS, we compared sickness at admission, process (both implicit and explicit), and outcomes scales before and after PPS implementation. When appropriate we adjusted for changes in sickness at admission. For example, in making outcome comparisons pre- and post-PPS it is necessary to adjust for admission sickness, so that observed outcome differences are not attributable simply to changes in how sick patients are when they arrive at the hospital.

To strengthen our pre- post-PPS comparisons, we supplemented them with an estimate of the impact on mortality of each of the described changes associated with PPS, with trend analyses to see if post-PPS values were consistent with pre-PPS trends, and with patient subset analyses, to see if post-PPS changes were consistent across patient subgroups.

CONFIDENTIALITY

To maintain confidentiality of hospitals and patients for the explicit data, coded identifiers were assigned to hospitals and patients. No identifying information about physicians was obtained. For the implicit review, all medical records were de-identified with respect to hospital, physician, and patient name before physician review.
III. RESULTS

This report presents results for five of the six diseases examined. The analysis of depression has not yet concluded and the results for that disease will be reported elsewhere.

SICKNESS AT ADMISSION AND LENGTH OF STAY

Following PPS implementation, patients are sicker at the time of hospitalization. We estimate that, if everything else had remained the same, the mortality rate 30 days after admission for our five diseases combined would have been 1.0 percentage points higher in the post-PPS period than its value (15.4 percent) in the pre-PPS period, just from the rise in admission sickness. The rise in sickness at admission was observed in all five diseases and was statistically significant for patients with pneumonia and hip fracture and for all five diseases combined.

Length of stay dropped significantly for each of the study diseases. Hospitalizations were shorter by 3.4 days on average—a 24 percent decline across the five diseases combined.

PROCESS OF CARE AND STABILITY AT DISCHARGE

For most process measures, better process was associated with better inhospital outcomes. As process changes from good to poor, the risk of inhospital death increases significantly, with relative risks for death within 30 days ranging up to 1.7, depending on the condition and type of process measure examined.

For all of our process measures, process of care improved after PPS implementation. This is true for physician cognitive assessment, nurse assessment, use of diagnostic and therapeutic technologies, and for monitoring with intensive care and telemetry.

Patients were sicker or less stable at discharge during the post-PPS period than they were in the pre-PPS period. Instability at discharge is also strongly related to postdischarge mortality. Patients discharged with at least one instability are 1.6 times more likely to die within 90 days after discharge than patients discharged without instability. During the pre-PPS period, 15 percent of patients were discharged with instability; post-PPS this figure is 3 percentage points (20 percent) higher. When discharge instability and sickness are combined with
other related factors such as discharge to a nursing home, total discharge problems have increased enough post-PPS to raise death rates 180 days from discharge 0.2 to 0.9 percentage points, depending on disease.

PATIENT OUTCOMES

Mortality

After adjustment for changes in sickness at the time of hospital admission, we found a reduction in inhospital mortality for all five diseases after the introduction of prospective payment. Adjusted inhospital mortality for the five diseases combined dropped from 16.1 percent to 12.8 percent. The 3.3 percentage point reduction in inhospital mortality (95 percent confidence interval 2.3 percent to 4.3 percent) was significant (p < 0.01), as was the reduction in mortality for four of the five diseases.

When we studied mortality in a fixed time period after hospital admission, adjusted mortality rates for all five diseases remained lower post-PPS compared with pre-PPS. However, the relationship was no longer statistically significant at the 0.01 level. Unweighted adjusted mortality rates 30 days after admission for the five diseases combined were 16.7 percent pre-PPS and 15.7 percent post-PPS, a difference of 1.0 percentage points (95 percent confidence interval −0.1 percent to 2.1 percent, p = 0.07). After reweighting the sample to represent the nation, the 30-day postadmission adjusted mortality rates were slightly different from the unweighted values (16.5 percent pre-PPS compared with 15.4 percent post-PPS, difference 1.1 percentage points, p = 0.04).

The adjusted mortality rates 180 days after admission for the five diseases combined were 29.6 percent pre-PPS and 29.2 percent post-PPS. Thus, almost one-third of Medicare patients hospitalized with the five study diseases expired within six months after admission. For congestive heart failure, cerebrovascular accident, and hip fracture, mortality dropped post-PPS (significantly for hip fracture: 17.8 percent pre-PPS, 14.8 percent post-PPS, p < 0.05), whereas for acute myocardial infarction and pneumonia, mortality rose post-PPS.

Discharge Destination

For the five diseases combined, the proportion of patients with a preadmission residence of home and a discharge destination of home was 77 percent pre-PPS and 73 percent post-PPS (p < 0.05), with the most important difference being for hip fracture patients (56 percent
pre-PPS and 48 percent post-PPS, p < 0.05). We found little change in the discharge destination for patients admitted from a nursing home. Overall, 95 percent of all patients admitted from a nursing home who also survived hospitalization returned to a nursing home, and this did not vary significantly by disease or by time period.

**Prolonged Nursing Home Stay**

In studying prolonged nursing home stay, we identified patients in three of our five states whose preadmission residence was home and who were still alive seven months after hospitalization. For the five diseases combined, 8 percent of such patients in two states were in some type of nursing home (skilled or residential) approximately six months after the hospitalization, whereas 2 percent of such patients in the third state were in a skilled nursing home.

Across the three states we found that 5.6 percent of patients in the pre-PPS period and 6.6 percent of patients in the post-PPS period were in nursing homes six months following hospitalization (p > 0.05). This finding was not statistically significant in any state.

**Readmissions**

We found that the number of patients who died or who had at least one readmission within 180 days of admission, for the five diseases combined, was unchanged during the two time periods: 57 percent pre-PPS and 56 percent post-PPS (p > 0.05). Results varied slightly by disease, with fewer congestive heart failure, pneumonia, and hip fracture patients post-PPS either dying or being readmitted (p > 0.05) but more patients with acute myocardial infarction suffering one of these two outcomes post-PPS (p < 0.05).

The proportion of those patients discharged alive within one year of admission who had at least one hospital readmission was two percentage points lower post-PPS for all diseases combined and was lower for each disease individually except acute myocardial infarction (p < 0.05 for congestive heart failure and hip fracture; p > 0.05 for the other diseases individually and for the five diseases combined). Across all diseases except acute myocardial infarction, the total number of days spent in the hospital within one year of the study hospitalization was two days less post-PPS than pre-PPS (p < 0.05 for congestive heart failure, pneumonia, hip fracture, and the five diseases combined).
Summary of Outcomes Pre- and Post-PPS

For the five diseases combined, inhospital mortality was three percentage points lower post-PPS than pre-PPS (p < 0.01). This post-PPS improvement in mortality decreased to 1.0 percentage points by 30 days postadmission and was almost gone by 180 days postadmission.

For patients admitted to the hospital from home, for the five diseases combined, we found that 4 percent more patients discharged alive post-PPS were not discharged to home (p < 0.05). We found that 1 percent (0–3 percent depending on the state) more patients with a preadmission residence of home were in a nursing home six months following hospitalization post-PPS (p > 0.05). For the five diseases combined the proportion of patients with one or more readmissions within one year of the initial hospitalization was 3.0 percentage points lower post-PPS than pre-PPS (p > 0.05).

EFFECTS OF PPS IMPLEMENTATION

Post-PPS improvements in inhospital process of care (after accounting for changes in demographics, sickness at admission, and initial “do not resuscitate” orders) were associated with noticeable decreases in expected mortality for all five diseases (0.5 to 1.3 percentage points). Trend and patient analyses support the view that improvement in process was due to ongoing trends in medicine rather than to PPS.

In contrast, post-PPS increases in problems at discharge have risen in a way that seems associated with the implementation of PPS. These discharge problems have increased enough post-PPS to raise expected death rates by an amount that varies from a total of 0.2 percentage points for acute myocardial infarction patients to 0.9 percentage points for pneumonia patients. Furthermore, instability at discharge is increasing across both patient and hospital subgroups. Both results implicate PPS.
IV. DISCUSSION

Before discussing the relationship between the introduction of PPS and changes in medical outcomes following hospitalization, it is important to place these results in context by noting the severe burden of illness carried by elderly patients hospitalized with one of the five conditions examined in this study. Within one month of admission, 16 percent of these patients have expired, with the death rate climbing to 29 percent within six months of admission. For our surgical condition—hip fracture—the six-month mortality rate is 16 percent, but for the other four medical conditions it is over 33 percent.

This burden of illness is also demonstrated by readmission rates. Of those patients who survived the initial hospitalization, more than half were readmitted in the year following their hospitalization. This fraction is highest for patients initially hospitalized with congestive heart failure (66 percent) and lowest for hip fracture patients (44 percent). In addition, across all our conditions, 25 percent of patients admitted from home and discharged alive are discharged to an institution. The corresponding figures for cerebrovascular accident and hip fracture patients are 41 percent and 52 percent, respectively.

Before and after the implementation of PPS, clinicians, patients, and families have feared, and in some instances have reported, disasters in outcomes of care that were thought to be related to the new financial incentives. We have measured outcomes pre- and post-PPS on a nationally representative sample of more than 14,000 patients who were hospitalized with one of five diseases that constitute 19 percent of Medicare admissions and 32 percent of deaths within 30 days of admission. In contrast to these fears and anecdotal reports, we find no significant increase post-PPS in mortality at 30 and 180 days posthospital admission, nor any significant increase in readmissions or prolonged nursing home stay. In fact, inhospital processes of care were noticeably better in 1985–1986 than in 1981–1982. We did find a significant increase in the fraction of patients discharged directly to an institution, but this does not appear to have resulted in a significant increase in nursing home stay at six months posthospitalization.

The main adverse change associated with PPS is a 20 percent rise in the rate with which patients are discharged from the hospital with instability. Total discharge problems, including instability and sickness at discharge and discharge to a nursing home, have increased enough post-PPS to raise death rates 0.2 to 0.9 percentage points.
Four caveats are worth bearing in mind when considering our results: (1) We studied only five diseases, albeit five important diseases in the Medicare cohort. (2) Our study design only allowed us to assess differences in quality of care once patients are hospitalized, so that, for example, we cannot comment on any changes in access to hospital care that PPS may have caused. (3) Our post-PPS payment data came from 1985–1986—a period in which the mechanism for determining the hospital’s payment was still changing. The rates paid to hospitals at that time included a component based on historical charges during the cost-plus reimbursement era. In addition, the amount of reimbursement for a patient with a given diagnosis has changed since 1986, and hospital financial margins have diminished. (4) Although outcomes other than discharge instability have not worsened on average, some subgroups of patients may have suffered. Analyses to address this concern are ongoing.

Even with these caveats, two key policy conclusions appear clear: (1) At least through the middle of 1986, PPS did not interrupt an important long-term trend toward better processes of inpatient care—a trend that has led to somewhat lower death rates. (2) On the other hand, we believe that PPS has had a detrimental effect on patients’ stability at discharge. These conclusions lead to two major policy recommendations: (1) To eliminate any existing problems with patient instability at discharge, physicians, hospitals, and PROs should undertake a more systematic assessment of the readiness of a patient to leave the hospital, so that patients are not discharged to home in a clinically unstable state. (2) To provide current information about the effects of Medicare’s payment methods on quality of care, clinically detailed data that monitor sickness at admission, processes, discharge status, and outcomes should continue to be collected on a regular basis as long as prospective payment is in place.