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HOSPITAL CASE-MIX CHANGE: SICKER PATIENTS OR DRG CREEP?

by Bruce Steinwald and Laura A. Dummit

Prologue: Medicare’s prospective payment system (PPS) has for the past five and a half years attempted to constrain the rising payments to hospitals for care of the nation’s elderly. Early on, the new system appeared to reward hospitals with double-digit Medicare profit margins. Later reports predicted that over half the hospitals would show a negative margin if annual update factors were not increased. Debate over the level of increase in the update factor for PPS’s unit of payment, diagnosis-related groups (DRGs), pits hospitals and government against each other, leading to mistrust between provider and payer. One payment factor that has not received much attention is the effect of PPS on hospitals’ case-mix (the mix of patients across DRGs in a hospital). Yet case-mix change under PPS has greatly affected payment levels to hospitals, say Bruce Steinwald and Laura Dummit. They write: “The cumulative formal update from the beginning of PPS through fiscal year 1988 totals less than 8 percent. The cumulative increase in payments due to case-mix change for the same period is over 20 percent.” Understanding case-mix change is important as Congress continues to set hospital payment rates. This article offers new information and insights into the “below the surface” phenomenon of case-mix change to help “dispel some of that mistrust between payer and providers,” said Steinwald. Both authors are staff members of the congressionally mandated Prospective Payment Assessment Commission (ProPAC). Steinwald, who serves as deputy director, received his master of business administration degree and took additional training in economics at the University of Chicago. Before joining ProPAC, Steinwald worked for the Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation (ASPE), rising to the level of acting deputy assistant secretary for health planning. Dummit received her master of public health degree from the University of North Carolina, Chapel Hill, and worked for the Alpha Center in Washington, D.C. before joining ProPAC as a senior policy analyst.
Medicare’s prospective payment system (PPS), implemented October 1, 1983, uses fixed prices that depend largely on the category in which the hospitalized patient is placed. The categories, or diagnosis-related groups (DRGs), are defined by diagnosis and other factors. Each of the 474 DRGs has an official weight that, in a relative sense, determines payment. A DRG with a weight of two is paid twice as much as a DRG with a weight of one, and so on. The array of patients across DRGs in a hospital is the hospital’s case-mix, and the average DRG weight for these patients is the hospital’s case-mix index (CMI).

Under PPS, hospital case-mix, rather than costs, is the most important factor in payment variations per case across hospitals. In the aggregate, case-mix is also an important determinant of the total amount of PPS payments to hospitals. Nearly $40 billion is paid annually to hospitals on the basis of DRGs. It follows that small amounts of change in DRG case-mix indexes have large effects on aggregate payments and on the distribution of payments across hospitals.

PPS was designed to permit inflation in the costs of goods and services that hospitals purchase to precipitate payment increases. The statute that created PPS, however, did not specify how to deal with the issue of case-mix change. Though much has been written about DRGs as a tool for measuring the relative resource requirements for hospital care of the Medicare beneficiary population, relatively little attention has focused on the issue of case-mix change, even though it has far greater ramifications for total payments under PPS.

This article examines case-mix change during the early years of PPS. We explain the phenomenon of “DRG creep,” a term often used pejoratively to connote changes in hospital record-keeping practices to increase case-mix indexes and reimbursement. We argue that much of this increase may be attributed to more thorough and accurate documentation. We further distinguish such changes from increases attributable to patient need, which we term “real” case-mix change.

**Hospital Case-Mix Trends**

DRG assignment is based on diagnosis and treatment information that physicians and other health care providers document on the patient’s medical record. Hospital personnel translate this information using the ninth revision of the International Classification of Diseases, Clinical Modification (ICD-9-CM). The coded data include the principal diagnosis, up to four additional diagnoses, and up to three procedures. These data, along with patient age, sex, and discharge status, are used by Medicare’s fiscal intermediaries to assign a DRG.
Thus, two kinds of hospital record keeping—medical record documentation and coding—are important to DRG assignment. Changes in record-keeping practices affect the information available for DRG assignment. For example, more thorough recording of secondary diagnoses provides greater opportunity for coding complications or comorbidities, which may result in assignment of a case to a higher-weighted DRG. Changes in the procedures for translating the diagnostic information into standard codes likewise affect DRG assignment.

Three Institute of Medicine (IOM) studies on the reliability of selected medical record items, conducted in the late 1970s, found substantial problems in hospital medical record documentation and coding. The IOM compared the original medical record with a reabstracted record. Although patient demographic data generally were reliable, the studies found that diagnosis and procedure data often were inaccurate. The IOM also concluded that medical record coding can be subjective, particularly regarding the assignment of a principal diagnosis—the condition determined after study to be chiefly responsible for the hospital admission. When there are multiple diagnoses, coders must rely on medical knowledge, coding guidelines, and often their own judgment in identifying the principal diagnosis. Thus, when PPS was implemented, there was considerable opportunity for improving the accuracy of the medical record. Further, the process of assigning codes that are important in determining the DRG was not completely standardized or objective.

A chronology of DRG case-mix change. In 1983, the Department of Health and Human Services (HHS) faced the difficult task of defining the DRGs and establishing initial weights. Although DRGs already had been used to help set cost reimbursement limits under Medicare, the new DRGs and weights were to become critical determinants of hospital payments. Indeed, some skeptics doubted whether a viable system would be ready for the implementation of PPS on October 1, 1983.

The DRG classifications and weights were developed using 1981 data on hospital costs and charges. The original weights were scaled so that the average hospital case-mix index would equal 1.0. This average gives all hospitals, large and small, equal weight. Large hospitals tend to have both higher-than-average CMIs and greater-than-average numbers of Medicare discharges. This means that the average case weight is greater than the average hospital CMI. The average case weight calculated from the 1981 data was about 1.05 (Exhibit 1).

Inaccurate and incomplete documentation in 1981 made the original distribution of cases appear less complex than if documentation had been thorough. Because hospitals had been given an incentive under PPS to code more thoroughly, an increase in CMIs and in the average case
Exhibit 1
Increases In DRG Case-Mix Indexes And In Average DRG Weight, 1981-1987

<table>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Average hospital case-mix index</td>
<td>1.00</td>
<td>1.06</td>
<td>1.09</td>
<td>1.11</td>
<td>1.13</td>
<td>5.93%</td>
<td>3.09%</td>
<td>2.04%</td>
<td>1.66%</td>
</tr>
<tr>
<td>Average case weight</td>
<td>1.05</td>
<td>1.13</td>
<td>1.18</td>
<td>1.21</td>
<td>1.24</td>
<td>7.73%</td>
<td>4.37%</td>
<td>2.88%</td>
<td>2.40%</td>
</tr>
<tr>
<td>Adjusted average case weight</td>
<td>1.05</td>
<td>1.13</td>
<td>1.19</td>
<td>1.23</td>
<td>1.26</td>
<td>7.73%</td>
<td>5.52%</td>
<td>2.88%</td>
<td>2.39%</td>
</tr>
</tbody>
</table>


Note: Based on a cohort of 5,017 hospitals. Excludes hospitals in Maryland, Massachusetts, New Jersey, and New York, which were not on the prospective payment system during the entire period. 1987 case-mix indexes based on preliminary data from 5,004 hospitals for which data were available from 1981.

Adjusted to reflect the 1.05 percent reduction in weights in 1985.

weight was anticipated. There was very little means of predicting how much change would take place, however. HHS used an estimate of 3.38 percent expected increase in the average case weight in its calculations to set the original levels of payments under PPS.5

After PPS began, early returns of patient bills confirmed the expectation that the DRG case-mix index had risen since 1981. Further, this increase was much larger than anticipated. In the summer of 1984, HHS again faced the task of estimating case-mix change to set the fiscal year 1985 rates. This had to be done long before all of the fiscal year 1984 PPS bills were received. HHS proposed reducing the DRG weights across the board by 2.3 percent to correct for underestimates of case-mix increases. After objections from the hospital industry, however, the reduction was changed to 1.05 percent.6 This was the only time the DRG weights were reduced across the board administratively.

When the data for the first year of PPS were complete, the average CMI had grown from 1.00 to 1.06 and the average case weight from 1.05 to 1.13. The adjusted average weight grew 5.5 percent over fiscal year 1984–1985, 2.9 percent over fiscal year 1985–1986, and 2.4 percent over fiscal year 1986–1987. In fiscal year 1987, the average CMI is estimated to be 1.13 and the average case weight to be 1.24. Preliminary estimates for 1988 indicate that the rate of change unexpectedly grew to 3.6 percent, resulting in an adjusted average case weight of 1.30.7

Case-mix change and hospital payments. To put these growth rates in perspective and to illustrate their financial importance, Exhibit 2 contrasts case-mix change with the annual formal update in the PPS rates. Payment rates were set by HHS in the first and second years of PPS so that, in principle, the average amount spent per case under PPS was the same as it would have been under cost reimbursement constrained by
Exhibit 2

Increases In Hospital Payments Due To Case-Mix Change And To The Update Factor, 1985-1988

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Case-mix change</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual percent change</td>
<td>4.4%</td>
<td>2.9%</td>
<td>2.4%</td>
<td>3.6(^a)</td>
</tr>
<tr>
<td>Cumulative percent change</td>
<td>4.4</td>
<td>7.4</td>
<td>9.7</td>
<td>10.3</td>
</tr>
<tr>
<td>Update factor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cumulative percent change</td>
<td>4.5</td>
<td>0.5</td>
<td>1.2</td>
<td>1.5</td>
</tr>
<tr>
<td>Annual percent change</td>
<td>4.5</td>
<td>5.0</td>
<td>6.2</td>
<td>7.8</td>
</tr>
</tbody>
</table>


\(^a\) Estimate based on case-mix index calculated with data through September 1988 compared with case-mix index calculated with data through September 1987.

limits imposed by the Tax Equity and Fiscal Responsibility Act (TEFRA) of 1982. In the third through fifth years, Congress set payment increases by statute as part of the annual budget reconciliation process. In each year, setting the rates was widely and publicly debated.

In contrast, increases in payments arising from case-mix change are a byproduct of a changing distribution of cases among the DRGs. These changes have not been debated widely; yet they have been a more significant source of increased payments than the formal update in prices. Further, in the first year of PPS, hospital PPS revenues per case increased almost 19 percent over the average cost-based payment per case in the previous year.\(^8\) This unanticipated, large increase in revenues undoubtedly was due primarily to case-mix index increases.

A study by the Prospective Payment Assessment Commission (ProPAC) presents an even more dramatic contrast. According to their estimates, the cumulative formal update from the beginning of PPS through fiscal year 1988 totals less than 8 percent. The cumulative increase in payments due to case-mix change for the same period is over 20 percent. We do not wish to imply that the increases in payments from changes in the average DRG weight are inappropriate. First, it is well known in HHS and Congress that hospitals have received additional payments from case-mix change. It is virtually certain that the formal updates in prices would have been greater in the absence of case-mix change. It is impossible to tell how much greater, however. Second, it is also certain that part of this change is associated with a more costly mix of patients since the beginning of PPS.

Distribution of case-mix changes. The amount of case-mix change differs across various hospital groups (Exhibit 3). Urban, teaching, and

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Exhibit 3  
Increases In The Average DRG Weight, By Hospital Type, 1981-1987

<table>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1981-84</td>
</tr>
<tr>
<td>Total</td>
<td>1.05</td>
<td>1.13</td>
<td>1.18</td>
<td>1.21</td>
<td>1.24</td>
<td>7.73%</td>
</tr>
<tr>
<td>Urban</td>
<td>1.08</td>
<td>1.17</td>
<td>1.22</td>
<td>1.26</td>
<td>1.29</td>
<td>8.32%</td>
</tr>
<tr>
<td>Rural</td>
<td>0.98</td>
<td>1.04</td>
<td>1.07</td>
<td>1.09</td>
<td>1.12</td>
<td>5.55%</td>
</tr>
<tr>
<td>Major teaching</td>
<td>1.15</td>
<td>1.27</td>
<td>1.33</td>
<td>1.38</td>
<td>1.41</td>
<td>9.74%</td>
</tr>
<tr>
<td>Minor teaching</td>
<td>1.10</td>
<td>1.20</td>
<td>1.26</td>
<td>1.30</td>
<td>1.33</td>
<td>9.20%</td>
</tr>
<tr>
<td>Nonteaching</td>
<td>1.02</td>
<td>1.09</td>
<td>1.13</td>
<td>1.15</td>
<td>1.18</td>
<td>6.91%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban fewer than 100 beds</td>
<td>0.98</td>
<td>1.04</td>
<td>1.07</td>
<td>1.10</td>
<td>1.12</td>
<td>5.62%</td>
</tr>
<tr>
<td>Urban 100-249 beds</td>
<td>1.04</td>
<td>1.11</td>
<td>1.16</td>
<td>1.19</td>
<td>1.21</td>
<td>7.04%</td>
</tr>
<tr>
<td>Urban 250-404 beds</td>
<td>1.08</td>
<td>1.16</td>
<td>1.22</td>
<td>1.25</td>
<td>1.28</td>
<td>7.85%</td>
</tr>
<tr>
<td>Rural fewer than 100 beds</td>
<td>0.94</td>
<td>0.98</td>
<td>1.00</td>
<td>1.01</td>
<td>1.03</td>
<td>4.20%</td>
</tr>
<tr>
<td>Rural 50-99 beds</td>
<td>0.96</td>
<td>1.02</td>
<td>1.04</td>
<td>1.06</td>
<td>1.07</td>
<td>5.63%</td>
</tr>
<tr>
<td>Rural 100-169 beds</td>
<td>0.99</td>
<td>1.05</td>
<td>1.08</td>
<td>1.10</td>
<td>1.13</td>
<td>5.68%</td>
</tr>
<tr>
<td>Rural more than 169 beds</td>
<td>1.03</td>
<td>1.10</td>
<td>1.14</td>
<td>1.17</td>
<td>1.20</td>
<td>6.09%</td>
</tr>
</tbody>
</table>


Note: Based on a cohort of 5,017 hospitals. Excludes hospitals in Maryland, Massachusetts, New Jersey, and New York, which were not on the prospective payment system during the entire period. 1987 case-mix indexes based on preliminary data from 5,004 hospitals for which data were available from 1981.

large hospitals had average case weights higher than the average for all hospitals in 1981. These hospitals also experienced the largest case weight increases through 1987. Small, rural hospitals, on the other hand, had the opposite experience. The average case weight in these hospitals was lower than the overall average in 1981 and grew at a slower rate through 1987.

At least part of the distributional differences across hospitals can be traced to inaccuracy of the data used to set the original DRG weights. These inaccuracies caused the original weights to be “compressed,” that is, relatively inexpensive cases had weights that were set too high, and relatively expensive cases had weights that were set too low. As hospitals improved their documentation and coding accuracy, the compression of the weights was reduced. A natural byproduct of this was a widening of the difference in average weights of hospitals that tend to treat many patients in high-weighted DRGs from hospitals that tend to treat many patients in low-weighted DRGs.

Further insight into the distributional aspects of case-mix change is provided by the experience of New York and Massachusetts hospitals (Exhibit 4). Entry of these hospitals into PPS was delayed until fiscal

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### Exhibit 4
Increases In The Average DRG Weight, New York And Massachusetts, 1981-1987

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</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>1.08</td>
<td>1.10</td>
<td>1.11</td>
<td>1.18</td>
<td>1.21</td>
<td>1.36%</td>
<td>0.94%</td>
<td>6.62%</td>
<td>2.77%</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>1.09</td>
<td>1.10</td>
<td>1.14</td>
<td>1.22</td>
<td>1.23</td>
<td>1.05</td>
<td>3.68</td>
<td>6.77</td>
<td>1.07</td>
</tr>
<tr>
<td>PPS hospitals</td>
<td>1.05</td>
<td>1.13</td>
<td>1.18</td>
<td>1.21</td>
<td>1.24</td>
<td>7.73</td>
<td>4.37</td>
<td>2.88</td>
<td>2.39</td>
</tr>
</tbody>
</table>


Note: Based on a cohort of 251 hospitals in New York and a cohort of 110 hospitals in Massachusetts. Prospective payment system (PPS) hospitals based on a cohort of 5,017 hospitals; excludes hospitals in Maryland, Massachusetts, New Jersey, and New York, which were not on PPS during the entire period. 1987 case-mix indexes based on preliminary data from hospitals for which data were available from 1981.

1986. Because these states tend to have relatively large hospitals, frequently with teaching programs, their average case weights were greater than the national average in 1981. In 1984 and 1985, however, hospitals in other states under PPS experienced case-mix change that raised the national average well above average case weights in New York and Massachusetts. In 1986, when hospitals in these two states came under PPS, their case-mix change exceeded the national rate of change (which had declined by 1986). The rapid case-mix growth experienced in these two states subsided by 1987, when their hospitals’ average case weights were much closer to the national average.

### Components Of Case-Mix Change

Changes in medical record documentation and coding practices may increase the accuracy of the DRGs, but such changes do not signify greater patient care requirements. In contrast, real case-mix change, by definition, is associated with changes in patient care. An equitable payment system should encourage more accurate coding but not allow coding changes to generate additional payments unrelated to patient need, and should be able to recognize and pay for increases in patient care requirements when they occur.

**Changes in coding practices.** Under PPS, there is a direct link between payments and the medical record. This gives hospitals incentives to increase the accuracy and completeness of medical record documentation and coding.\(^\text{11}\) Also, the 1981 database used to create the original DRGs and weights contained many errors. A study using 1985 data indicated that there were still substantial errors in the selection of the principal diagnosis and other coding activities that affect DRG assignment.\(^\text{12}\) Coding practices were not uniform across hospitals in the early years of PPS.
ProPAC conducted an informal survey of hospital medical record personnel in 1986-1987 to assess changes in medical record documentation and coding practices that may contribute to case-mix increases. Respondents indicated that more attention is paid to completing and coding the medical record since the beginning of PPS. Medical record personnel reported that physicians’ narrative descriptions of diagnoses and procedures have become more specific, and communication with physicians is improving. Medical record personnel are paying more attention to the technical aspects of coding. In addition, software is becoming increasingly available to help standardize assignment of ICD-9-CM codes and to determine DRG assignment. These practices contribute to increased hospital case-mix indexes.

“DRG creep” may aptly describe the results of changing documentation and coding practices, but we see nothing wrong with hospitals’ acting in their best financial interests, especially when such actions are associated with genuine improvements in data thoroughness and accuracy. The major problem with coding changes is distinguishing them from changes in patient care requirements.

Changes in patients across DRGs. Changes in medical practice patterns also have a significant effect on the distribution of patients across DRGs. The diffusion of new technologies and treatments changes the proportions of patients receiving more or less intensive care than in the past. Medical innovations also result in shifting certain treatments, previously performed in hospitals, to an outpatient setting. The increasing availability of more aggressive and resource-intensive treatments can shift patients into higher-weighted DRGs and thus increase both the costliness of care and the average DRG weight.

Hospital admissions have declined significantly since PPS was implemented. Many patients who previously would have been treated in an inpatient setting are being treated elsewhere. Patients in lower-weighted DRGs are more likely to be moved out of the hospital into less intensive settings, causing the frequency of low-weighted DRGs to decline relative to high-weighted DRGs. The shift of less complex cases to outpatient settings is particularly noticeable with the treatment of certain illnesses of the eye in DRG 39 (lens procedures). DRG 39 had a weight of approximately 0.57 in 1986, significantly below the average case weight of approximately 1.21. As these patients were moved to outpatient settings for ambulatory surgery, the overall average DRG weight for inpatients increased. Therefore, both the average costliness of inpatient care and the average DRG weight increased.

Case-complexity change within DRGs. The two types of case-mix change described above both raise the average DRG weight. Some
increases in patient care requirements do not necessarily affect DRG assignment and, therefore, the CMI, although they do reflect increased complexity of illness. Case complexity change within DRGs is caused, for example, by shifts to outpatient treatment. The patients moved to an outpatient setting are likely to be less severely ill than those who are kept in an inpatient setting. Another potential cause of case-complexity change within DRGs is the aging of the inpatient population. Although research indicates that aging has not been a source of observed case-mix increases across DRGs, it may still be a source of case-complexity change as patients within a DRG become older and more difficult to care for.  

**Components of case-mix change.** In view of the financial importance of case-mix change, it is surprising that this issue has not been studied more extensively. We report on two noteworthy studies sponsored by HHS and ProPAC. First, the RAND/University of California, Los Angeles (UCLA) Center for Health Care Financing Policy Research conducted an extensive study for HHS to evaluate the unexpectedly large increase in the average DRG weight from 1981 to 1984. RAND hypothesized that the increase in case-mix was caused by changes in patients’ resource needs, in medical practice patterns, and in coding practices and data. RAND used two data sources: Medicare claims data from 1981 and 1984 and patient abstract data compiled by the Commission on Professional and Hospital Activities from 1981 through 1984. RAND investigated changes in Medicare patients’ resource needs by examining age-specific CMIs and the proportion of Medicare discharges by age groups.

The effects of changing-medical practice patterns were investigated by looking at pre-PPS trends in case-mix, changes in medical versus surgical DRGs, and DRGs with potential for outpatient shifts. RAND estimated that medical practice trends, such as increases in heart surgery, contributed 1.4 percentage points to the increase in the average case weight. Another 0.7 percentage point was attributed to the large shift of lens procedures to outpatient settings.

Finally, RAND estimated that seven percentage points of the case-mix change were attributable to data and coding changes. Of this amount, 2.8 percentage points were because of increased physician documentation, improved medical record coding practices, and coding efforts to maximize reimbursement. This estimate was based, in part, on an examination of quarterly CMIs related to when a hospital started under PPS. The remainder of the case-mix change was attributed to the differences in the completeness of the databases used to calculate the 1981 and 1984 indexes. The 1981 database contained substantially less information to classify patients into DRGs, and ICD-9-CM codes were assigned by the Health Care Financing Administration (HCFA) rather than by hospital
staff. The greater accuracy and thoroughness of the 1984 data was a major source of higher measured case-mix.

SysteMetrics/McGraw-Hill, Inc. recently completed a major study for ProPAC to investigate within-DRG case-complexity change.\textsuperscript{16} Using all fiscal year 1986 Medicare discharge records from a representative 10 percent sample of PPS hospitals, they constructed case-mix indexes that accounted for changes in patient complexity within each DRG. Patient complexity was measured in two ways, by assigning a disease stage and a patient management category (PMC) to each patient record. These severity classification systems were used to define systematic differences among patients within DRGs according to complexity of illness.

This study provides substantial evidence that the patients assigned to DRGs are increasingly complex over time and, therefore, more costly to treat. The indexes used in this analysis, however, are influenced by coding improvements, as is the CMI. SysteMetrics/McGraw-Hill found that between 1984 and 1986, the average number of secondary diagnoses per patient increased from 1.9 to 2.7 (Exhibit 5). This higher number of secondary diagnoses can affect the disease stage or PMC, as well as DRG assignment. While some of this increase undoubtedly was due to more severely ill patients, it is not possible to determine the proportion of this increase due only to increased patient resource requirements.

HHS and ProPAC are continuing research in both of these areas.\textsuperscript{17} RAND is examining CMI change to apportion that change into real and upcoding components. They are using medical records that were reab-

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**Exhibit 5**
Increase In Average Number Of Diagnoses Coded For Medicare Patients, 1984-1987

![Graph showing the increase in average number of diagnoses coded for Medicare patients from 1984 to 1987.]

stracted without any incentive for upcoding to estimate real case-mix change. Preliminary results indicate that a substantial portion of the 1987 case-mix change was real. Also, changes in hospital coding behavior and coding standards were important in increasing the CMI. SysteMetrics/ McGraw-Hill refined and updated its methodology for examining patient complexity change. They demonstrated that increased coding of secondary diagnoses has an important effect on this measure. After this is taken into account, however, patient complexity change within DRGs remains a significant portion of real case-mix change even though the rate of change is declining.

Implications

Evidence on DRG case-mix change in the years since the beginning of PPS clearly indicates the strong influence of financial incentives on documentation and coding practices. It is not possible to distinguish this type of change from real case-mix change with much precision. If real change followed a steady long-term trend, it would be less difficult to estimate these components. Substantial changes in medical practice patterns in this decade, however, have made real change nearly as volatile as coding change.

Recent data from 1988 indicate that CMI change is less predictable than originally thought. The dramatic increase in the CMI in 1988 points out the critical need to better understand the causes of case-mix change. Several other considerations also indicate that case-mix change deserves increased attention.

First, the technology of case-mix measurement is still in a transitional phase with an uncertain future. In a few short years, the situation facing hospitals has changed from one in which medical record documentation and coding had little financial impact to one in which thorough and revenue-sensitive practices may be necessary to ensure survival. Because many other third-party payers (notably state Medicaid programs and Blue Cross plans) are adopting case-mix reimbursement systems, the financial link between case-mix measurement and payment is likely to become even stronger.

Second, some sources of real case-mix change are endemic. Substantial alterations of medical practice patterns in this decade have affected hospital case-mix. Such profound change as the treatment of cataract disease may be rare, but major changes in practice patterns undoubtedly will continue.

Third, improvements in DRG classifications and weights are accompanied by new opportunities and incentives to adapt coding practices in
ways that may influence payments. The removal of age as a DRG-defining variable (which occurred at the beginning of fiscal 1988), for example, increases hospitals’ incentives to code complications and comorbidities more thoroughly.\textsuperscript{18} This, in turn, would raise CMIs. Also, the scheduled introduction of ICD-10 codes in the early 1990s and other major changes to DRG classifications will have unpredictable effects on case-mix change. Even routine reclassifications and annual recalibration of the DRG weights, actions that are taken to enhance the ability of the DRGs to accurately reflect technological change, contain the seeds of a continued incentive to change coding practices.

Fourth, the distributional differences in case-mix change across hospitals have never been addressed as a policy issue. The pace of case-mix change varies substantially across hospitals. If these variations are related to underlying differences in patient need, then the associated payment differences are appropriate. If some hospitals simply adapt to the new payment system faster than others, then the associated inequity in payments should be time limited as the slower hospitals eventually catch up. But if the differences are related to systematic variations in the relative contributions of patient need and upcoding to case-mix change, then use of average CMI change rates in updating payment amounts may be unfair.

A fifth reason for improving our ability to evaluate case-mix change is rooted in our need to know more about how the health care system functions. Understanding health care practices and how they change is essential to the formulation of rational health policy. The record keeping that documents these practices is, in many respects, as important as the practices themselves. The technology of case-mix measurement in hospitals has not been thoroughly examined in many years. Yet we know that these practices have undergone significant change, partly in response to reimbursement incentives.

Finally, the case-mix change issue is one of trust in addition to one of establishing fair payments. The treatment of such changes has been a sore point between government and the hospital industry since the beginning of PPS. Hospitals, naturally, have been suspicious of offsets for upcoding in the payment rates, especially in years when falling admission rates led to a substantially sicker inpatient population. The development of better data and methods not only will improve measurement of the components of case-mix change, but also will enhance the level of trust between government and hospitals and the overall functioning of PPS and other case-mix reimbursement systems.

\textit{Views expressed in this paper are the authors’ and do not necessarily reflect positions adopted by the Prospective Payment Assessment Commission.}


3. Project HOPE, Center for Health Affairs, Review of the Evidence and Literature Relevant to the Measurement of the Hospital Case Mix Index, Final Report, prepared for the Prospective Payment Assessment Commission under contract no. T-31416362, 1 July 1986.


5. The law implementing PPS required that aggregate hospital payments under PPS equal aggregate payments that hospitals would have received under the rate of increase limits set by the Tax Equity and Fiscal Responsibility Act of 1982. To meet this requirement, the Health Care Financing Administration had to estimate case-mix index change in 1984 and use this estimate in establishing the original PPS rates.


15. Ibid.


17. ProPAC, Report and Recommendations to the Secretary (1 March 1989).