The Costs of Decedents in the Medicare Program: Implications for Payments to Medicare+Choice Plans

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Objective. To discuss and quantify the incentives that Medicare managed care plans have to avoid (through selective enrollment or disenrollment) people who are at risk for very high costs, focusing on Medicare beneficiaries in the last year of life—a group that accounts for more than one-quarter of Medicare’s annual expenditures.

Data Source. Medicare administrative claims for 1994 and 1995.

Study Design. We calculated the payment a plan would have received under three risk-adjustment systems for each beneficiary in our 1995 sample based on his or her age, gender, county of residence, original reason for Medicare entitlement, and principal inpatient diagnoses received during any hospital stays in 1994. We compared these amounts to the actual costs incurred by those beneficiaries. We then looked for clinical categories that were predictive of costs, including costs in a beneficiary’s last year of life, not accounted for by the risk adjusters.

Data Extraction Methods. The analyses were conducted using claims for a 5 percent random sample of Medicare beneficiaries who died in 1995 and a matched group of survivors.

Principal Findings. Medicare is currently implementing the Principal Inpatient Diagnostic Cost Groups (PIP-DCG) risk adjustment payment system to address the problem of risk selection in the Medicare+Choice program. We quantify the strong financial disincentives to enroll terminally ill beneficiaries that plans still have under this risk adjustment system. We also show that up to one-third of the selection observed between Medicare HMOs and the traditional fee-for-service system could be due to differential enrollment of decedents. A risk adjustment system that incorporated more of the available diagnostic information would attenuate this disincentive; however, plans could still use clinical information (not included in the risk adjustment scheme) to identify beneficiaries whose expected costs exceed expected payments.

Conclusions. More disaggregated prospective risk adjustment methods and alternative payment systems that compensate plans for delivering care to certain classes of patients should be considered to ensure access to high-quality managed care for all beneficiaries.

Key Words. Medicare, risk adjustment, managed care, end-of-life costs

Medicare's payment system for health maintenance organizations (HMOs) would ideally reward plans that efficiently deliver care. In practice, however, Medicare's capitated payment system instead gives health plans and subcapitated providers incentives to attract low-risk patients and disenroll high-risk patients.

One well-known way to mitigate such risk selection is to "risk adjust" payments to providers so they view all enrollees, sick or healthy, as equally profitable. A risk adjusted payment system thus pays more for enrollees with predictably higher costs. The closer such a risk adjusted payment system comes to reflecting what individual enrollees are *expected* to cost, the fewer incentives providers have to discriminate among potential enrollees or to configure themselves to attract certain types of enrollees. Payment does not, however, need to reflect all of the components of actual spending, which vary in random, unpredictable ways.

It is well known that Medicare beneficiaries who die are, on average, very costly, and thus predictors of death would seem to be obvious candidates for risk adjusters. Although the figures vary slightly from year to year, the 5 percent of the Medicare beneficiaries who die each year account for 25–30 percent of Medicare spending (Lubitz and Riley 1993; Hogan et al. 2001). The average Medicare decedent has costs in the last year of life six times those of the average survivor (Hogan et al. 2001). Most of these costs are incurred at the very end of patients' lives: 36 percent of the costs of Medicare beneficiaries in their last year of life are incurred in their last 30 days, and nearly 60 percent are incurred in their last 90 days (Riley et al. 1987). However, predicting time to death is sometimes difficult for clinicians, much less rate-setters armed only with administrative data (Lynn 2001). Questions remain, therefore, about the magnitude of the incentives to select against the terminally ill and whether predictors of death can be found and used effectively as risk adjusters.

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This article shows that the diagnosis-based risk adjustment system the Centers for Medicare and Medicaid Services (CMS) is implementing does not predict the costs of decedents well. Thus it does little to alter incentives that plans face to avoid enrolling the terminally ill.¹ This is not a surprise; many limitations of this risk adjustment system resulted from deliberate policy decisions to make the system easier to implement and harder to “game.” However, we also show that several potential risk adjusters, currently unused, could improve prediction of costs of people with life-threatening conditions. Risk adjusters that explain these costs are thus an area that researchers could explore further. In addition, we show that certain increases in costs at the end of life cannot be predicted easily using administrative data, but could be predicted by a plan or provider with more clinical data about an enrollee. We conclude that Medicare needs another strategy for adjusting payments for these types of beneficiaries.

The article is organized into four parts. The first section begins by describing the high costs of care incurred by Medicare decedents and their underrepresentation in Medicare plans. A substantial part of the observed favorable selection into Medicare HMOs is attributable to this underrepresentation. It then discusses risk adjustment in more detail, including the potential of risk adjustment to increase plans’ incentives to enroll persons with heightened probabilities of dying.

The second section introduces the data and methods that will be used to address the paper’s two empirical objectives: (1) gauging the performance for terminally ill patients of the risk adjustment payment system that CMS began to implement in 2000 and (2) suggesting the outlines of an improved risk adjustment system.

The third section quantifies some limitations of the current CMS risk adjustment system. It describes the financial incentives plans would face under CMS’s Principal Inpatient Diagnostic Cost Group (PIP-DCG) risk adjustment system were it fully implemented. It then investigates predictors of Medicare costs for beneficiaries at the end of life that could supplement the PIP-DCG payment system.

The conclusion identifies ways that Medicare’s payment system could better match plan payments to terminally ill beneficiaries’ expected costs.

DECEDENTS IN THE MEDICARE+CHOICE PROGRAM

Managed care plans enrolling Medicare beneficiaries under the Medicare+Choice program operate under a different set of financial incentives from providers in the traditional Medicare program. Medicare plans have

traditionally been paid 95 percent of the average expenditures for fee-for-service enrollees.² They thus have strong incentives to avoid terminally ill beneficiaries who are likely to incur large health care costs in their final months of life. Plans are also not responsible for all end-of-life care for their Medicare enrollees. Hospice is “carved out” of the Medicare HMO benefit package and reimbursed on a per diem basis by CMS. (It is the only service that is carved out of the HMO benefit package.) Managed care plans thus have an incentive to refer costly patients to hospice treatment for which they are not financially responsible.³

The available evidence suggests that plans have enrolled disproportionately few terminally ill beneficiaries. Adjusted death rates are lower for HMO enrollees overall (Maciejewski et al. 2001; Medicare Payment Advisory Commission [MedPAC] 2001).⁴ Although the plans in theory might reduce mortality rates somewhat by providing superior care, the great bulk of the 15 percent difference in adjusted death rates found by MedPAC is surely attributable to plans’ enrolling healthier than average individuals. Furthermore, death rates are higher among recent disenrollees of Medicare HMOs (Brown et al. 1993). In other words, terminally ill patients seem to disenroll disproportionately from Medicare+Choice plans before dying. It is not clear whether disenrollments are caused because of plans’ actions, because beneficiaries are receiving hospice services outside the plan, or because of other beneficiary preferences.⁵ Regardless of the cause, however, the disproportionately low share of dying beneficiaries in Medicare+Choice plans means that the plans have been reimbursed relatively generously.

This lower rate of mortality in Medicare+Choice plans explains a substantial proportion of the estimated difference in costs between plans and the traditional fee-for-service Medicare program due to favorable selection. That difference has been estimated by a number of researchers, with the best estimates ranging from 6 to 8 percent (Brown et al. 1993; Riley et al. 1996; Congressional Budget Office 1997). Given that the adjusted mortality risk of Medicare+Choice enrollees is 15 percent lower than beneficiaries in traditional Medicare, that Medicare decedents are nearly six times more expensive than survivors, and that Medicare+Choice enrollment is around 15 percent, the difference in costs between enrollees and nonenrollees attributable to differences in mortality risk alone is on the order of 3.2 percent.⁶

Adjusting Payments for the Costs of Decedents

One solution to this problem is to improve the payment system for Medicare HMOs. If risk adjusters could be developed that would pay additional

amounts for the terminally ill, plans would no longer have a financial incentive to avoid them. However, the Medicare payment system cannot pay more simply because an enrollee died for an obvious reason: “death” as a risk adjuster would provide a perverse incentive that would reward health care providers when their patients died.⁷ A better option would be to use diagnoses or other indicators of high risk for mortality as risk adjusters. These would be “prospective” adjusters that would not depend upon actions the providers might take.

Such diagnoses would ideally be easy and inexpensive to collect (e.g., available in administrative data), verifiable by auditors, and not subject to “gaming” through changes in coding or practice patterns. They should also not encourage poor-quality care—for example, generous reimbursement for chemotherapy and failure to compensate advance care planning might reduce the frequency of counseling about decisions to forgo repeated rounds of chemotherapy when initial rounds are not successful and compromise patients’ quality of life. Finally, they should adjust for identifiable factors that could plausibly be used by plans to select good risks or “dump” bad ones. Health expenditures that are truly unpredictable do not need to be included in a risk adjustment system, since plans cannot predict and exclude people who will suffer from such events. For the 7–15 percent of Medicare decedents whose death is sudden, no matter how high-cost, risk adjustment is not necessary (Lunney et al. 2003). The “verifiable, predictable, and expensive” condition categories developed by Dudley et al. (2003) are a good example of this type of adjuster.

The best possible risk adjustment system would thus not need to have perfect predictive power; it would simply have to be as good at predicting future expenditures as health plans could be. For example, if death was virtually unpredictable and all end-of-life costs were concentrated in the last 30 days of life, then plans might not be able to act quickly enough to disenroll members in their last month of life. Indeed, even without such a dramatic surge in expenditures, a highly imperfect risk adjuster may be good enough since plans do incur costs—both in targeting bad risks and in reputation—when they engage in risk selection activities.

In 1997, Congress included a provision in the Balanced Budget Act that directed CMS to introduce health-status-based risk adjustment into the Medicare+Choice program. The CMS chose to implement this provision, beginning in the year 2000, using the Principal Inpatient Diagnostic Cost Groups (PIP-DCGs). The PIP-DCG system classifies beneficiaries into 1 of 10 groups, based on the principal inpatient diagnoses they received during

hospitalizations in the 6- to 18-month period before the payment period. Beginning in January 2004 CMS will move to the CMS Hierarchical Coexisting Conditions (CMS-HCC) model, which incorporates inpatient and outpatient diagnostic data. Risk adjustment is being phased in over a seven-year period.

In choosing the PIP-DCG risk adjustment system over other models with more predictive power, CMS deliberately emphasized simplicity and reduced susceptibility to “gaming.” In fact, CMS modified the PIP-DCG model in three ways to further reduce the ability of plans to increase their reimbursement under the system by changing their practice patterns: (1) it based the PIP-DCG weight on predicted spending in the year following a diagnosis rather than the year of the diagnosis;⁸ (2) it dropped discretionary admissions to the lowest payment category; and (3) it did not provide reimbursement for one-day hospital stays. Each of these changes reduced the predictive power of the model. The CMS has announced that it will begin paying under the more powerful CMS-HCC model next year. This article finds that the PIP-DCG risk adjustment system will do little to alter plans’ strong financial incentives to avoid terminally ill patients—in large part because there are substantial differences between the costs of decedents and survivors even within diagnosis categories. Thus, we think it is unlikely that the move to the HCC system, or the planned full implementation of risk adjustment in 2007, will dramatically alter these financial incentives.

After discussing the problems associated with the PIP-DCG payment system, we will explore ways in which additional risk adjusted payments could be associated with certain diagnoses. Our work in this area is primarily illustrative. Nevertheless, our preliminary results suggest that associating higher payments with certain diagnoses could yield useful benefits.

Approach to Prospective Risk Adjusting

Van Vliet and Lamers (1998) investigated mortality as a risk adjuster using seven years of panel data on health care costs and utilization for fifty thousand members of one Dutch sickness fund. As have many others, they found that the costs of decedents were much higher than the costs of survivors (27 times higher in the last year of life for the younger than age 65 group and 4.7 times higher for the older than age 65 group). They also found that decedents’ costs were elevated in the six years prior to their deaths as well. They then used diagnoses from previous hospitalizations to classify the sickness fund members into one of five diagnostic cost groups devised by Lamers. While they

concluded that implementation difficulties and the perverse incentives precluded using mortality as a risk adjuster, they also determined that many of the high costs associated with end-of-life care were unpredictable and hence could be ignored in risk adjustment.

There are, however, reasons to question their conclusion. Van Vliet and Lamers's most comprehensive model used a coarse classification of five broad diagnostic groups (in addition to age, gender, degree of urbanization, disability status, and costs in the last three years). The categories were based entirely on the highest-cost principal inpatient diagnosis from previous years' hospitalizations.

We take a different approach to dealing with death's unpredictability. Following common medical practice, we consider different "trajectories" of death. Acute deaths resulting from ailments or accidents that occur suddenly without a preceding decline in health status are almost completely unpredictable. Deaths from chronic medical illnesses, such as organ system failures like congestive heart failure or cirrhosis, that involve a slow decline, periodic health crises, and a relatively sudden death are somewhat more predictable (Institute of Medicine et al. 1997; Glaser and Strauss 1968). Prognoses for people with these types of conditions, however, are uncertain: they may live for years before having a crisis that results in their death. In addition, there are patients with "progressive disabilities" such as patients with strokes, dementia, or frailty. These patients usually decline in functioning and eventually succumb from what might otherwise be a trivial infection or complication (Lynn 2001; Lunney, Lynn, and Hogan 2002). Despite this uncertainty about the timing of death, however, it is known that patients with both of these types of diseases have an elevated risk of death. Finally, progressive diseases such as cancer often have a clearly identifiable terminal phase. Even for these diseases, however, prognoses are uncertain because the response to treatment is so variable. (There is also, of course, variability in the diseases themselves and in patients' willingness to undergo treatment for them.) Once cancer patients enter a period of decline, however, their death trajectory becomes fairly predictable.

Although we use this difference among diseases to predict spending, problems arise if health plan clinicians or patients are privy to information about future expenditures that is not reflected in diagnosis and other information on claims and can thus predict expenditures better than claims-based risk adjusters. This could be the case with many of the conditions suffered by the terminally ill. For example, plans could have access to lab reports about HbA1c levels for diabetics and the stage of cancer. We discuss this possibility below, along with some ideas about how payments might be structured for these conditions.

DATA AND METHODS

To assess how well the PIP-DCG system performs for the terminally ill (our first objective), we calculated the average monthly over- and underpayment for decedents and survivors under the adjusted average per capita cost (AAPCC) and PIP-DCG systems. We used Medicare claims data for a 5 percent random sample of the fee-for-service beneficiaries who were older than age 64 throughout 1994 and died in 1995. The 5 percent sample included 74,433 such decedents. An approximately equal size “survivor” cohort of 78,608 beneficiaries enrolled in fee-for-service Medicare throughout 1994 and 1995, matched to the decedents on the basis of age and sex, was drawn from the 5 percent Medicare sample. A matched sample rather than a random sample was drawn to ensure that there would be a high enough prevalence of potentially fatal conditions among the survivors to compare the costs of decedents to survivors with similar diseases. (For most of the analyses the survivor sample was then weighted to reflect the age and sex distributions of survivors in the Medicare population as a whole.) We excluded from the analyses beneficiaries younger than 65 years of age and those enrolled in HMOs during any month in 1994 or 1995. (Those enrolled in HMOs had incomplete diagnosis information because HMOs were not required to submit inpatient information to Medicare until 1999.) The dataset contained demographic information including the dates of birth and death, gender, and county of residence of these beneficiaries. The claims data included 1994 and 1995 Part B data on outpatient, physician visit, home health, lab, durable medical equipment (DME), and hospice claims, as well as Part A data on inpatient claims and diagnoses, DME, home health, and hospice. The data were aggregated and results reported at the level of the calendar month so that decedents who died midyear could be accurately compared to survivors.

We estimated AAPCC and PIP-DCG payments for each individual in the dataset.⁹ We assigned AAPCC payments based on the beneficiaries’ age, gender, and county of residence. We weighted by the prevalence of working aged, Medicaid eligible, and institutionalized persons residing in the county since individual-level data on these variables are unreliable.¹⁰ We estimated both versions 3.0 and 4.1 of the PIP-DCG model, using the data to produce risk adjusted payments for 1995.¹¹ We based the PIP-DCG predictions on individuals’ age, gender, county of residence, original reason for entitlement,¹² and their principal inpatient diagnoses in 1994. To avoid complexity and to focus on the accuracy of the risk adjustment mechanism, we did not consider the effect of the floors, blends, and minimum updates introduced by the Balanced Budget Act of 1997.

We then investigated whether there are predictors of costs that are not fully exploited by the PIP-DCG system. We classified each beneficiary with one or more inpatient admissions into one or more of the National Center for Health Statistics' (NCHS) 72 selected causes of death categories based on the beneficiary's principal inpatient diagnoses. These categories are aggregates of the diseases in the International Classification of Diseases. The International Classification of Diseases (ICD) was developed by the World Health Organization to code and classify mortality data, so it is an appropriate classification if one is looking for diseases that are associated with deaths. It is also the basis for the ICD-9-CM system of coding inpatient diagnoses used by Medicare. It thus affords an easy way to map diagnosis codes into these categories.

Following the risk adjustment literature, we fit linear regression models predicting the difference between actual costs and the PIP-DCG rate (i.e., residual costs not explained by the PIP-DCGs). In order to test whether the presence of these diseases in the 72 NCHS categories predicted costs better than DCG adjustment alone, we ran the following regression to predict the residual difference (Δ) between actual Medicare payments and PIP-DCG adjusted payments using indicators for each NCHS category as the explanatory variables:

$$\Delta = \alpha + \beta NCHS\ category + \varepsilon \quad (1)$$

Using the frequencies with which these conditions occurred in our decedent and our (weighted) survivor cohorts, we calculated the death rate for each of the categories to see if those categories with large residuals also had high death rates. We then estimated model (2), below, which separates the costs associated with the conditions from the costs associated with the terminal years of those conditions using dummy variables for the 72 NCHS categories and for those categories interacted with indicators of death.

$$\Delta = \alpha + \beta_1 Decedent + \beta_2 NCHS\ category + \beta_3 Decedent * NCHS\ category + \varepsilon \quad (2)$$

RESULTS

Table 1 presents the average monthly losses and gains that plans would incur for decedents and survivors under the AAPCC and PIP-DCG systems. Given that the average decedent in this data set was alive for half of 1995, a plan enrolling such a person would be underpaid by \$15,000 (6 months x \$2,500), and they would be overpaid by approximately \$600 (12 months x \$50) for each survivor. The PIP-DCGs better match individual payments to expected

Table 1: Monthly Underpayments for Decedents and Survivors under Different Risk-Adjustment Systems

<i>Risk Adjustment Methods</i>	<i>1995 Deaths</i>		<i>1995 Survivors</i>	
	<i>Mean</i>	<i>Standard Deviation</i>	<i>Mean</i>	<i>Standard Deviation</i>
AAPCC	\$2,514	4,853	− \$58	3,140
PIP-DCG Version 3.0	\$2,572	4,859	− \$50	3,151
PIP-DCG Version 4.1	\$2,515	4,876	− \$41	3,158

Note: Values are total claims paid minus plan payment amounts. The sample size is 150,041. All figures are for the year 1995.

Table 2: Percentage of Cohort in Multiple NCHS Categories

<i>Number of NCHS Categories Assigned Based on 1994 Admissions</i>	<i>Died in 1995</i>	<i>Survived 1995</i>
0	65.74 %	88.34 %
1	24.16 %	9.66 %
2	7.51 %	1.69 %
3	2.03 %	.25 %
4	.46 %	.05 %
5 or more	.001 %	.0001 %

costs than the AAPCCs—but almost entirely by reducing overpayment for the survivor group. Even if capitation payments to plans were fully adjusted by the PIP-DCG system, therefore, plans would on average continue to incur substantial losses on enrollees who die and obtain excessive compensation for enrollees who survive.

Tables 2 and 3 summarize the classification of the cohorts of decedents and survivors into the NCHS categories and the risk of death in each category. Interestingly, more than 65 percent of 1995 decedents had no inpatient admissions during 1994 (Table 2). Ten percent had more than one disease that was the primary reason why they were hospitalized in the year prior to their death. This is not surprising given that elderly cancer decedents have an average of 0.84 additional causes of death on their death certificates, and elderly diabetes decedents have an average of 2.13 additional causes of death (Hogan et al. 2001). However, it does demonstrate that substantial information is lost when seniors are classified on the basis of their single highest diagnostic category as the PIP-DCGs do. Among survivors, less than 12 percent were classified into one or more of the NCHS categories.

Table 3: Regression Results for Payment Residuals, Death Rates for Medicare Beneficiaries Hospitalized, by NCHS Category

<i>NCHS Category</i> ⁷	<i>Death Rate</i> ² (1)	<i>Regression Parameters</i>	
		<i>Coefficient</i> ³ (2)	<i>Standard Error</i> (3)
Intercept		− 8.91*	3.75
Certain other intestinal infections	11.0%	228.17*	109.77
Septicemia	26.9%	869.42**	63.70
Viral hepatitis	56.2%	575.56	945.08
Syphilis	53.6%	2,106.87	1,299.96
All other infectious and parasitic diseases	23.7%	328.90	120.06
Malignant neoplasms of lip/oral cavity/pharynx	31.3%	1,240.71**	262.77
Malignant neoplasms of digestive organs/ peritoneum	31.7%	875.16**	67.48
Malignant neoplasms of respiratory/ intrathoracic organs	50.6%	1,660.03**	102.63
Malignant neoplasms of genital organs	14.9%	448.53**	66.86
Malignant neoplasms of urinary organs	19.5%	695.88**	98.94
Malignant all—all other/unspecified sites	30.2%	440.73	243.61
Leukemia	82.6%	4,761.74**	394.17
Other malignant neoplasms-lymphatic/ hematopoietic tissues	63.1%	3,173.81**	210.01
Benign neoplasms	9.0%	258.29*	74.12
Diabetes mellitus	21.3%	1,106.4**	60.87
Nutritional deficiencies	39.4%	1,642.33**	273.46
Anemias	31.7%	1,065.84**	116.61
Hypertensive heart disease	23.5%	961.81**	95.11
Hypertensive heart and renal disease	44.7%	2,891.42**	189.16
AMI	15.2%	550.80**	43.40
Other acute and subacute forms of IHD	10.1%	486.35**	47.83
Angina pectoris	10.3%	298.40	88.38
Old MI and other forms of chronic IHD	6.7%	461.61**	38.16
Other diseases of endocardium	8.2%	349.74*	129.02
All other forms of heart disease	21.7%	761.64**	25.31
Hypertension with or without renal disease	17.0%	1,253.02**	101.85
Intracerebral/other intracranial hemorrhage	21.5%	1,196.40**	137.64
Cerebral thrombosis/occlusion of cerebral arteries	18.9%	681.80**	55.63
Cerebral embolism	17.3%	663.62**	132.49
All other/late effects—cerebrovascular diseases	15.9%	394.08**	37.73
Atherosclerosis	17.7%	977.92**	88.32
Other diseases—arteries arterioles/capillaries	13.6%	798.00**	69.92
Pneumonia	24.5%	691.35**	32.42
Bronchitis chronic and unspecified	21.4%	876.13**	59.32
Emphysema	27.7%	1,497.25**	173.50
Asthma	13.4%	577.74**	87.81
Other COPD and allied conditions	28.7%	872.71**	80.05

continued

Table 3. *Continued*

<i>NCHS Category</i> ¹	<i>Death Rate</i> ² (1)	<i>Regression Parameters</i>	
		<i>Coefficient</i> ³ (2)	<i>Standard Error</i> (3)
Ulcer of stomach and duodenum	13.2%	368.34**	67.81
Hernia of abdominal cavity or intestinal obstruction	12.0%	425.22**	49.56
Chronic liver disease and cirrhosis	41.6%	1,698.77**	228.29
Cholelithiasis gallbladder disorders	7.8%	184.59*	55.76
Acute glomerulonephritis nephrosis	43.4%	1,146.85*	583.09
Renal failure	29.9%	1737**	122.77
Infections of kidney	12.6%	605.67**	140.33

Notes: ¹Categories are not mutually exclusive. Persons with admissions falling into the NCHS categories for whooping cough, meningococcal infection, acute poliomyelitis, measles, acute bronchitis and bronchiolitis, pregnancy with abortive outcome, and birth trauma did not appear in the data. The two persons falling into the motor vehicle accidents category both survived while the two persons falling into the shigellosis and amebiasis category and the 12 persons falling into the chronic glomerulonephritis category all died. The categories for suicide, homicide or legal intervention, and other external causes could not be detected in the claims data as they are not valid for Medicare inpatient claims. Categories that had probabilities of death lower than 30 percent in the calendar year following the inpatient diagnosis and were not significant predictors of higher costs are not listed in this table (tuberculosis of respiratory system, streptococcal sore throat, malignant neoplasms of the breast, meningitis, rheumatic fever, influenza, appendicitis, complications of pregnancy, congenital abnormalities, and all other diseases [the residual category]).

²Categories in bold reflect probabilities of death greater than 30 percent.

³Coefficients with one asterisk are significant at the 5 percent level; coefficients with two asterisks are significant at the 1 percent level.

Table 3 shows the probabilities of death in the following year for beneficiaries in each of the NCHS categories, controlling for the age, gender, and region of the decedent versus the survivor categories.¹³ Only five categories—leukemia, other malignant neoplasms of the lymphatic/hemopoietic tissues, viral hepatitis, syphilis, and malignant neoplasms of the respiratory/intrathoracic organs—are associated with a risk of death in the following year of more than 50 percent, illustrating the difficulty of predicting death.¹⁴ (In addition, all these conditions except for malignant neoplasms of the digestive organs are rare diseases occurring in less than 1 in 1,000 Medicare beneficiaries in a given year.) However, as expected, cancers have relatively high probabilities of death and progressive illnesses such as heart disease and kidney diseases also have relatively high death rates.¹⁵

Given the finding in Table 1 that the PIP-DCGs do not adjust well for the costs of decedents, we examined the diseases with higher risks of death to see if

they had high expenses not accounted for in the PIP-DCG methodology. Table 3 also shows that the vast majority of the NCHS categories are statistically significant predictors of positive differences between actual expenses and the amount that would be reimbursed under the PIP-DCG system. Diseases with death rates of more than 30 percent, which are in bold on the Table, have particularly high coefficients. For example, an average person in the NCHS category, “malignant neoplasms of respiratory/intrathoracic organs,” would have had expenses in 1995 that exceeded reimbursement by \$1,660 per month.

Much of the residual difference is associated with the cost of decedents. Of the 13 diseases with coefficients of \$1,000 or more, 9 have death rates of more than 30 percent and 12 have death rates greater than 20 percent in the following year. Thus, if plans used the information about principal inpatient diagnoses that they are submitting to CMS, they would know which enrollees had expected costs that are thousands of dollars in excess of their risk-adjusted capitation rates.

Table 4 quantifies the additional costs of decedents using model (2) from above. The additional costs for a decedent in a given NCHS category are $\beta_1 + \beta_3$, or $\$2,208 + \beta_3$. Most of the NCHS categories are positive and significant predictors of the cost variation remaining after the PIP-DCG risk adjustment. The interactions between the categories and the mortality variable are also largely positive and significant, indicating that death is associated with a surge in cost for many conditions. Thus, if plans had, in addition to inpatient diagnosis information, extra information with which to predict more accurately which enrollees with these diseases have higher-than-average (for the disease) probabilities of death, the plans would have still stronger incentives to select against those enrollees. And plans could have access to more information about enrollees such as the stage of an enrollee’s cancer or the APACHE score of a heart disease patient (Knaus and Wagner 1989).

Important differences between the cancers and the organ system failure diseases are apparent in Table 4. The cancer patients, by and large, do not have significantly higher costs than the average decedent if they die rather than survive (i.e., the interaction terms are insignificant). In contrast, the organ system failure decedents do have higher costs than average—likely because their death was precipitated by a “health crisis” in their illness and resources were invested with the assumption that the patient might survive the crisis.

None of the interaction terms in this regression was negative and significant. No candidate NCHS categories emerged in this analysis, therefore, for *reducing* payments if a patient dies (i.e., as payments are reduced for acute

Table 4. Predictors of High-Payment Residuals after PIP-DCG Adjustment¹

<i>Variable/NCHS Category²</i>	<i>Category³</i> (1)	<i>Standard Error</i> (2)	<i>Coefficient on Category*Death</i> (3)	<i>Interaction Standard Error</i> (4)
Intercept	− 90.23**	3.56		
Died in 1995	2,208.19**	17.71		
Certain other intestinal infections	262.65*	106.81	− 332.67	356.76
Tuberculosis of respiratory system	− 134.52	439.05	3,626.00*	1,044.66
Septicemia	461.62**	67.78	272.91*	139.20
Viral hepatitis	− 108.21	1,211.86	− 656.13	1,756.68
Syphilis	2,485.12	1,627.36	− 3,099.40	2,426.74
Malignant neoplasms of lip/oral cavity/ pharynx	553.45	289.60	580.02	537.38
Malignant neoplasms of digestive organs/peritoneum	266.70*	73.51	426.41*	141.04
Malignant neoplasms of respiratory/ intrathoracic organs	616.10**	129.56	257.58	191.68
Malignant neoplasms of genital organs	264.17**	66.42	184.74	186.71
Malignant neoplasms of urinary organs	400.54**	100.75	191.49	245.19
Malignant all—all other/unspecified sites	− 22.47	261.59	86.69	520.43
Leukemia	− 131.81	776.40	4,153.06**	880.63
Other malignant neoplasms—lymphatic/hemotopoietic tissues	1,472.67**	317.24	658.92	402.47
Benign neoplasms	186.92*	71.54	911.41*	261.71
Diabetes mellitus	805.64**	62.35	352.11	147.89
Nutritional deficiencies	990.25*	314.09	36.47	533.73
Anemias	379.26*	127.30	647.46*	242.58
Meningitis	− 146.76	568.99	9,065.94**	1,737.69
Hypertensive heart disease	566.74**	99.48	504.31*	216.19
Hypertensive heart and renal disease	2,220.76**	229.56	− 51.01	357.02
AMI	288.04**	43.20	961.09**	120.13
Other acute and subacute forms of IHD	407.19**	46.42	525.83**	159.31
Angina pectoris	213.80*	86.01	473.69	286.57
Old MI and other forms of chronic IHD	429.42**	36.46	1,324.18**	154.19
Other diseases of endocardium	197.01	124.07	2,242.03**	475.25
All other forms of heart disease	412.27**	26.00	355.96**	61.71
Hypertension with or without renal disease	867.58**	102.06	1856.24**	271.55
Intracerebral/other intracranial hemorrhage	805.50**	142.87	555.64	319.26
Cerebral thrombosis/occlusion of cerebral arteries	448.75**	56.53	113.74	139.30
Cerebral embolism	489.20*	133.54	− 169.44	343.05
All other/late effects—cerebralvascular diseases	239.20**	37.63	16.18	103.27
Atherosclerosis	841.00**	88.98	266.72	230.46

continued

Table 4. *Continued*

<i>Variable/NCHS Category²</i>	<i>Category³</i> (1)	<i>Standard Error</i> (2)	<i>Coefficient on Category*Death</i> (3)	<i>Interaction Standard Error</i> (4)
Other diseases—arteries arterioles/capillaries	523.10**	68.88	1,888.36**	205.91
Pneumonia	280.14**	33.84	467.62**	74.74
Bronchitis chronic and unspecified	517.61**	61.25	628.59**	140.15
Emphysema	900.33**	185.17	1,172.01*	376.12
Asthma	355.69**	87.04	814.53**	248.19
Other COPD and allied conditions	285.83*	86.17	835.80**	171.50
Ulcer of stomach and duodenum	182.15*	66.94	515.85*	196.86
Hernia of abdominal cavity or intestinal obstruction	298.01**	48.69	374.10*	149.10
Chronic liver disease and cirrhosis	375.81	266.22	1,699.23**	440.09
Cholelithiasis gallbladder disorders	122.06*	53.62	539.97*	205.37
Acute glomerulonephritis nephrosis	−734.59	678.03	3,382.42*	1,126.25
Renal failure	1,247.16**	135.76	387.80	250.61
Infections of kidney	448.45*	137.92	300.87	419.89
Hyperplasia of prostate	52.09	60.14	802.51*	272.86
Symptoms signs/ill-defined conditions	237.52**	33.14	285.21*	93.08
All other diseases (residual)	346.75**	25.51	66.56	71.47

¹The dependent variable is the residual difference between actual costs and PIP-DCG-adjusted payments.

²The omitted category in the regression is survivors without any inpatient diagnoses.

³Coefficients with one asterisk are significant at the 5 percent level; coefficients with two asterisks are significant at the 1 percent level.

myocardial infarction patients who die under the acute hospital Prospective Payment System).

Our results indicate that the PIP-DCGs are poor predictors of costs for Medicare beneficiaries at the end of life, and that plans could easily identify a set of profitable and unprofitable patients under the PIP-DCG system. There is thus room for improvement of CMS's risk adjustment system. We find, however, that more disaggregated prospective diagnostic data do not predict the high expenditures associated with the medical "crisis" or exacerbation that precipitates death for progressive organ system failure patients.

CONCLUSIONS

Although PIP-DCG-adjusted capitation rates reduce the incentives for Medicare HMOs to select healthy Medicare beneficiaries, they do not reduce

them much. Considerable differences remain between the PIP-DCGs and the expected costs of beneficiaries who have been hospitalized in a number of diagnostic categories. Medicare plans still have incentives to avoid these beneficiaries with high expected costs.

Two limitations of this paper may cause our results to overstate the degree to which plans are underpaid for decedents. First, because the information in Medicare claims data about beneficiaries' institutional (nursing home) status was unreliable, we used the PIP-DCG default value for this variable. In 1995, Medicare paid higher rates for institutionalized than noninstitutionalized beneficiaries. Thus, to the extent that decedents are institutionalized at higher rates than the Medicare population as a whole, we will be underestimating their AAPCC and PIP-DCG rates as of 1995. The Balanced Budget Act of 1997, however, removed the incremental payment for institutionalized beneficiaries, and even in 1995 the institutional adjustment was very small.

Second, because hospice care is "carved-out" of the Medicare HMO benefit, plans do not pay for the hospice costs of enrollees who use those services (McCarthy et al. 2003). Since hospice costs were bundled with our Part A costs in this analysis, however, we have overstated the amount by which plans are currently underpaid in the diagnosis categories in which hospice is used, as well as the degree to which the PIP-DCGs underpay for decedents.¹⁶

Our work suggests areas in which the risk-adjusted payment system currently in place could be augmented or improved. First, disaggregating the risk adjustment categories would be useful, since plans submit more detailed information about diagnoses to CMS that they could use to select within the broad PIP-DCG groups. The introduction of the 61-category CMS-HCC model will be a step in this direction, but considerable variation within groups will still remain. Of course, in doing so careful clinical consideration must be given to any potential payment variables to ensure that they will not provide incentives to deliver poor quality of care or be otherwise clinically unsuitable for use as risk adjusters. Second, courses of illness could be taken into consideration when setting the time periods for which risk-adjusted payments are calculated. The current system pays more only for patients with courses of illness (and their associated costs) that extend into the year after they begin. The costs of illnesses that kill within this period are, therefore, largely left out of the risk-adjustment scheme. Finally, risk of death—perhaps implemented as stage or severity of illness—could be incorporated into risk adjustment or other payment methodologies to the extent that information about the predictability of death is available to plans and that enrollees have higher

expected costs in the period before their deaths. In the case of organ system failure diseases this would not constitute a “payment for death” but rather would reflect the higher costs associated with giving a patient a chance to survive a health crisis.

Moreover, there is a legislative precedent for this type of payment to Medicare HMOs. In an effort to encourage high quality care for congestive heart failure, CMS is paying bonuses in 2002 and 2003 to plans that evaluate and treat most of their congestive heart failure patients with ACE inhibitors. A similar scheme is employed in Germany, where sickness funds that enroll patients in disease management programs receive higher risk-adjusted payments (Busse 2003). Currently, CMS plans to phase these payments out in 2004 when it implements the more comprehensive HCC risk adjustment system. Our findings show that, rather than phasing this type of payment out, supplemental payments to plans that diagnose, evaluate, and treat patients with life-threatening conditions could be part of a reimbursement system that gives plans incentives to serve all Medicare beneficiaries well.

NOTES

1. We use the phrase “the terminally ill” to refer to beneficiaries who have a progressive incurable illness that will culminate in death.
2. Since the Balanced Budget Act of 1997 implemented floors and minimum updates, this is no longer true (MedPAC 2001). If anything, however, these changes strengthen our conclusions, because the reductions in the high rate areas have affected more enrollees than the increases in the low rate areas.
3. Hogan et al. (2001) found that Medicare+Choice enrollees use hospice at a higher rate than those in the traditional Medicare program.
4. This is after adjustment for age and sex. The raw proportion of deaths in plans is even lower because plan enrollees tend to be much younger than average.
5. However, one study found that beneficiaries with cancer diagnosed after enrollment were no more likely to disenroll, but those whose cancer was diagnosed before they entered an HMO were at high risk for disenrollment. This finding suggests that plans are not systematically “dumping” cancer patients (Riley, Feuer, and Lubitz 1996). Also, enrollment in hospice does not necessitate disenrollment and plans and enrollees actually have little financial incentive to disenroll.
6. The 3.2 percent was calculated as follows. Mortality risk among HMO patients is 85 percent of FFS (MedPAC 2000, Table A-5), 5.1 percent of beneficiaries die in a year (NCHS 1996), and costs of decedents are 5.98 times nondecedents (Hogan et al. 2001). Assuming that 85 percent of beneficiaries are in FFS and the rest in HMOs, the traditional FFS death rate would be $.051 / (.85 + (.15)(.85)) = .0522$. Then

FFS costs are proportional to $(1 - .0522)(1) + (.0522)(5.98) = 1.2600$ and HMO costs are proportional to $(1 - (.85)(.0522)) + (.85)(.0522)(5.98) = 1.2210$. This is a 3.2 percent difference, which is around half the observed selection effect. Historically the Medicare+Choice share was less than 15 percent, which would reduce the 3.2 percent value.

7. Despite this incentive, mortality has been used and considered for use as an aggregate level risk adjuster in Europe, although a regional level incentive should have weak effects on behavior at the individual level. The British National Health Service allocates funds to different regions based on age and local mortality rates. Mortality was also considered for use as a risk adjuster by Dutch sickness funds (van Vliet and Lamers 1998). It is also used in the DRG system for patients with an acute myocardial infarction, since those patients who die cost less than those who survive.
8. The differential that a plan receives for an individual with a given diagnosis will equal the amount an individual with that diagnosis is expected to cost in the year following their inpatient admission. Due to regression to the mean this amount is less than the full expected cost of the year in which the hospitalization occurred.
9. The PIP-DCG model is calibrated using diagnostic data from the period 6 to 18 months prior to the year from which the costs being predicted are incurred. This is done in order to reflect the time period needed between data collection and payment adjustment. We used the PIP-DCG model's published relative resource rates for the Medicare population and used diagnostic data from calendar year 1994 to assign calendar year 1995 PIP-DCG payment rates. Thus, our results overstate the accuracy of the PIP-DCGs to the extent that we are picking up and accounting for more recent diagnoses but understate them to the extent that the PIP-DCG weights reflect more established conditions. (In 2004, CMS will move to a system that uses prior year data to set the following year's rates, paralleling what we have done here.) We compared these to 95 percent of the adjusted average per capita cost, which reflects the payment rates used by the Medicare program.
10. All of the default and county-level variables used will produce accurate results to the extent that decedents and beneficiaries in given disease categories are representative of the Medicare population as a whole.
11. Version 4.1 of the PIP-DCG model is actually not as good at predicting expenditure as version 3.0 due to modifications CMS made in order to reduce the ability of plans to "game" the risk adjustment system.
12. This indicates whether the beneficiary was disabled before age 65.
13. The probabilities of death are derived from the relative frequencies of the conditions in the decedent and matched survivor samples.
14. Syphilis is probably associated with this high rate of mortality because it is occurring in patients with AIDS or other serious conditions. This is also likely the case for viral hepatitis.
15. The categories on this table are not mutually exclusive so some of the probabilities of death are higher than they would be if each beneficiary were categorized into their single most serious condition group. For example, an inpatient admission for a stomach ulcer in 1994 is associated with a 13 percent chance of death in 1995, but

this could be because stomach ulcers are correlated with heart disease, which truly does carry with it an elevated level of risk of death. In addition, some causes of death, such as dementia, are unlikely to be listed as the primary cause of a hospitalization or of death.

16. Over the period 1994–1998 hospice care accounted for 4 percent of last year of life costs, or approximately \$80 per month (Hogan et al. 2001). Thus, our results regarding payments for decedents are overstated by at most this amount.

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