Inpatient Psychiatric Prospective Payment System

Background

The Balanced Budget Refinement Act of 1999 (BBRA) requires the Secretary of the Department of Health and Human Services (HHS) to develop a per diem Medicare prospective payment system (PPS) for inpatient psychiatric services, which is based upon a patient classification system that reflects differences in patient resource use and cost among hospitals, and is budget neutral to current payments. The BBRA also requires the submission of a report to Congress that describes the new methodology by October 1, 2001, and implementation of the new PPS in cost reporting years beginning after October 1, 2002. The Centers for Medicare and Medicaid Services (CMS) within HHS has been charged with developing the PPS and preparing the report to Congress.

The mandated payment and patient classification system will profoundly impact upon the care of Medicare beneficiaries because it will cause a significant redistribution in payments. Since under the current payment system aggregate payments are about 3.1% less than aggregate costs, facilities that lose revenue under the new PPS would not end up with merely smaller surpluses, but operating deficits, which would force them to reduce service levels. The 3.1% shortfall was generated by payment reductions enacted in the Balanced Budget Act of 1997 (BBA). The budget neutrality requirement in the BBRA locks in this shortfall.

The PPS will cause a significant redistribution in payments because, while current payments are based on cost, PPS payments will be based upon the national average cost of inpatient psychiatric services, albeit with adjustments for patient and hospital characteristics that have been shown to affect cost. One factor that is known to be an important driver of cost is length of stay, however variation in length of stay has yet to be adequately explained. If the PPS had been case based, providers treating patients requiring longer than average lengths of stay would have experienced systematic risk and would have been forced to reduce needed services for those patients or avoid them altogether. Therefore, the decision by Congress to promulgate a per diem PPS was appropriate and an important protection for the most vulnerable patients.

However, even a per diem system will cause major redistributions because, thus far, the explanation for why per diem costs vary widely across inpatient facilities and clinical providers has remained elusive. One reason for the paucity of data is that diagnosis-related group (DRG) assignment does not influence the cost of psychiatric services nearly as much as it influences the cost of medical and surgical services. By extension, secondary diagnoses (cormorbidities) probably play a more important role in psychiatry, yet have not been studied rigorously.

The American Psychiatric Association (APA) has taken a keen interest in the development of the PPS because the psychiatric inpatient delivery system in the United States is already fragile and beset by problems that have been steadily reported to the APA from across the country. The APA's principal concern is that the PPS not further

destabilize inpatient psychiatric services and diminish access and quality for Medicare beneficiaries. Prompted by these critical patient care issues, the APA commenced a series of activities to provide clinical input into the design of the PPS. This work was done through the APA's Committee on Reimbursement for Psychiatric Care, whose Chairman is Joseph T. English, M.D., Chairman of Psychiatry at New York Medical College and the Saint Vincents Catholic Medical Centers and whose Vice Chairman is Steven S. Sharfstein, M.D., President and C.E.O. of the Sheppard Pratt Health System. Irvin Muszynski, J.D., and Lloyd I. Sederer, M.D. provided APA central office support.

The Committee identified several principles that the new PPS should embody: 1) it should be constructed in a manner that prioritizes patient care and does not jeopardize access to or the quality of essential services that are known to be in short supply, 2) the patient classification system should be rational, i.e., clinically meaningful, 3) the payment model should not be static; it should incorporate what is known now and be amenable to modification as new information on predictors of cost are discovered, 4) the payment system should not inadvertently create financial incentives for providers to increase services that, while essential, should be kept to a minimum, such as the use of restraints and seclusion, and 5) the PPS should not add administrative burdens to clinicians, which would take precious time away from patient care.

Among its activities related to the PPS, the Committee partnered with The Health Economics and Outcomes Research Institute (THEORI), a division of the Greater New York Hospital Association (GNYHA), to investigate whether existing administrative data could be used to develop a PPS that would satisfy the BBRA's requirements and embody the APA's principles. THEORI has been working with administrative data since 1995 to provide confidential risk-adjusted quality and efficiency data to its members to prepare them for public report cards and to facilitate their responses to press inquiries about their relative performance. The cornerstone of THEORI's research is an algorithm that edits diagnostic codes and that designates each code as either a comorbidity or a complication. THEORI uses comorbidities, i.e., conditions with which patients present to the hospital, as risk factors in regression analysis by grouping them by etiology and then using the count in each of 12 etiology groups as independent variables. The APA became aware of THEORI's work through Dr. English, who serves as Chairman of GNYHA's Mental Health Committee.

Providing consultations to the research were Judith R. Lave, Ph.D., at the University of Pittsburgh and Barbara O. Wynn at the RAND Corporation. The APA also sought guidance and assistance from the American Hospital Association (AHA) and the National Association of Psychiatric Health Systems (NAPHS), which have particular expertise in hospital operations, regulations, and billing systems, and which are prominent representatives of the hospital industry.

This paper describes the classification and payment methodology developed by THEORI and the APA. Both organizations recognize and assert that the model is only a starting point and not a final destination. Further work to improve upon this model is anticipated and welcome.

An Inpatient Psychiatric PPS Model

The inpatient psychiatric PPS model that the study group developed was based upon a linear regression analysis that used 38 independent variables to explain variation in average per diem costs in inpatient psychiatric freestanding hospitals and units within general hospitals.

Dependent Variable: The Log of the Average Per Diem Cost of Each Case

Inpatient psychiatric cases reimbursed according to the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA) payment methodology were drawn from the 1998 MedPAR database. Cases were excluded from the analysis if they failed any one of a series of edits. Total charges for each case were reduced to cost using ratios of costs to charges (RCCs) derived from the 1998 Medicare Cost Reports. Costs include operating and capital-related costs but exclude direct graduate medical education costs. The RCC derived for each hospital represents a weighted average of separate routine and ancillary RCCs. Hospitals missing the requisite data and hospitals with RCCs above 2.00 or below 0.20 were assigned either urban or rural statewide average RCCs.

Cost per day was calculated by dividing the total cost for each case by the total length of stay for each case. The log of the average per diem cost for each case was the dependent variable in the model. Cases were excluded from the regression model (but included in the fiscal impact analysis) if their per diem cost was more than three standard deviations from the mean of the log distribution of the per diem cost of all cases. The dependent variable was not standardized in any way.

Independent Variables

Location. Dummy variables were included for hospitals located in rural areas, Alaska, and Puerto Rico. The coefficients for these locations were positive for rural hospitals, positive for Alaska hospitals, and negative for Puerto Rico hospitals, as expected. A dummy for hospitals located in Hawaii was negative, which was not expected. Therefore, this dummy was dropped.

Hospital Variables. Hospital variables included 1) the log of the area wage index, 2) the log of (one plus the exempt psychiatric unit or hospital's ratio of interns and residents to beds (IRB)), and 3) the log of (one plus (the exempt unit or hospital's disproportionate patient percentage (DPP) minus the population average)).

- The wage indices were taken from the 2001 inpatient rehabilitation PPS final rule because, even though they reflect 1997 data, they exclude 100% of teaching data.

- The IRBs were derived for the exempt units and hospitals based on data from the HCRIS file rather than the more commonly used database, the Hospital Data Set, because the latter database does not include exempt unit resident counts.

- DPPs were also derived for the exempt units and hospitals where data were available. The Medicaid share of total days was derived from the Hospital Data Set. For exempt units, the Medicare SSI share of total Medicare days reflects the hospital-wide SSI percentage obtained from the Provider-Specific File. Since SSI percentages were not available for exempt hospitals, statewide averages derived from general hospital percentages were assigned to each exempt hospital. CMS would use correct data instead of estimates if it ran a similar model. Furthermore, in constructing an actual DSH variable, CMS would consider that psychiatric hospitals, as Institutions for Mental Diseases (IMDs), are precluded by federal law from receiving federal matching payments for Medicaid patients between the ages of 22 and 64.

Demographics. Dummy variables were used for patients over 65 and female patients.

Principal Diagnosis. Dummy variables were used for each of the psychiatric and substance abuse DRGs associated with patients treated in exempt units and hospitals.

Comorbidities. The model uses the count of major comorbidities in each of 12 etiologies. Appendix A provides a description of the etiologies and summary statistics about the frequency of comorbidities coded for inpatient psychiatric patients.

Length of Stay. A dummy variable was assigned to each case associated with one of five LOS ranges.

Other Variables. Several other variables were tested and increased the explanatory power of the model, but were dropped because they were inappropriate for one reason or another.

- The indicator that a patient's admission was court-ordered was dropped because the standards for such admission vary widely among the states.

- Indicators that a patient was admitted through the emergency room, died, or was transferred to another facility were dropped because their coefficients were all positive, but providing higher payments for these patients would create perverse incentives.

- A dummy variable for freestanding government facilities—as a proxy for state-run psychiatric hospitals—was dropped because it was felt that these facilities should be excluded altogether. They would have received extraordinary profits if included, even with the dummy variable, which indicates that they provide a different product than freestanding non-government hospitals and psychiatric units within general hospitals. In addition, freestanding government hospitals code comorbidities much less frequently than other hospitals and units. A separate regression model for these hospitals had a very high R-squared—over 35%—so CMS could consider developing a separate payment model for them.

- Dummies for various ranges of capital share of total cost performed very well in adjusting payments for the capital cycle, but were excluded because the study group felt that CMS would not use them.

The Intercept

The intercept of the regression model—which becomes the standardized amount of the PPS—represents a patient with the following characteristics. "Lou" is a male patient under 65 (as are most psychiatric inpatients), with a principal diagnosis of psychoses (DRG 430), no comorbidities, and an LOS in the range of one to two days. He was admitted to an urban, non-teaching hospital in the continental United States with a wage index of 1.0000 and a DPP of 25.5% (the average for the database).

Explanatory Power

The model has an R-squared and an adjusted R-squared of almost 22%. Additional variables available on the MedPAR file increased the R-squared to 24%, but these variables were not included for the reasons explained above.

Updating the Model

The model should be updated on a periodic basis to keep up to date with changes in practice patterns. However instead of updating only the DRG weights, which is done in the general hospital PPS, all the variable coefficients should be updated to preserve the integrity of the new payment system. After the initial years of the system, i.e., when providers are correctly reporting their data, it is expected that the updates will reflect only gradual changes and will not cause instability in payments.

Calculating the PPS Per Diem Payment

Step 1. The coefficients on the length of stay variables were increasingly negative for increasing lengths of stay, meaning that the longer the length of stay, the lower the average per diem cost of the stay. This was expected because many costs are front-end loaded. The normal way to apply the LOS adjustment would be to pay the same amount for every day of a stay, with the amount varying for each case depending on its actual length of stay. That application would be highly impractical, however, because the hospital would not know the patient's LOS until the end of the stay and would not be able to bill during the stay. Therefore, the study group decided to use the length of stay coefficients to reduce the first and second day's payment at specified intervals during the hospital stay, a "block per diem" approach. The LOS intervals were determined by observing peaks in a graph of the cases' lengths of stay. Table 1 shows the discount schedule produced by the model.

Table 1. Discounts for Various Per Diem Blocks

	LOS Coefficients in Log Form	Antilog = Discount Factor
Days 1 and 2	0.00	1.00
Days 3 through 7	-0.18	0.84
Days 8 through 14	-0.26	0.77
Days 15 through 91	-0.30	0.74
Days 92 through 182	-0.37	0.69
Days higher than 182	-0.46	0.63

To illustrate the application of the block per diem approach, Table 2 shows the calculation of the total PPS payment for a patient whose fully-adjusted per diem payment for the first two days of care equal the standardized amount of $617.17, and who has a length of stay of 12 days, the average of all patients in the database. The total PPS payment for the hospital would be $6,205.

Table 2. Illustration of Block Per Diem Calculation

	Day												Total
	1	2	3	4	5	6	7	8	9	10	11	12	Pmt.
Fully-adjusted per diem payment	617	617	617	617	617	617	617	617	617	617	617	617	
Discount factor	1.00	1.00	0.84	0.84	0.84	0.84	0.84	0.77	0.77	0.77	0.77	0.77	
Final per diem payment	617	617	517	517	517	517	517	478	478	478	478	478	6,205

Step 2. Even though the model was specified using total costs and total days, aggregate payments were calculated by applying the fully adjusted payment to the number of *covered* days per case. Covered days are capped at 190 days in freestanding hospitals, but are not capped in psychiatric units within general hospitals.

Step 3. Once the aggregate payments were calculated, they were compared with current TEFRA payments for the cases in the model,[1] and a budget neutrality factor was determined to equate total PPS payments with total TEFRA payments. This budget neutrality factor was applied to the standardized amount. The intercept of the model was 6.46, yielding an antilog, or standardized amount, of $638.64 for each of the first two days of the stay. The discount factor required for budget neutrality was about .97, so that the final standardized amount was $617.17.

[1] Current TEFRA payments for each case were calculated by first deriving TEFRA operating and capital payments per day from the 1998 Medicare Cost Reports and then multiplying the per diem payments by the number of covered days for each case. No adjustments were made to the 1998 TEFRA payments to account for changes in TEFRA payment policy enacted after 1998, such as the wage adjustment of the 75th percentile target amounts.

Table 3 summarizes the PPS model for units and freestanding non-government hospitals.

Table 3. Inpatient Psychiatric PPS Model for Units and Freestanding Non-government Hospitals

Risk Factors		Model Output	
		Logs	Antilogs
Intercept = Standardized Amount		6.46	$638.64
Standardized Amount Adjusted by Budget Neutrality Factor		0.97	$617.17
Location	Rural	0.16	1.17
	Alaska facilities	0.22	1.25
	Puerto Rico facilities	-0.53	0.59
Hospital Adjustments	Log of area wage index	0.49	1.63
	Log of (1+ ratio of interns and residents to beds)	0.41	1.50
	Log of (1+ (disproportionate patient percentage - average))	-0.34	0.71
Demographics	Over Age 65	0.08	1.08
	Female	0.03	1.03
Principal Diagnosis (Psychiatric and Substance Abuse DRGs)	424 OR procedures w principal diagnoses of mental illness	0.23	1.26
	425 Acute adjustment reaction & disturbances of psychosocial dysfunction	0.06	1.06
	426 Depressive neuroses	0.02	1.02
	427 Neuroses except depressive	0.02	1.02
	428 Disorders of personality & impulse control	0.04	1.05
	429 Organic disturbances & mental retardation	0.01	1.01
	431 Childhood mental disorders	0.00	1.00
	432 Other mental disorder diagnoses	0.09	1.09
	433 Alc/drug abuse or dependence, left AMA	-0.05	0.95
	434 Alc/drug abuse or dependence, detox or oth sympt treat w CC	0.02	1.02
	435 Alc/drug abuse or dependence, detox or oth sympt treat w/out CC	-0.07	0.94
	436 Alc/drug dependence w rehab therapy	0.00	1.00
	437 Alc/drug depen, combined rehab & detox therapy	0.06	1.06
Secondary Diagnoses (Comorbidity Etiologies)	Autoimmune/antigens/allergens	0.07	1.07
	Congenital	0.05	1.05
	Degenerative	0.07	1.07
	Drug/alcohol	0.02	1.02
	Infectious	0.08	1.08
	Medical care	0.13	1.14
	Nutritional/endocrine/metabolic	0.08	1.08
	Oncologic	0.08	1.09
	Psychiatric	0.01	1.01
	Reproductive	0.00	1.00
	Traumatic	0.09	1.10
	Unknown etiology	0.07	1.08
Discount Factors for Block Per Diem Payments			
Length of Stay	Between 3 and 7 Days	-0.18	0.84
	Between 8 and 14 Days	-0.26	0.77
	Between 15 and 91 Days	-0.30	0.74
	Between 92 and 182 Days	-0.37	0.69
	More than 182 days	-0.46	0.63

Fiscal Impact

The database included 1,619 facilities representing $2.763 billion in inpatient psychiatric costs and $2.677 billion in TEFRA payments, for a starting cost margin of –3.1%. The PPS model would redistribute $264 million, or 10% of current payments. The redistribution is shown in Table 4. The section that stratifies the fiscal impact by the facilities' capital share of total cost is the most revealing. The biggest losers would be those in the high-cost phase of their capital cycle. These hospitals do not necessarily have the highest per diem costs, just the highest capital share of total cost.

Table 4. Fiscal Impact of Inpatient Psychiatric PPS Model

	# of Providers	Payment Change		# of Providers	Payment Change
Hospitals	308	10.9%	Teaching	580	-1.4%
Units	1,311	-3.2%	Non-Teaching	1,039	1.1%
Large Urban	763	1.2%	Voluntary	947	-1.0%
Other Urban	478	-3.0%	Proprietary	456	3.8%
Rural	378	0.3%	Government	216	-4.8%
New England	86	-0.8%	Capital share >= 32%	6	-47.1%
Middle Atlantic	249	9.5%	27% =< Capital share < 32%	13	-27.9%
South Atlantic	237	4.9%	21% =< Capital share < 27%	44	-10.2%
East North Central	293	-1.9%	16% =< Capital share < 21%	160	-7.7%
East South Central	141	0.3%	11% =< Capital share < 16%	437	-2.1%
West North Central	136	-4.2%	6% =< Capital share < 11%	705	3.4%
West South Central	218	-15.0%	Capital share < 6%	254	4.9%
Mountain	88	-1.9%			
Pacific	168	-2.0%			
Puerto Rico	3	-3.9%			

Note: The TEFRA payments used in the fiscal impact analysis reflect 1998 payment policy with no adjustments to account for subsequent changes. A fiscal impact analysis based on 2001 TEFRA payment policy would show smaller gains for hospitals in the Middle Atlantic region and smaller losses for hospitals in the West South Central region because the wage adjustment of the 75th percentile target amount, which took effect in 2000, increased payments for hospitals in the Middle Atlantic region and decreased payments for hospitals in the West South Central region, thus reducing the gap between their TEFRA payments and PPS payments.

Table 5 further illustrates that including capital in the PPS drives the fiscal impact for most hospitals more than any particular characteristic of the hospitals or their patients. The first column of numbers repeats the fiscal impact of the PPS as shown in Table 4. The second column shows the fiscal impact if the operating portion of the payment were based on the PPS but the capital portion continued to reflect TEFRA policy, i.e., cost minus 15%. Simply keeping capital on cost-based reimbursement would significantly reduce the payment change for all categories of hospitals. The third column of Table 5 shows the fiscal impact if the operating portion of the payment continued to reflect

TEFRA policy but the capital portion were based on the PPS. This shows that most of the payment change is attributable to changing payment policy for capital costs.

Table 5. Illustration That Including Capital in the PPS Determines the Fiscal Impact More Than Other Aspects of the PPS

	Payment Change		
Facility-specific Capital Share	100% PPS	If Operating Were PPS and Capital Were TEFRA	If Operating Were TEFRA and Capital Were PPS
Capital share >= 32%	-47.1%	-17.4%	-29.7%
27% =< Capital share < 32%	-27.9%	-8.0%	-19.8%
21% =< Capital share < 27%	-10.2%	2.7%	-12.9%
16% =< Capital share < 21%	-7.7%	-0.7%	-7.0%
11% =< Capital share < 16%	-2.1%	0.1%	-2.1%
6% =< Capital share < 11%	3.4%	0.8%	2.6%
Capital share < 6%	4.9%	-1.3%	6.2%

Transition

Because the losses are largely caused by including capital costs in the PPS, the study group recommends that CMS provide a longer transition into the capital portion of the PPS than into the operating portion of the PPS. CMS should do this by first splitting the PPS payment between operating and capital payments by assigning roughly 10% of total PPS payments to capital, the current capital share of total TEFRA inpatient psychiatric payments. Then CMS should provide a three-year transition into the PPS for operating payments during which Year 1 payments would be a blend of 2/3 TEFRA operating payments and 1/3 PPS operating payments, and Year 2 payments would be a blend of 1/3 TEFRA operating payments and 2/3 PPS operating payments. Year 3 payments would be 100% PPS operating payments. In addition, CMS should provide a ten-year transition into the PPS for capital payments, with Year 1 payments being a blend of 90% TEFRA capital payments and 10% PPS capital payments, etc., until Year 10, in which all payments would be 100% PPS. The elongated transition for capital payments would provide significant relief to high capital hospitals. The entire transition is budget neutral.

Conclusion

The study group believes that the PPS model that it developed from administrative data embodies the APA's principles and is adequate to the task of satisfying the BBRA mandate for a per diem inpatient psychiatric PPS based on a patient classification system. Furthermore, the group believes that the transition schedule it proposes is appropriate to mitigate the losses for hospitals in a budget neutral way.

Appendix A. Comorbidities

The inpatient psychiatric prospective payment system (PPS) model developed by the American Psychiatric Association (APA) and The Health Economics and Outcomes Research Institute (THEORI) is based upon a regression analysis that uses co-morbid conditions as independent variables. Out of 387,209 cases included in the regression model, 62% had no comorbidities, while 38% had at least one. Table 1 shows the frequency with which hospitals coded comorbidities for inpatient psychiatric and substance abuse cases in the 1998 MedPAR file.

Table 1. Frequency of Coding Co-Morbid Conditions

Number of Comorbidites	Patients Having Each Number of Comorbidities	
	Number	Percentage
0	240,034	62%
1	102,864	27%
2	30,738	8%
3	9,689	3%
4	2,866	1%
5	760	0%
6	206	0%
7	46	0%
8	6	0%
Total	387,209	100%

Table 2 shows the most frequently coded secondary diagnoses for patients with a principal diagnosis of psychiatric or substance abuse illness. Several of these diagnoses pertain to heart conditions.

Table 2. Most Frequently Coded Comorbidities

496 CHR AIRWAY OBSTRUCT NEC	22,667		2768 HYPOPOTASSEMIA	3,693
4280 CONGESTIVE HEART FAILURE	13,747		2639 PROTEIN-CAL MALNUTR NOS	3,367
30390 ALCOH DEP NEC/NOS-UNSPEC	11,139		30560 COCAINE ABUSE-UNSPEC	3,104
42731 ATRIAL FIBRILLATION	8,687		78830 URINARY INCONTINENCE NOS	2,933
25001 DMI WO CMP NT ST UNCNTRL	7,213		4139 ANGINA PECTORIS NEC/NOS	2,652
30500 ALCOHOL ABUSE-UNSPEC	6,926		4928 EMPHYSEMA NEC	2,452
30391 ALCOH DEP NEC/NOS-CONTIN	6,185		7801 HALLUCINATIONS	2,360
30590 DRUG ABUSE NEC-UNSPEC	4,358		4240 MITRAL VALVE DISORDER	2,312
2761 HYPOSMOLALITY	3,877		2662 B-COMPLEX DEFIC NEC	2,130
2765 HYPOVOLEMIA	3,702		30420 COCAINE DEPEND-UNSPEC	2,018

The way in which THEORI uses comorbidities is to classify them by etiology and then to use the count of each case's comorbidities in each etiology as risk factors. The following is a description of the each of the etiology categories, along with the five most frequently coded secondary diagnoses in each category for the inpatient psychiatric and substance abuse patients in the psychiatric PPS model.

Autoimmune, antigens, and allergens. Conditions that result from autoimmune disorders or allergic reactions. Examples include thrombocytopenia not otherwise specified (NOS), lupus erythematosus, autoimmune hemolytic anemia, aplastic anemia, and polymyositis.

49320 CH OB ASTH W/O STAT ASTH	1,724
2875 THROMBOCYTOPENIA NOS	1,227
7100 SYST LUPUS ERYTHEMATOSUS	699
2848 APLASTIC ANEMIAS NEC	438
2874 SECOND THROMBOCYTOPENIA	259
135 SARCOIDOSIS	249

Congenital. Conditions that are inborn or that develop in the perinatal period. Some are specific to newborns, such as neonatal jaundice, while others are relevant to all patients of any age, such as hemophilia. Other examples include respiratory distress syndrome, ventricular septal defect and cystic fibrosis.

3182 PROFOUND MENTAL RETARDAT	136
2824 THALASSEMIAS	114
2873 PRIMARY THROMBOCYTOPENIA	114
3591 HERED PROG MUSC DYSTRPHY	110
28260 SICKLE-CELL ANEMIA NOS	98

Degenerative. Conditions of gradual or abrupt organ or tissue failure generally associated with aging. Examples include congestive heart failure, chronic obstructive pulmonary disease, angina and chronic renal failure.

496 CHR AIRWAY OBSTRUCT NEC	22,667
4280 CONGESTIVE HEART FAILURE	13,747
42731 ATRIAL FIBRILLATION	8,687
4139 ANGINA PECTORIS NEC/NOS	2,652
4928 EMPHYSEMA NEC	2,452

Drug and alcohol abuse. Secondary diagnoses resulting from the use of alcohol or illegal drugs. Examples include alcohol dependence, opioid dependence, alcoholic cirrhosis of the liver, delirium tremens and drug withdrawal syndrome.

30390 ALCOH DEP NEC/NOS-UNSPEC	11,139
30500 ALCOHOL ABUSE-UNSPEC	6,926
30391 ALCOH DEP NEC/NOS-CONTIN	6,185
30590 DRUG ABUSE NEC-UNSPEC	4,358
30560 COCAINE ABUSE-UNSPEC	3,104

Infectious. Conditions caused by pathogenic microorganisms or inflammatory processes in the body. Examples include HIV disease, cellulitis, hepatitis and candidiasis.

042 HUMAN IMMUNO VIRUS DIS	1,970
49121 OBS CHR BRNC W ACT EXA	1,535
6826 CELLULITIS OF LEG	1,079
07051 HPT C ACUTE WO HPAT COMA	938
07054 CHRNC HPT C WO HPAT COMA	801

Medical care. Conditions arising as a result of previous medical care or other patient status conditions that impact medical care. Examples include agranulocytosis (often a result of chemotherapy) and indicators that a patient had a major organ transplant.

2880 AGRANULOCYTOSIS	650
V451 RENAL DIALYSIS STATUS	365
V420 KIDNEY TRANSPLANT STATUS	184
72283 POSTLAMINECT SYND-LUMBAR	97
V422 HEART VALVE TRANSPLANT	81

Nutritional, endocrine, and metabolic. Conditions caused by under- or over-consumption of nourishment (excludes poisonings), endocrine or metabolic problems. Examples include hypovolemia, acidosis, diabetes mellitus, hypopotassemia and pernicious anemia.

25001 DMI WO CMP NT ST UNCNTRL	7,213
2761 HYPOSMOLALITY	3,877
2765 HYPOVOLEMIA	3,702
2768 HYPOPOTASSEMIA	3,693
2639 PROTEIN-CAL MALNUTR NOS	3,367

Oncologic. Conditions related to primary or secondary malignant neoplasms. Examples include malignant neoplasm of the liver, bone or lymph nodes, leukemia and lymphoma.

73313 PATH FX VERTEBRAE	806
1629 MAL NEO BRONCH/LUNG NOS	391
1985 SECONDARY MALIG NEO BONE	316
61172 LUMP OR MASS IN BREAST	232
20410 CHR LYM LEUK W/O RMSION	220

Psychiatric. Secondary diagnoses related to mental disorders. Examples include schizophrenia, major depressive disorder, bipolar affective disorder, and anorexia nervosa.

7801 HALLUCINATIONS	2,360
29383 ORGANIC AFFECTIVE SYND	1,404
29633 RECUR DEPR PSYCH-SEVERE	763
29570 SCHIZOAFFECTIVE-UNSPEC	553
3071 ANOREXIA NERVOSA	472

Reproductive. Secondary diagnoses indicating a woman was pregnant at the time of or shortly before admission. Examples include various delivery codes (with or without problems), antepartum anemia, and supervision of high-risk pregnancy. This etiology was not statistically significant in the psychiatric PPS model.

64843 MENTAL DISORDER-ANTEPART	53
64844 MENTAL DISORDER-POSTPART	22
64833 DRUG DEPENDENCE-ANTEPART	10
64823 ANEMIA-ANTEPARTUM	8
64893 OTH CURR COND-ANTEPARTUM	6

Traumatic. Conditions arising from physical injury, poisoning or exposure to harmful substances. Examples include traumatic pneumothorax, concussion, and open wounds.

8208 FX NECK OF FEMUR NOS-CL	224
82021 INTERTROCHANTERIC FX-CL	138
8054 FX LUMBAR VERTEBRA-CLOSE	127
8082 FRACTURE OF PUBIS-CLOSED	110
8052 FX DORSAL VERTEBRA-CLOSE	103

Unknown etiology. Miscellaneous conditions for which the etiology is unknown. Examples include hematuria, hydroureter, or ascites.

78830 URINARY INCONTINENCE NOS	2,933
5997 HEMATURIA	1,249
5789 GASTROINTEST HEMORR NOS	530
7994 CACHEXIA	386
5781 BLOOD IN STOOL	295

Finally, Table 3 shows the frequency of coding co-morbid conditions by etiology.

Table 3. Frequency of Coding Co-morbid Conditions by Etiology

Comorbidity Etiology	0 Comorbidities		1 Comorbidity		2 or More Comorbidities	
	# of Patients	% of Patients	# of Patients	% of Patients	# of Patients	% of Patients
Autoimmune/Antigens/Allergens	381,857	98.6%	5,262	1.4%	90	0.0%
Congenital	386,110	99.7%	1,094	0.3%	5	0.0%
Degenerative	325,954	84.2%	47,469	12.3%	13,786	3.6%
Drug/alcohol	334,376	86.4%	51,976	13.4%	857	0.2%
Infectious	376,525	97.2%	10,165	2.6%	519	0.1%
Medical Care	385,629	99.6%	1,563	0.4%	17	0.0%
Nutritional/Endocrine/Metabolic	353,892	91.4%	30,236	7.8%	3,081	0.8%
Oncologic	383,451	99.0%	3,350	0.9%	408	0.1%
Psychiatric	378,635	97.8%	8,530	2.2%	44	0.0%
Reproductive	387,096	100.0%	91	0.0%	22	0.0%
Traumatic	385,579	99.6%	1,566	0.4%	64	0.0%
Unknown	380,334	98.2%	6,745	1.7%	130	0.0%