Medicare hospital outpatient services and costs: Implications for prospective payment

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Medicare expenditures of hospital outpatient department (HOPD) services are growing rapidly, prompting congressional interest in a prospective payment system. In this article, the authors identify frequently provided services and examine service volume and charges in the HOPD. Relatively few services drive Medicare HOPD spending, and volume is dominated by visits, imaging and laboratory tests, whereas surgery accounts for a large proportion of charges. Hospital-level variations in charges, costs, case mix, and outliers are also explored. There is substantial variation in charges and costs across hospital types. However, after case-mix adjustment, all hospital types have average costs within 6 percent of the national average.

Introduction

Congress has mandated the development of a Medicare prospective payment system (PPS) for HOPD services. In this article, we present a descriptive analysis of Medicare HOPD services, including analysis of the procedures most frequently provided to Medicare beneficiaries, the types of services that account for HOPD volume and spending, and variations in charges, costs, and case mix by hospital type.

Although movement toward the outpatient setting began in the late 1970s, more recently there has been unprecedented growth in outpatient services generally, and HOPD services specifically. Perhaps the most important force behind this growth is the technological advances allowing procedures to be performed outside the inpatient setting. However, the implementation of the Medicare inpatient PPS in 1983 appears to have added momentum to this process.

The growth in HOPD services is reflected in changes in hospital organization, utilization, and revenues. In 1981, 41 percent of hospitals had organized outpatient departments, compared with 69 percent by 1987 (Prospective Payment Assessment Commission, 1990). In the 5 years preceding implementation of the inpatient PPS (1979-83), the number of outpatient visits in all community hospitals increased by about 6 percent. In the 5 years following PPS implementation (1984-88), outpatient visits in these same hospitals increased 27 percent (American Hospital Association, 1990). The Prospective Payment Assessment Commission (ProPAC) reports that hospitals received 12 percent of their revenues from outpatient services in 1979, compared with 21 percent in 1989 (Prospective Payment Assessment Commission, 1990).

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The rapid growth in HOPD services for all patients is mirrored by Medicare's experience. HOPD services are the fastest growing Medicare service. The Health Care Financing Administration (HCFA) Office of the Actuary estimates that in 1980 inpatient hospital services accounted for 66 percent of total Medicare payments, compared with HOPD services, which accounted for 5 percent. By 1989, inpatient hospital services accounted for 54 percent of total Medicare payments, and HOPD services accounted for 8 percent of the total (Prospective Payment Assessment Commission, 1990). The average annual increase in Medicare inpatient payments from 1983 through 1986 was 6 percent; during the same period, Medicare HOPD payments grew at an average annual rate of 17 percent. The success of the inpatient PPS and the continuing high growth rate of Medicare HOPD expenditures have spurred interest in an outpatient PPS.

Data

The data base constructed for this analysis comes from two primary sources, the Hospital Outpatient Bill (HOP) file and the Part B Medicare Annual Data (BMAD) file. The HOP file contains facility bills, and the BMAD file reports Part B (primarily physician) bills. Both files are random 5-percent samples of beneficiaries in calendar year 1987. (The BMAD file contains 100 percent of claims for end stage renal disease beneficiaries.) These two files were merged on the basis of beneficiary identification number and date of service. That is, for a given beneficiary on a given date of service, the file contains HOPD facility bills and related physician bills.

The reason for merging these data bases is to correct coding deficiencies in the 1987 HOP file. Hospitals reconcile with HCFA at the end of the year at the facility level, which is why precision at the claims level, particularly in 1987, is lacking. HCFA has been moving toward use of the HCFA Common Procedure Coding System (HCPCS), which incorporates the full range of Current Procedural Terminology, 4th Edition (CPT-4) (American Medical Association, 1987) codes as well as

HCFA-created codes.[1] As a result of coding changes taking place at different points in 1987, there are three coding deficiencies in the HOP file: Many procedures (particularly medicine) are not HCPCS-coded at all, certain surgery claims have ICD-9-CM procedure codes only, and radiology, laboratory, and pathology claims are HCPCS-coded for only part of the year. (ICD-9-CM is the *International Classification of Diseases, 9th Revision, Clinical Modification* [Public Health Service and Health Care Financing Administration, 1981].) In contrast, the BMAD file contains complete HCPCS coding. A merged HOP-BMAD file allows us to use HCPCS procedure codes from the BMAD file to correct HOP file coding deficiencies.

There are a total of 1,993,246 claims in the 1987 HOP file. BMAD claims are composed of line items representing different services. Screening records (e.g., for duplicates, invalid dates of service, zero-charge claims) and merging the HOP and BMAD files results in 1.2 million HOP claims linked with 2.5 million BMAD line items for about 545,000 beneficiaries. If one makes the assumption that the HCPCS code reported on the associated physician bill approximates the missing code on the HOP claim, HCPCS codes from the physician bill can be used to fill in missing codes on the HOP claim. HOP claims are generally linked to few physician line items: 51 percent of HOP claims are linked to one BMAD line item; another 25 percent are linked to two BMAD line items.

An additional deficiency of the HOP data was also addressed. A claim in the 1987 HOP file usually has a total charge and the components of that total charge are apportioned across (up to 28) revenue centers (e.g., operating room, recovery room). The crux of the problem in working with the HOP file is that an HCPCS code is almost never associated with the component charges. This occurs in the 1987 HOP file because, as already noted, hospitals were not required to allocate many charges by procedure code.

There is no clear methodology to retrospectively assign HCPCS codes to individual charges where there is more than one component charge. (For payment purposes, HCFA does not retroactively assign HCPCS codes to charges because, as noted, settlement occurs at the facility level.) About 45 percent of HOP claims,however, report the total charge and only one HCPCS code (referred to as single-service claims). Thus, we conduct the following analysis using claims with only one HCPCS code. Selecting single-service claims only results in 545,651 claims for about 300,000 beneficiaries.

The reliance on claims that report one service and one charge is the weakness of this analysis. Single-service claims may be peculiar to certain types of patients and hospitals. This weakness will persist in analyses of Medicare HOPD services until more complete coding requirements are made and enforced. Since 1987, HCFA has required more complete coding of services, although medicine services (e.g., emergency department visits, routine visits, electrocardiograms) were still not required to be reported prior to October 16, 1992. The following analysis should be replicated with more recent data or a sample of completely coded claims. One final point regarding the use of single-service claims: In the complete sample, claims for surgery services are overwhelmingly (94 percent) single-service claims. Thus, the potential bias of using single-service claims does not pertain where surgery services are concerned.

Data trimming

Before proceeding to the analysis, the data were trimmed to remove extreme values. Trimming is undertaken because extremely high- or low-value data probably represent anomalies in the distribution. We generally followed the same trimming rules used for the recalibration of inpatient PPS weights. Under the inpatient PPS system, extreme data are eliminated from further analysis at three standard deviations from the geometric mean for a given diagnosis-related group (DRG). For the reasons already given, HOP charges on a claim-by-claim basis can be quite extreme.

The objectives of data trimming were to remove extreme values at both ends of the distribution and lower the coefficient of variation (CV) for a given procedure, without an unacceptable loss of cases. The process was to compare untrimmed and trimmed charges using various trimming points for the entire distribution of charges and for selected high-volume procedure charges in order to decide where to trim the data.

The PPS three-standard-deviation rule was rejected because it only eliminates approximately 1 percent of cases and frequently fails to trim one end of the distribution or the other on a procedure-by-procedure basis. Instead, we chose to trim the data at two standard deviations from the geometric mean (i.e., using a log normal distribution). Trimming at two standard deviations eliminates approximately 5 percent (26,525) of claims, reducing the number of claims available for analysis to 519,126. This trimming decision reduces procedure CVs and eliminates high- and low-charge claims without an unacceptable loss of claims.

Hospital characteristics

The objective of this analysis is to explore HOPD services. Because the HOP file contains claims for providers other than HOPDs (e.g., freestanding dialysis facilities), the next step was to link claims with their appropriate hospitals on the basis of provider identification. Hospital data were obtained from four files: the Medicare Hospital Cost Report Information System (HCRIS), the Provider Specific file, the American Hospital Association (AHA) 1987 Annual Survey file, and the HCFA wage-index file. This linkage allows us to identify hospital claims, to calculate costs using hospital cost-to-charge ratios (from HCRIS), to determine wage-adjusted costs (using the wage-index file), and to compare relevant HOPD costs, charges, etc., by different hospital types (e.g., teaching versus

[1]Using HCPCS codes, one can classify HOPD services into four broad categories: surgery, radiology, laboratory and pathology, and medicine (e.g., visits, electrocardiograms, dialysis).

non-teaching region). The nine census divisions are used to define our nine regions. Linking claims to hospital-level data results in the loss of 49,140 claims because claims for facilities other than HOPDs are included in the HOP file, and because of incomplete information across the four hospital-level files.

High-volume services

Table 1 presents the distribution of HOPD claims and charges by HCPCS group. Surgery services have the smallest share of claims (10.6 percent) but more than one-quarter of HOPD charges (26.7 percent). Conversely, laboratory-pathology services account for 23.8 percent of claims but only 14.4 percent of charges. Radiology services account for 34.3 percent of claims and 39.3 percent of charges, and medicine claims account for 31.3 percent of claims and 19.7 percent of charges. Surgery claims have the highest average charge ($408.63), but average charges for radiology ($185.40), laboratory-pathology ($97.31), and medicine ($101.60) claims all range from nearly $100 to nearly $200.

Table 2 presents the distribution of claims and charges by Medicare eligibility status. Aged Medicare beneficiaries, with an average charge of $161.17, account for the majority of HOPD claims and charges, 87.3 and 87.0 percent, respectively. Disabled beneficiaries have a lower average charge ($118.29) and account for 11.4 percent of claims and about 8.3 percent of charges. Finally, beneficiaries with chronic renal disease (CRD) account for only 1.4 percent of claims, but 4.7 percent of charges, and have an average charge of $557.10.

Table 3 summarizes the percentage of all claims and charges accounted for by the 40 most frequently provided services. These 40 services account for 46 percent of all charges and 53 percent of all claims. Surgery procedures among these 40 services account for 13 percent of all HOPD charges, with only 3 percent of all claims. Radiology procedures account for the second-greatest proportion of charges (20 percent), with 19 percent of claims.

Table 4 examines the 40 highest volume procedures in greater detail. The single most frequently provided Medicare service in the HOPD is mammography (HCPCS 76091), which accounts for 4.93 percent of all claims, 2.28 percent of all charges, and has an average charge of $74.86. The five services with the highest volume are two radiology (mammography and chest X-ray) procedures, two routine visits (established patient, limited and intermediate service) and one emergency department visit (new patient, limited service). These five procedures together account for 17.99 percent of claims and 7.55 percent of charges. The average charges for the 40 high-volume procedures range from a low of $17.76 (HCPCS 85610, prothrombin test) to a high of $1,691.46 (HCPCS 66984, one-stage cataract removal and lens insertion).

The three high-volume surgery procedures (two endoscopic procedures and a cataract procedure) account for few claims (2.46 percent) but a large percentage of all charges (12.76 percent). One cataract surgery procedure (HCPCS 66984) alone accounts for 10.24 percent of all HOPD charges, with 0.98 percent of claims. Thirteen high-volume radiology procedures (computerized axial tomography [CAT] scans, routine chest X-rays, gastrointestinal radiology examinations, mammography, bone imaging, and therapeutic radiation treatments) account for 18.89 percent of all

Table 1

Percentage of all hospital outpatient department claims and charges accounted for, by HCPCS categories: 1987

Category	Number of claims	Percentage of claims	Percentage of charges	Average charge[1]
Total	469,986	100.0	100.0	$161.72
Surgery	49,581	10.6	26.7	408.63
Radiology	161,240	34.3	39.3	185.40
Laboratory-pathology	112,063	23.8	14.4	97.31
Medicine	147,102	31.3	19.7	101.60

[1]All averages are claims-weighted.

NOTES: HCPCS is Health Care Financing Administration Common Procedure Coding System. Percentage columns may not add to totals shown because of rounding.

SOURCES: Health Care Financing Administration: Hospital Outpatient Bill file and Part B Medicare Annual Data file, both 1987; data development by the Urban Institute.

Table 2

Percentage of all hospital outpatient department claims and charges accounted for, by Medicare status: 1987

Beneficiary status	Number of claims	Percentage of claims	Percentage of charges	Average charge[1]
Total	469,986	100.0	100.0	$161.72
Aged without chronic renal disease	410,128	87.3	87.0	161.17
Disabled without chronic renal disease	53,418	11.4	8.3	118.29
All with chronic renal disease	6,440	1.4	4.7	557.10

[1]All averages are claims-weighted.

NOTE: Percentage columns may not add to totals shown because of rounding.

SOURCES: Health Care Financing Administration: Hospital Outpatient Bill file and Part B Medicare Annual Data file, both 1987; data development by the Urban Institute.

Table 3

Percentage of all hospital outpatient department claims and charges accounted for, by the 40 most frequently provided procedures: 1987

Category	Claims	Charges
	Percent	
Total	53	46
Surgery	3	13
Radiology	19	20
Pathology-laboratory	11	4
Medicine	20	9

SOURCES: Health Care Financing Administration: Hospital Outpatient Bill file and Part B Medicare Annual Data file, both 1987; data development by the Urban Institute.

Table 4

Forty most frequently provided hospital outpatient department procedures, ranked by HCPCS code: 1987

HCPCS code and description	Number of claims	Percent of all claims[1]	Average charge[2]	Percent of all charges[3]
Surgery				
45330 Sigmoidoscopy, flexible fiberoptic diagnostic	4,547	0.97	266.79	1.60
45378 Colonoscopy, fiberoptic	2,382	0.51	292.95	0.92
66984 Extracapsular cataract removal with insertion of intraocular lens prosthesis (one-stage procedure)	4,601	0.98	1,691.46	10.24
Radiology				
70450 Computerized axial tomography, head or brain	2,424	0.52	319.06	1.02
70470 Computerized axial tomography, head or brain without contrast material, followed	5,807	1.24	420.26	3.21
71020 Radiologic examination, chest, two views, frontal and lateral	19,382	4.12	56.10	1.43
74160 Computerized axial tomography, abdomen with contrast material(s)	3,526	0.75	436.74	2.03
74240 Radiologic examination, gastrointestinal tract	4,651	0.99	111.16	0.68
74270 Radiologic examination, colon barium enema	7,873	1.68	115.42	1.20
74280 Radiologic examination, colon air contrast with specific high-density barium	4,217	0.90	144.71	0.80
74400 Urography (pyelography), intravenous	2,759	0.59	133.64	0.49
76091 Mammography bilateral	23,157	4.93	74.86	2.28
76700 Echography, abdominal, b-scan and/or real-time with image documentation	3,463	0.74	144.65	0.66
77405 Daily megavoltage treatment management intermediate	2,664	0.57	556.86	1.95
77410 Daily megavoltage treatment management complex	2,494	0.53	568.99	1.87
78306 Bone imaging whole body	6,247	1.33	268.51	2.21
Laboratory-pathology				
80002 Automated multichannel test 1 or 2 clinical chemistry test(s)	3,574	0.76	53.45	0.25
80019 Automated multichannel test 19 or more clinical chemistry tests	3,643	0.78	60.59	0.29
81000 Urinalysis routine (Ph, specific gravity, protein)	8,000	1.70	71.71	0.75
82947 Glucose except urine (e.g., blood, spinal fluid, joint fluid)	8,325	1.77	26.53	0.29
84132 Potassium blood	2,410	0.51	31.00	0.10
85022 Blood count hemogram, automated, and manual differential	4,590	0.98	118.97	0.72
85028 Blood count	3,079	0.66	139.69	0.57
85610 Prothrombin time	9,174	1.95	17.76	0.21
88150 Cytopathology, smears, cervical or vaginal (e.g., Papanicolaou), up to three smears	2,839	0.60	20.73	0.08
88304 Surgical pathology, gross and microscopic examination of presumptively abnormal tissue(s)	4,254	0.91	85.47	0.48

See footnotes at end of table.

claims and 19.83 percent of all charges. Ten high-volume laboratory-pathology procedures (automated multichannel tests, urinalysis, various blood tests and counts, prothrombin tests, Pap smears, and surgical pathology) account for about 10.62 percent of claims but only 3.74 percent of charges. Fourteen high-volume medicine procedures (routine visits, emergency department visits, and electrocardiograms) account for 19.93 percent of all claims and 9.01 percent of all charges.

We also examined the 40 most frequently provided services within each of the four HCPCS categories. As shown in Table 5, the 40 highest volume surgery procedures account for 8 percent of all HOPD claims and 20 percent of all HOPD charges. Within the surgery category, these 40 surgery procedures account for 72 percent of surgery claims and 75 percent of surgery charges. The 40 highest volume surgery procedures are dominated by cataract-lens procedures, other eye procedures, and endoscopic procedures. Cataract-lens procedures and other eye procedures account for 22 percent of surgery claims and 48 percent of surgery charges. Frequently provided endoscopy procedures account for about 27 percent of surgery claims and 18 percent of surgery charges.

The 40 highest volume radiology procedures account for 27 percent of all claims, 30 percent of all charges, 80 percent of radiology claims, and 75 percent of radiology charges. CAT scan procedures account for only 4 percent of radiology claims, but 27 percent of radiology charges. Similarly, daily radiation treatment procedures account for only 4 percent of claims and 12 percent of radiology charges. Other radiology procedures (data not shown) accounting for significant proportions of all radiology charges include: radiological examinations of the gastrointestinal tract (9 percent), mammographies (6 percent), bone imaging (7 percent), sonography procedures (3 percent), and routine chest X-rays (4 percent).

Table 4—Continued

Forty most frequently provided hospital outpatient department procedures, ranked by HCPCS code: 1987

HCPCS code and description	Number of claims	Percent of all claims[1]	Average charge[2]	Percent of all charges[3]
Medicine				
90040 Office medical service, established patient brief service	6,308	1.34	51.18	0.42
90050 Office medical service, established patient limited service	15,664	3.33	71.47	1.47
90060 Office medical service, established patient intermediate service	13,141	2.80	80.00	1.38
90070 Office medical service, established patient extended service	2,594	0.55	93.94	0.32
90500 Emergency department service, new patient minimal service	2,746	0.58	42.78	0.15
90505 Emergency department service, new patient brief service	8,535	1.82	47.52	0.53
90510 Emergency department service, new patient limited service	13,200	2.81	57.09	0.99
90515 Emergency department service, new patient intermediate service	7,755	1.65	74.54	0.76
90540 Emergency department service, established patient brief service	3,265	0.69	36.89	0.16
90550 Emergency department service, established patient limited service	5,012	1.07	43.16	0.28
90560 Emergency department service, established patient intermediate service	4,417	0.94	45.75	0.27
93010 Electrocardiogram, routine with at least 12 leads interpretation and report only	4,512	0.96	88.95	0.53
93018 Cardiovascular stress test using maximal or submaximal treadmill or bicycle exercise	3,134	0.67	180.33	0.74
93870 Non-invasive studies of carotid arteries, imaging (e.g., flow imaging by ultrasonic arteriography, high resolution)	3,371	0.72	227.34	1.01

[1]These 40 procedures account for 52 percent of all claims.
[2]All averages are claims-weighted.
[3]These 40 procedures account for 45 percent of all charges.

NOTE: HCPCS is Health Care Financing Administration Common Procedure Coding System.

SOURCES: Health Care Financing Administration: Hospital Outpatient Bill file and Part B Medicare Annual Data file, both 1987; data development by the Urban Institute.

The 40 highest volume laboratory-pathology procedures account for 77 percent of laboratory-pathology claims and 65 percent of laboratory-pathology charges. Among these high-volume laboratory-pathology procedures, certain sets of related procedures account for significant proportions of total charges. Blood-count tests account for only 3 percent of claims but 21 percent of laboratory-pathology charges. Automated multichannel tests account for 4 percent of claims and 12 percent of laboratory-pathology charges. Finally, surgical pathology procedures account for about 2 percent of claims and 10 percent of laboratory-pathology charges.

The 40 highest volume medicine services account for 84 percent of medicine claims and 68 percent of medicine charges. The most frequently rendered HOPD medicine service is a routine visit for an established patient receiving a limited level of care. This routine visit has an average charge of $71.47 and accounts for 11 percent of medicine claims and more than 7 percent of medicine charges. HOPD medicine service volume is overwhelmingly dominated by routine visits, which account for 29 percent of medicine claims, and emergency department visits, which account for another 34 percent of claims. Although dominating volume, routine and emergency department visits account for relatively smaller proportions of medicine charges, 21 and 18 percent, respectively.

These data indicate that a relatively small number of procedures drive Medicare HOPD spending. The 40 highest volume procedures within each HCPCS group (i.e., 160 procedures) account for 72 percent of all HOPD charges. Twelve of these high-volume procedures (HCPCS codes given) each account for significant (i.e., greater than 1 percent) HOPD charges:

- 45330 sigmoidoscopy (1.6 percent).
- 66984 single-stage cataract removal and lens insertion (10.2 percent).
- 70470 CAT scan, head or brain (3.2 percent).
- 71020 routine chest X-ray (1.4 percent).
- 74160 CAT scan, abdomen (2.0 percent).
- 74270 radiological examination, colon (1.2 percent).
- 76091 mammography (2.3 percent).
- 77405 daily radiation treatment, intermediate (2.0 percent).
- 77410 daily radiation treatment, complex (1.9 percent).
- 78306 bone imaging, whole body (2.2 percent).
- 90050 routine visit, established patient, limited (1.4 percent).
- 90060 routine visit, established patient, intermediate (1.4 percent).

The principle that a small number of procedures drives spending is most true of surgery and radiology and least true of laboratory-pathology services. High-volume radiology and medicine procedures account for

Table 5

Percentage of claims and charges accounted for, by the 40 most frequently performed procedures within each HCPCS group

HCPCS group	Claims	Charges
	Percent	
Surgery		
As percentage of all HOPD services	8	20
As percentage of all HOPD surgery services	72	75
Cataract and other eye procedures	22	48
Endoscopies	27	18
Radiology		
As percentage of all HOPD services	27	30
As percentage of all HOPD radiology services	80	75
Computerized axial tomography scans	4	27
Daily radiation treatments	4	12
Laboratory-pathology		
As percentage of all HOPD services	18	9
As percentage of all HOPD laboratory-pathology services	77	65
Blood count tests	3	21
Automated multichannel tests	4	12
Surgical pathology procedures	2	10
Medicine		
As percentage of all HOPD services	26	13
As percentage of all HOPD medicine services	84	68
Routine visits	29	21
Emergency department visits	34	18

NOTES: HOPD is hospital outpatient department. HCPCS is Health Care Financing Administration Common Procedure Coding System.

SOURCES: Health Care Financing Administration: Hospital Outpatient Bill file and Part B Medicare Annual Data file, both 1987; data development by the Urban Institute.

much of the aggregate HOPD volume (i.e., 53 percent of all HOPD claims). High-volume surgery procedures account for only 8 percent of HOPD claims, and high-volume laboratory-pathology procedures account for 18 percent of all HOPD claims.

Volume and charges

In the previous section, we examined individual procedures. In designing a policy, it is useful to have a complete picture of volume and spending in the HOPD. To obtain a complete picture, a typology that classifies the entire range of services into clinically meaningful groups (i.e., imaging, patient visits) is necessary. The existing Medicare type-of-service system is relatively simple and of limited application for research purposes (the major problem being that two categories—medical care and surgery—account for the majority of charges). To examine total HOPD volume and charges, we use a more useful classification scheme recently developed by Berenson and Holahan (1992).

Berenson and Holahan convened panels of physicians to categorize specific services into broad type-of-service categories based on HCPCS procedure codes. More than 7,000 HCPCS procedure codes were categorized into a new system of 21 type-of-service categories. The criteria used in development were completeness (i.e., all HCPCS codes were classified with little reliance on "other" categories) and category definitions that were mutually exclusive, clinically meaningful, stable over time, and relatively immune to changes in technology and practice patterns.

Berenson and Holahan's classification scheme includes four kinds of imaging services: standard imaging, advanced imaging (e.g., CAT scans, magnetic resonance imaging), sonographic imaging, and imaging involving a major procedure (e.g., cardiac catheterization). Medical services have been divided into office visits, hospital visits, home and nursing home visits, emergency department visits, specialist evaluation and management services, and consultations. Major surgery procedures have been divided into cardiovascular, orthopedic, and other. Ambulatory surgery procedures have been divided into those related to the eye and other. Minor procedures (e.g., skin biopsy and nail debridement), oncology (e.g., radiation treatment and chemotherapy injections), dialysis, and endoscopy services are classified separately. Laboratory tests and other tests (e.g., electrocardiography) comprise the final categories.

The Berenson-Holahan system was designed to categorize physician services in all settings. As a result, some of the categories include inpatient procedures making them less relevant to the HOPD, (e.g., major procedures). We therefore collapsed some of the Berenson and Holahan categories. Additionally, because cataract-lens procedures (HCPCS 66800-66999) account for such a significant proportion of Medicare HOPD spending, this category was separated from other eye procedures. Thus, we use the 19 type-of-service categories listed in Table 6: routine visits, emergency department visits, consultation or specialty services, other visits, cataract-lens procedures, other eye procedures, other ambulatory procedures, minor procedures, major procedures, endoscopic procedures, imaging procedures, advanced imaging, standard imaging, sonography, oncology services, dialysis services, laboratory tests, other tests, and other-unclassified.

Using this classification scheme, it is evident that HOPD volume is driven by routine visits, emergency department visits, standard imaging (e.g., X-rays), and laboratory tests (Table 6). To a lesser extent, consultations, advanced imaging (e.g., CAT scans), and other tests also account for significant HOPD volume. Charges, on the other hand, are dominated by cataract-lens procedures, advanced imaging, standard imaging, and laboratory tests. Routine visits, endoscopic procedures, and oncology services also account for significant proportions of charges.

Because their average charges are relatively lower, routine visit ($80.81), emergency department visit ($55.40), standard imaging ($107.66), and laboratory test ($95.28) services account for smaller proportions of charges than their volume would suggest. On the other hand, given their high average charges, cataract-lens ($1,157.88), advanced imaging ($424.28), and oncology

Table 6

Distribution of hospital outpatient department claims and charges, by type of service

Type of service	Number of claims	Percentage of claims	Percentage of charges	Average charge[1]
Routine visits	48,610	10.3	5.3	$80.81
Emergency department visits	51,461	10.9	3.8	55.40
Consultations or specialty services	26,116	5.6	3.1	89.66
Other visits	1,755	0.4	0.3	121.99
Cataract-lens procedures	8,241	1.2	12.6	1,157.88
Other eye procedures	4,269	0.9	0.2	267.67
Other ambulatory procedures	6,048	1.3	2.8	356.70
Minor procedures	12,195	2.3	2.3	145.19
Major procedures	2,197	0.5	1.2	539.46
Endoscopy procedures	15,051	3.2	5.7	287.27
Imaging procedures	1,842	0.4	1.2	725.88
Advanced imaging	24,418	5.2	13.6	424.28
Standard imaging	116,035	24.7	16.4	107.66
Sonography	16,358	3.5	3.7	171.70
Oncology services	9,593	2.0	6.2	490.83
Dialysis services	1,151	0.2	2.3	[2]1,508.20
Laboratory tests	99,180	21.1	12.4	95.28
Other tests	20,660	4.4	3.6	132.51
Other	4,806	1.0	1.2	190.84

[1]All averages are claims-weighted.

[2]Analysis of claims data indicates that facilities report an average of 12 treatments per claim. If submitted separately, about 11,000 additional dialysis claims (about 2 percent of all claims) would be reported with an average charge of approximately $126.

SOURCES: Health Care Financing Administration: Hospital Outpatient Bill file and Part B Medicare Annual Data file, both 1987; data development by the Urban Institute.

($490.83) services account for larger percentages of charges than their low volume would suggest. It is striking that cataract-lens procedures account for 12.6 percent of all HOPD charges with only 1.2 percent of volume.

Dialysis services require separate comment. The average charge ($1,508.20) suggests that HOPDs submit a single claim covering multiple treatment visits. Under Medicare payment policy, a single composite payment is made to facilities for dialysis services. Assuming the average wage-adjusted composite payment of $126 in 1987 suggests that a month's worth of treatment visits (about 12 visits) is reported on a single claim. A typical dialysis patient is expected to receive about 13 treatments per month (Held et al., 1990). If these visits were submitted as separate claims, approximately 11,000 additional dialysis claims (accounting for 2 percent of all claims) would be reported. Thus, because of HOPD billing practices, dialysis visits actually account for significantly more volume than one would gather from Table 6.

Using the Berenson and Holahan typology, we see that volume and spending do not always coincide. Volume is dominated by routine and emergency department visits (21.2 percent), advanced and standard imaging (29.9 percent), and tests (25.5 percent). Together, these service categories account for 76.6 percent of volume. Charges, on the other hand, are more dispersed: routine and emergency department visits (9.1 percent), cataract-lens surgery (12.6 percent), advanced and standard imaging (30.0 percent), endoscopic procedures (5.7 percent), oncology services (6.2 percent) and tests (16.0 percent). Together, these service categories account for 79.6 percent of charges.

Hospital-level analysis

In this section, we analyze differences in charges, costs, outliers, and case mix by various classes of hospitals (e.g., bed size, teaching status, urban-rural). We examine these characteristics at the hospital level for two reasons. First, the potential distributional impact of an HOPD PPS is an important policy consideration. Implicit in this analysis is the notion that certain hospitals are more or less efficient providers of services. Consequently, moving to a PPS that only adjusts for differences in case mix across hospitals is likely to result in "gainers" and "losers." The second reason, following from the first, is to explore the need for special hospital-type (e.g., urban-rural) adjustments under an HOPD PPS, if policymakers deem such adjustments legitimate. We recognize that a descriptive analysis alone cannot definitively address these issues and, as such, the results should be considered indicative rather than definitive.

In undertaking this analysis, the inpatient PPS and related research serve as our precedents. More specifically, we parallel a number of aspects of the PPS system and previous research: converting charges to costs at the hospital level, adjusting for variations in area input prices, establishing an outlier policy, and developing relative procedure weights and a hospital case-mix index to control for differences in the mix of patients. Each of these is discussed in turn.

Converting charges to costs

In order to examine costs we must convert charges to costs. Converting charges to costs is done on the basis of a hospital-level cost-to-charge ratio (CCR). This CCR is an average for the hospital across all revenue-

center-specific cost-to-charge ratios used for outpatient services.

The hospital-level average CCR is used because of data limitations. In principle, revenue-center-specific CCRs would be more accurate. However, our analysis of revenue-center CCRs indicated a number of problems. First, hospitals do not follow consistent standards for reporting services by revenue center. Daily radiation treatments might be reported in a general radiology revenue center or in a therapeutic radiology revenue center. Second, given inpatient PPS and other changes in payment policies, hospitals have incentives to allocate more costs to outpatient settings. Third, revenue-center CCRs were dramatically skewed and demonstrated high degrees of variation. Outpatient-service CCRs (e.g., clinic) were often two or greater (i.e., $2 of cost for every $1 of charges) for a full 10 percent of hospitals. CVs commonly exceeded one. In short, using a hospital-average CCR has the effect of dampening variations within the hospital, whereas revenue-center-specific CCRs provide a false sense of precision. We judged the former error preferable to the latter.

Even hospital-based CCRs can be extreme and adjustment is necessary. Using 1987 HCRIS data for 6,325 hospitals, the average CCR was 0.70 with a standard deviation of 0.66. Minimum and maximum CCRs were -0.038 and 9.97, respectively. Obviously, they represent aberrations—a hospital cannot have negative costs and is equally unlikely to have $60 of cost for every $1 of charges. (The value of 9.97 is likely to be an indicator of missing data.) For hospitals with extreme CCRs, the choice is between eliminating them altogether or truncating the CCR at more reasonable values. We truncate extreme CCRs in the interest of maintaining sample size.

Our methods for determining and truncating extreme CCRs parallel those used for inpatient PPS. A "reasonable" range of CCRs is defined by the middle 95 percent of the distribution. CCRs are distributed in a log-normal fashion and thus are adjusted on that basis. Following the PPS precedent, we set CCR limits at three standard deviations above and below the geometric mean. Roughly 3.5 percent of hospital CCRs were truncated using this criterion. After truncating, the mean CCR is 0.61, the standard deviation is 0.17, and the minimum and maximum values are 0.27 and 1.37, respectively. This is reasonably close to the CCR cutoff points used for inpatient PPS purposes: 0.36 and 1.24.

Area wage adjustment

Certain procedures, particularly surgery and advanced imaging, are more likely to be provided in urban areas. Because urban areas are likely to have higher input costs, procedures done more frequently in higher cost areas will have higher average costs. For the purposes of developing relative procedure weights (and, in turn, a case-mix index), costs unadjusted for area cost variation will reflect both differences in procedure costs and location. Thus, costs must be purged of area variations before developing relative weights. Costs at the hospital level, adjusted for area wages, are also presented in selected tables herein.

To adjust for area input costs, we use the HCFA area wage index. This index is intended to measure the average wage level for hospital workers in metropolitan statistical areas (MSAs) and non-MSA parts of each State relative to the national average. It is used for the inpatient PPS program to adjust the labor-related portion of the base payment amount for the wage level of a hospital's area.

Under inpatient PPS, there is a standardized payment, part of which is adjusted to reflect differences in area wage costs for hospitals located in large urban areas, other urban areas, and rural areas. Averaging across these three hospital types, 74 percent of the inpatient PPS standardized payment amount is attributed to labor costs and adjusted by the area wage index. HOPD costs include labor, capital, and non-labor/non-capital, (i.e., medical supplies and drugs) costs. Without a detailed analysis of HOPD input costs, it is difficult to know if they vary geographically. However, Pope, Hurdle, and Posner (1989) suggest that both labor and capital costs vary geographically. As mentioned, 74 percent of the input PPS standardized payment is adjusted using the HCFA area wage index. Thus, following the PPS precedent, we adjust three-quarters of HOPD costs using the wage index.

Establishing an outlier threshold

Outlier costs are computed for the purpose of estimating which categories of hospitals are more likely to have extremely high-cost HOPD cases. The inpatient PPS outlier policy is designed to insure hospitals against extremely high-cost cases. This reduces incentives for hospitals to deny access to extremely sick Medicare patients. The argument for an outlier policy in the HOPD setting may be less compelling than in the inpatient setting. If an HOPD case becomes an outlier, it is quite possible the case becomes an inpatient admission. On the other hand, analysis of procedure-level cost and charge variation suggests that some degree of risk is present for hospitals receiving standardized prospective payments (Miller and Sulvetta, 1990). Furthermore, hospitals are likely to be critical of a PPS with no insurance mechanism.

Under inpatient PPS, outliers are defined in terms of days and costs. Obviously, a day outlier policy serves no purpose in the HOPD setting. There are three parameters involved in the PPS outlier policy: the proportion of all payments in the system set aside to be used for outlier payments (referred to as the "outlier pool"), the payment threshold, and the payment amount (e.g., 75 percent of per diem). No policy decisions have been made regarding HOPD outliers, so for research purposes we use the size of the outlier pool as the driving factor. Under inpatient PPS, a 5-percent pool is in place, but because the case for outliers may not be as strong in the HOPD setting, an outlier pool of 3 percent of costs was set as the target. Truncating costs at three times the mean on a procedure-by-procedure

basis results in an outlier pool of 3.2 percent, which is reasonably close to the target. (Inpatient PPS defines one cost outlier threshold as two times the prospective rate for the DRG.) In the following analysis we present the percentage of costs exceeding the outlier threshold by hospital type.

Case-mix adjustment

Finally, hospital costs may vary because of differences in the mix of patients treated. These differences are taken into account by constructing a hospital-level case-mix index. In order to calculate hospital-level HOPD case-mix values, the relative weight for each procedure must first be derived. The procedure weight is derived by dividing the average cost for a given procedure by the average cost for all procedures. In order to estimate a reliable average cost for a given procedure, there must be a sufficient sample size (i.e., number of claims). Procedures with sufficient claims have a separate procedure weight calculated. Procedures with insufficient claims are grouped into four "catchall" groups (quartiles) based on costs. Each of these four catchall groups is treated as a "procedure" for the purposes of estimating a relative weight and building a case-mix index.

To calculate the minimum sample size needed to estimate average costs for a procedure, two criteria were employed. First, any procedure with fewer than 20 claims was considered to have an insufficient sample size. Second, the following calculation was applied to all remaining procedures:

$$N_i = ((16.5) * S_i/\overline{X}_i)^2$$

Using the procedure coefficient of variation, this calculation defines the number of claims (N_i) needed to estimate a procedure average within 10 percent of the true average 90 percent of the time. This rule was employed in the development of the original DRG weights (Pettengill and Vertrees, 1982). Using this rule, 379 procedures (accounting for about 90 percent of HOPD claims and costs) have sufficient claims to estimate stable relative weights. The remaining low-volume procedures are grouped into quartiles on the basis of average costs. The catchall groups were defined as follows: Group 1, costs $\geq$ \$440; Group 2, costs \$298-\$439; Group 3, costs \$90-\$297; and Group 4, costs $\leq$ \$89. Also, for reasons already noted, we derive visit-level claims from multiple-visit claims submitted for dialysis services. This is accomplished by dividing the wage-adjusted composite rate (\$126) into the total charge reported on the claim and rounding to the nearest visit. This results in an additional 11,000 claims. Thus, in tables that present case-mix-adjusted costs, the total number of claims is 480,626.

In sum, hospital-specific case-mix values are developed using 383 relative weights (379 separate procedures and four catchall groups). The case mix for a given hospital is derived in the usual manner: The procedure weight is multiplied by the proportion of HOPD claims in each procedure and summed across all procedures in the hospital.

Results

Our descriptive analysis is presented in two parts. In the first part, we discuss charges, costs, CCRs, cost variation, and outliers by hospital type. The purpose is to familiarize the reader with the underlying variations in the system. Special attention is paid to wage-adjusted costs, variation around those costs, and outlier costs. If hospitals were paid a standardized amount purely on the basis of national averages, these are good indicators of hospital performance. Presumably, an HOPD PPS would take case-mix differences into account. The second part of the discussion focuses on the variation in case mix and case-mix-adjusted costs and the impacts of moving to a PPS based on case-mix-adjusted costs.

As shown in Table 7, the average total charge across the 5,207 hospitals in our sample is \$161.72. The average CCR is 0.59, resulting in an average total cost of \$95.46. After wage adjustment, the average total cost declines to \$93.39. A great deal of variation around this average cost is evident, however, as the CV for wage-adjusted costs is 1.83.

As expected, average charges increase with hospital bed size. Hospitals with fewer than 50 beds have average charges of \$97.17, but hospitals with more than 500 beds have average charges of \$186.03. Despite differences in CCRs (0.62 for hospitals with fewer than 50 beds, and 0.57 for those with 51-100 beds), costs also increase with bed size. It is also interesting to note that, although the largest hospitals (501 beds or more) have lower-than-average cost variation (wage-adjusted cost CV of 1.76), they have the highest percentage of outlier costs of any hospital category at 5.0 percent. Hospitals in the 351-500 bed range also exhibit a high percentage of outlier costs (4.9 percent).

As expected, urban hospital average charges and costs exceed the national average, but rural hospital charges and costs are below average. Three points are noteworthy with respect to urban and rural hospitals. First, the average CCRs for these hospitals are very similar. Second, once variations in area wages are controlled, the difference between urban and rural costs is small (about \$15). Third, rural hospitals have lower-than-average outlier costs.

Contrary to prior expectations, major teaching hospitals exhibit lower average charges than minor teaching and non-teaching hospitals.[2] However, major teaching hospitals display the highest average CCR at 0.69, compared with 0.57 for non-teaching hospitals. As a result, major teaching hospital average costs (\$95.25) exceed average costs for non-teaching hospitals (\$89.78), although by a small margin. This pattern is reversed after wage adjustment, with non-teaching hospital adjusted costs averaging (\$90.70), minor teaching hospital costs averaging \$102.39, and major teaching hospital costs averaging \$86.04. It should be noted that teaching hospitals as a group have high

[2] "Major" and "minor" teaching hospitals denote the level of teaching activity, using the intern- and resident-to-bed ratio (IBR). Hospitals with IBRs above 0.25 are considered major teaching hospitals.

Table 7

Hospital outpatient department charges and costs, by hospital type: 1987

Hospital type	Number of hospitals	Number of claims	Average total charge	Average total cost	Ratio of cost to charge	Average wage-adjusted total cost[1]	Coefficient of variation of wage-adjusted total cost	Average wage-adjusted outlier percent
All hospitals	5,207	469,986	$161.72	$95.46	0.59	$93.39	1.83	3.2
Census division								
New England	231	42,393	131.16	86.87	0.66	83.46	1.80	3.0
Mid-Atlantic	521	77,733	150.90	94.14	0.62	88.11	1.91	2.9
South-Atlantic	770	78,789	171.23	96.26	0.56	100.07	1.79	3.4
East North Central	816	94,287	153.88	96.55	0.63	92.96	1.85	3.3
East South Central	459	32,295	151.97	75.38	0.50	83.94	1.83	2.2
West North Central	734	36,114	155.04	95.40	0.62	98.63	1.80	3.7
West South Central	744	34,617	177.65	96.25	0.54	101.85	1.68	3.7
Mountain	336	20,100	151.97	90.53	0.60	89.02	1.69	3.1
Pacific	596	53,658	205.70	114.49	0.56	98.14	1.93	3.0
Bed size								
50 or fewer	1,624	40,842	97.17	60.25	0.62	63.80	1.83	2.4
51-100	1,178	63,945	134.73	76.21	0.57	79.23	1.83	2.0
101-250	1,539	170,062	163.69	93.27	0.57	91.82	1.80	2.6
251-350	464	85,855	175.35	102.57	0.58	98.22	1.81	3.3
351-500	294	70,883	192.14	118.06	0.61	112.35	1.82	4.9
501 or more	108	38,399	186.03	121.33	0.65	113.06	1.76	5.0
Urban-rural status								
Rural	2,552	126,150	128.63	74.32	0.58	82.50	1.82	2.5
Urban	2,655	343,836	173.86	103.21	0.59	97.38	1.83	3.4
Other urban	1,437	179,540	168.79	99.26	0.59	98.52	1.82	3.6
Large urban	1,218	164,296	179.39	107.53	0.60	96.14	1.84	3.2
Teaching status								
Non-teaching	4,288	277,578	158.87	89.78	0.57	90.70	1.78	2.7
Teaching	919	192,408	165.98	103.88	0.63	97.39	1.90	3.8
Minor teaching	737	132,556	178.39	107.69	0.60	102.39	1.81	3.9
Major teaching	182	59,852	137.83	95.25	0.69	86.04	2.10	3.6
Disproportionate-share hospital (DSH) status								
Non-DSH	4,049	326,629	162.42	95.77	0.59	95.09	1.80	3.1
DSH	1,158	143,357	160.12	94.74	0.59	89.52	1.91	3.4
Sole community hospital (SCH) status								
Non-SCH	4,876	454,033	162.84	96.09	0.59	93.82	1.84	3.2
SCH	331	15,953	129.76	77.41	0.60	80.96	1.74	2.3
Rural referral center (RRC) status								
Non-RRC	5,026	445,104	161.68	95.48	0.59	92.70	1.83	3.1
RRC	181	24,882	162.32	94.98	0.59	105.71	1.83	3.6
Type of control								
Voluntary, non-profit	2,955	339,265	168.06	101.69	0.61	98.19	1.83	3.3
Proprietary	1,015	50,393	168.03	77.94	0.46	80.06	1.78	1.9
Government or other[2]	1,237	80,328	130.99	80.11	0.61	81.47	1.86	3.4

[1]Adjusted using the 1987 Health Care Financing Administration area wage index.
[2]The number of hospitals in this category: non-Federal Government 1,194: Federal Government 35; and other 8.

NOTE: Averages are weighted by number of claims in hospital.

SOURCES: Health Care Financing Administration: Hospital Outpatient Bill file, Part B Medicare Annual Data file, Hospital Cost Reporting Information System file, Wage Index file, and Provider-Specific file, all 1987; American Hospital Association: Annual Survey of Hospitals file, 1987; data development by the Urban Institute.

outlier costs (3.8 percent) and that major teaching hospitals exhibit a very high degree of cost variation (wage-adjusted cost CV of 2.10).

Disproportionate-share hospitals (DSHs) display average charges and costs (adjusted or unadjusted for wages) that are lower than those of non-DSH hospitals. Sole community hospital (SCH) average charges, costs, and wage-adjusted costs are well below the national average. Average charges, wage-adjusted costs, and the outlier percentage for rural referral centers (RRCs) exceed the national averages. CCRs and cost variation for RRCs are equal to the national average.

Finally, Table 7 shows that proprietary and non-profit hospitals have higher-than-average charges. Proprietary hospitals have a remarkably low average CCR, however (0.46), resulting in total average costs substantially below the national average. Proprietary hospitals also have a markedly lower outlier percentage (1.9 percent). Government hospitals exhibit lower-than-average charges, costs, and wage-adjusted costs.

Although the preceding tables provide useful information concerning the charge and cost patterns of various classes of hospitals, we assume that any prospective payment system will incorporate a case-mix adjustment. Therefore, we have investigated the variation in case mix and its impact on hospital costs. Table 8 reports case mix and average costs (normalized to the national average) before and after case-mix adjustment. For this analysis we chose to use costs truncated for outliers for two reasons. First, we have found that the distributional impacts of using costs truncated versus untruncated are marginal (Miller and Sulvetta, 1990). Second, given the PPS precedent, choosing costs truncated for outliers as the baseline seems reasonable.

Relative to their respective counterparts, case mix is higher for larger, urban, teaching, rural referral center, and non-profit hospitals. Somewhat surprisingly, case mix is higher for minor teaching hospitals (1.10) than for major teaching hospitals (0.93). In fact, HOPD case mix for major teaching hospitals is less than that for non-teaching hospitals. Also surprisingly, case mix for DSHs (0.96) is lower than that for non-disproportionate share hospitals (1.02).

As might be expected, adjusting for case mix reduces the variation across hospital types, pushing them closer to the national average. For example, before adjustment, large hospitals (351 or more beds) have average costs that are 16-18 percent above the national average, while small hospitals (100 beds or fewer) have costs that are 69-87 percent of the national average. After adjusting for case mix, large hospitals are 1-3 percent above the national average and small hospitals are 2-4 percent above average. (Hospitals with 100-350 beds are slightly below the national average after case-mix-adjusting.) Perhaps more importantly, after adjusting for case mix, no class of hospitals is more than 6 percent above or below the national average. West North Central and West South Central hospitals, very small hospitals (50 beds or fewer), and SCHs all have adjusted costs 4 percent or more above the national average. Hospitals in the Pacific region and proprietary hospitals have adjusted costs 4 percent or more below the national average.

So far, we have examined the distributional impact of adjusting for case mix using the average for a class of hospitals. Within each hospital category, however, there is variation around the average. In other words, the experience of an individual hospital may be different than the experience of the average hospital. Table 9 addresses the question of within-class hospital variation.

Case-mix-adjusted normalized costs for the various classes of hospitals display relatively little variation, with CVs ranging from 0.17 to 0.28. This suggests that, in the aggregate, variation around the average cost ratio within a class of hospital is not dramatic. Nationally, 16 percent of hospitals have costs that exceed the national average by 20-50 percent. About 4 percent of hospitals have costs that exceed the national average by more than 50 percent. However, the distribution of certain classes of hospitals deviates markedly from the national average, resulting in greater proportions of high-cost and low-cost hospitals.

As shown in Table 9, greater proportions of hospitals in the western regions have average costs exceeding the national average by 20-50 percent and by more than 50 percent. Similarly, greater proportions of very small (50 beds or fewer), rural, major teaching, sole community, and government hospitals have average costs that exceed the national average by 20-50 percent and by 50 percent or more. The most significant deviations from the national distribution are seen for very small and sole community hospitals. The performance of small and rural hospitals is at least in part attributable to small sample sizes.

The implications of this distributional analysis are worth noting. For example, the normalized costs (0.98) and variation (CV = 0.28) for major teaching hospitals suggest that as a group, these hospitals are relatively efficient compared with the average hospital. However, relative to the national average, there are greater proportions of both high-cost and low-cost hospitals among the major teaching hospitals. In short, major teaching hospitals appear to perform well as a group because some perform significantly above average and others perform significantly below average.

Discussion

This hospital-level analysis explores the distributional impacts of an HOPD PPS controlling for case mix. Obviously, because the analysis is univariate, observations made are suggestive rather than definitive. A multivariate analysis controlling for many factors at once can provide additional clarification.

There are three broad conclusions from the hospital analysis. First, certain classes of hospitals have higher-than-average case-mix-adjusted costs, but in the most extreme cases, average costs for these classes of hospitals only exceed the national average by 6 percent. Second, certain classes of hospitals have significantly higher-than-average outlier costs. Third, the system as a whole demonstrates a high degree of cost variation,

Table 8

Hospital outpatient department costs unadjusted and adjusted for case mix, normalized to the national average, by hospital type: 1987

Hospital type	Average costs as a ratio of national average costs				
	Costs truncated			Number of	
	Unadjusted	Adjusted	Case-mix[1] index	Hospitals	Claims
All hospitals	1.00	1.00	1.00	5,207	480,626
Census division					
New England	0.89	0.99	0.92	231	43,095
Mid-Atlantic	0.92	0.98	0.94	521	82,744
South-Atlantic	1.08	1.02	1.06	770	79,774
East North Central	0.99	1.01	0.98	816	96,542
East South Central	0.92	0.97	0.95	459	32,224
West North Central	1.06	1.04	1.01	734	36,231
West South Central	1.09	1.06	1.06	744	35,134
Mountain	0.96	0.98	0.99	336	20,578
Pacific	1.06	0.96	1.09	596	54,304
Bed size					
50 or fewer	0.69	1.04	0.66	1,624	41,765
51-100	0.87	1.02	0.84	1,178	65,393
101-250	0.99	0.99	1.00	1,539	173,912
251-350	1.05	0.97	1.08	464	87,799
351-500	1.16	1.01	1.16	294	72,488
501 or more	1.18	1.03	1.18	108	39,269
Urban-rural status					
Rural	0.90	1.04	0.85	2,552	126,624
Urban	1.04	0.98	1.05	2,655	354,002
Other urban	1.05	0.99	1.06	1,437	184,961
Large urban	1.03	0.98	1.05	1,218	169,041
Teaching status					
Non-teaching	0.98	1.01	0.97	4,288	283,862
Teaching	1.03	0.99	1.04	919	196,764
Minor teaching	1.09	0.99	1.10	737	135,557
Major teaching	0.90	0.98	0.93	182	61,207
Disproportionate-share hospital (DSH) status					
Non-DSH	1.02	1.00	1.02	4,049	330,904
DSH	0.95	0.99	0.96	1,158	149,722
Sole community hospital (SCH) status					
Non-SCH	1.00	1.00	1.01	4,876	464,810
SCH	0.89	1.05	0.84	331	15,816
Rural referral center (RRC) status					
Non-RRC	0.99	1.00	1.00	5,026	454,986
RRC	1.12	1.02	1.08	181	25,640
Type of control					
Voluntary, non-profit	1.05	1.00	1.04	2,955	348,680
Proprietary	0.88	0.94	0.93	1,015	50,464
Government or other[2]	0.87	1.03	0.85	1,237	81,482

[1]Case-mix index is based on truncated costs.
[2]The number of hospitals in this category: non-Federal Government 1,194; Federal Government 35; and other 8.

NOTES: Costs are adjusted for differences in area costs using the 1987 Health Care Financing Administration wage index and truncated for outliers. Average costs are weighted by the number of claims in each hospital.

SOURCES: Health Care Financing Administration: Hospital Outpatient Bill file, Part B Medicare Annual Data file, Hospital Cost Reporting Information System file, Wage Index file, and Provider-Specific file, all 1987; American Hospital Association: Annual Survey of Hospitals file, 1987; data development by the Urban Institute.

Table 9

Case-mix adjusted hospital outpatient department costs normalized to the national average: Average, coefficient of variation, and distribution of hospitals, by hospital type: 1987

Hospital type	Average costs as a ratio of national average costs[1]						
			Percentage of hospitals with costs[2]				
	Average[3]	Coefficient of variation[3]	Less than 0.50	0.80-0.50	1.20-1.50	Greater than 1.50	Number of hospitals
All hospitals	1.00	0.21	1.17	18.92	16.23	3.74	5,207
Census division							
New England	0.99	0.23	0.43	13.85	16.02	2.60	231
Mid-Atlantic	0.98	0.19	0.57	19.77	10.36	1.15	521
South-Atlantic	1.02	0.20	0.65	17.53	11.69	2.73	770
East North Central	1.01	0.17	0.86	15.44	11.76	0.98	816
East South Central	0.97	0.24	1.53	21.79	13.94	4.14	459
West North Central	1.04	0.21	1.50	16.62	24.25	5.18	734
West South Central	1.06	0.22	1.61	20.43	21.51	6.45	744
Mountain	0.98	0.23	2.08	20.54	23.51	5.65	336
Pacific	0.96	0.21	1.34	24.50	14.60	5.03	596
Bed size							
50 or fewer	1.04	0.27	2.46	22.04	26.48	8.07	1,624
51-100	1.02	0.21	0.42	17.66	16.72	2.72	1,178
101-250	0.99	0.19	0.71	18.45	9.75	1.36	1,539
251-250	0.97	0.19	0.43	16.59	6.47	1.08	464
351-500	1.01	0.19	0.68	15.65	9.86	1.02	294
501 or more	1.03	0.22	0.93	11.11	8.33	2.78	108
Urban-rural status							
Rural	1.04	0.21	1.41	17.55	22.26	5.64	2,552
Urban	0.98	0.20	0.94	20.23	10.45	1.89	2,655
Other urban	0.99	0.19	0.97	17.88	10.37	1.95	1,437
Large urban	0.98	0.21	0.90	22.99	10.51	1.89	1,218
Teaching status							
Non-teaching	1.01	0.20	1.26	19.22	17.02	4.10	4,288
Teaching	0.99	0.22	0.76	17.52	12.51	2.07	919
Small teaching	0.99	0.19	0.41	16.42	10.72	1.49	737
Large teaching	0.98	0.28	2.20	21.98	19.78	4.40	182
Disproportionate-share hospital (DSH) status							
Non-DSH	1.00	0.20	0.99	17.66	17.31	3.78	4,049
DSH	0.99	0.22	1.81	23.32	12.44	3.63	1,158
Sole community hospital (SCH) status							
Non-SCH	1.00	0.20	1.11	19.13	15.44	3.38	4,876
SCH	1.05	0.23	2.11	15.71	27.79	9.06	331
Rural referral center (RRC) status							
Non-RRC	1.00	0.21	1.21	19.28	16.41	3.84	5,026
RRC	1.02	0.18	0.00	8.84	11.05	1.10	181
Type of control							
Voluntary, non-profit	1.00	0.19	0.85	16.24	13.74	2.67	2,955
Proprietary	0.94	0.24	1.67	27.29	15.57	3.35	1,015
Government or other	1.03	0.24	1.54	18.43	22.72	6.63	1,237

[1]Costs are case-mix-adjusted, adjusted for differences in area costs using the 1987 Health Care Financing Administration wage index, and truncated for outliers.

[2]For the hospital distribution analysis, the unit of analysis is the unweighted hospital. Interpretation is as follows: 1.17 percent of all hospitals have average costs less than 50 percent of the national average.

[3]Average cost ratio and coefficient of variation of ratio are weighted by the number of claims in each hospital.

SOURCES: Health Care Financing Administration: Hospital Outpatient Bill file, Part B Medicare Annual Data file, Hospital Cost Reporting Information System file, Wage Index file, and Provider-Specific file, all 1987; American Hospital Association: Annual Survey of Hospitals file, 1987; data development by the Urban Institute.

which is substantially reduced after case-mix adjustment. Nonetheless, the distributions within hospital type suggest that very different experiences can occur even within a class of hospitals.

The issues that policymakers must address are whether costs that are not accounted for by case-mix differences represent legitimate costs or inefficiencies. If higher-than-average case-mix-adjusted costs in certain classes of hospitals are deemed legitimate, adjustments to the national rates should be made (e.g., a teaching status adjustment). Furthermore, policymakers must decide whether an "insurance policy" for extremely high-cost cases is warranted. An outlier policy similar to inpatient PPS would reduce risk to hospitals with higher-than-average outlier costs and help ensure access for Medicare patients.

High degrees of cost variance are harder to address from a policy perspective. High cost variance for a given class of hospitals suggests that the individual experience for many hospitals may be very different from the "average" experience for that class of hospitals. Or put differently, high degrees of variation around costs could result in significant numbers of both gainers and losers. It seems undesirable from a policy perspective to have significantly different experiences within a given class of hospitals. The fact that some hospitals within the class perform well weakens the argument for payment adjustment for the entire class of hospitals. An outlier policy would address this issue to some extent, but is designed to capture extreme costs on a case-by-case basis, not for entire groups of hospitals.

Western region (West North Central, West South Central, and Mountain Divisions) hospitals have high outliers. An outlier policy would help to reduce the risk for hospitals in these regions. However, even after correcting for outliers, hospitals in these regions have high case-mix-adjusted costs and greater proportions of high-cost and low-cost hospitals. Given higher costs in the Western region, the variation in costs seen across all regions, and the within-class disparity, a transition period with some degree of blending between regional and national rates may be desirable.

Very small hospitals (fewer than 50 beds) and larger hospitals (351 beds or more) have higher-than-average case-mix-adjusted costs. The distribution of small hospitals (i.e., greater proportions of both high-cost and low-cost hospitals) indicates that the impact of national prospective rates would be more variable among these hospitals. Larger hospitals have substantially (5 percent) greater outlier costs, the magnitude of which suggests the need for an outlier policy. An outlier policy would help reduce the risk for large hospitals but would be unlikely to help small hospitals (where outliers are well below average).

The results for teaching hospitals are mixed. After case-mix adjusting, teaching hospital costs are not substantially different from those for non-teaching hospitals. However, major teaching hospitals have higher outlier costs and greater proportions of high-cost and low-cost hospitals (after eliminating outlier costs). An outlier policy would help reduce the case-by-case risk for large teaching hospitals. The appropriateness of a special teaching hospital adjustment, such as the inpatient PPS adjustment, is questionable. Teaching hospital outpatient costs are less than non-teaching hospitals, and, even among teaching hospitals, the relationship between the level of teaching activity and costs appears to be negative.

Rural hospitals have higher-than-average case-mix-adjusted costs, greater proportions of losers, but low outlier costs. Urban hospitals have below-average case-mix-adjusted costs, greater proportions of winners, but above-average outlier costs. An outlier policy would help urban hospitals. These results do not demonstrate the clear need for an urban-rural payment differential because the difference in cost between these two hospital types is small. However, in the absence of a multivariate analysis, we cannot say precisely whether it is other characteristics correlated with urban-rural location (e.g., bed size) that contribute to these outcomes. In fact, the results suggest that SCH status may be more relevant than the broader rural location. SCHs have higher-than-average case-mix-adjusted costs and greater proportions of high-cost hospitals than rural hospitals in general. Arguably, an SCH adjustment without an urban-rural adjustment may be sufficient.

Finally, DSHs have below-average case-mix-adjusted costs and do not demonstrate great numbers of high-cost and low-cost hospitals. These hospitals do have high outlier costs. This lends further support to the argument for an outlier policy. However, unlike inpatient PPS, no special increased payment adjustment appears to be warranted for these hospitals.

Policy implications

The implicit assumption behind any PPS is to create categories of patients for payment purposes. To this end, the aim is to minimize within-category variance and maximize between-category variance. Patients can be classified on a clinical basis, on a resource basis (i.e., cost), or both. Although the two are inseparable, one can be emphasized over the other.

The analysis presented here indicates that, although the range of services that could be provided in the HOPD is potentially quite broad (and very complex to classify), relatively few procedures drive Medicare HOPD spending. Assuming that one wished to account for cost variation, these results suggest that a payment system with relatively few groups may suffice for the purpose of paying hospitals for Medicare HOPD services. Or put differently, a payment system based on a relatively small number of groups is likely to explain most variance in Medicare HOPD costs. Sulvetta (1991) finds that classification systems with few groups (e.g., 30) explain cost variation nearly as well as those with very many (e.g., 300) groups. Nonetheless, assuming one wanted to maximize explained cost variation and clinical meaningfulness, a system with more payment groups may be preferable.

There are two additional administrative arguments for starting with a payment system with relatively few groups. First, fewer groups would be easier to

administer and easier for hospitals to understand. Presumably, the traditional opportunities for gaming the system (e.g., coding creep) would be reduced. Second, the inpatient PPS experience demonstrates that payment systems become more, rather than less, complex over time. As an insurer, HCFA may want to start with a simple system to ease the implementation process. Over time, as with inpatient PPS, refinements to the system can be made.

Our analysis indicates differences in outlier costs can be dramatic. Hospitals with 351 or more beds have average outlier costs of 5 percent, compared with a national average of 3.2 percent. A number of classes of hospitals have outlier costs well above the national average, suggesting the need for an outlier policy. Consistent with inpatient PPS policy, we would recommend that a payment rate less than full cost be paid above the outlier threshold. This ensures that hospitals continue to have incentives to control costs after exceeding the threshold.

Case-mix-adjusted costs vary by region. Moreover, within certain regions there are greater degrees of dispersion among hospitals. This suggests that moving directly to a national HOPD PPS could have disproportionate regional impacts. As was the case for the inpatient PPS, a transition period blending national and regional rates might be considered. Such an approach may also reduce the need for payment adjustments for selected classes of hospitals.

Beyond regional blending, we do not find strong support for numerous payment adjusters, such as those used for inpatient PPS. There is evidence that rural hospitals have higher-than-average case-mix-adjusted costs and higher percentages of high-cost hospitals. But the difference in urban and rural hospital costs is small, and it is not clear whether the urban-rural results are attributable to other characteristics (e.g., bed size) or to certain classes of rural hospitals (e.g., sole community hospitals).

Under inpatient PPS, teaching and disproportionate-share hospitals have received considerable attention. We find that both of these classes of hospitals have lower-than-average HOPD costs. These results must be examined further using multivariate analyses. Nonetheless, the analysis presented here indicates little support for a positive teaching or DSH adjustment such as that provided under inpatient PPS.

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