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).

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

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\(^1\) Using HCPCS codes, one can classify HOPD services into four broad categories: surgery, radiology, laboratory and pathology, and medicine (e.g., visits, electrocardiograms, dialysis).
beneficiaries have a lower average charge ($118.29) and beneficiaries, with an average charge of $161.17, charges by Medicare eligibility status. Aged Medicare claims all range from nearly $100 to nearly $200. Laboratory-pathology ($97.31), and medicine ($101.60) charges. Surgery claims have the highest average charge greater detail. The single most frequently provided second-greatest proportion of charges (20 percent), with 46 percent of all charges and 53 percent of all claims. These 40 services account for charges accounted for by the 40 most frequently provided services. These 40 services 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 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 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 procedure. 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 claims

**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 |
|---------------|------------------|----------------------|-----------------------|---------------|
| Total         | 469,986          | 100.0                | 100.0                 | $161.72       |
| Surgery       | 49,681           | 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        |

**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 |
|-------------------|------------------|----------------------|-----------------------|---------------|
| 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.

**Table 3**  
Percentage of all hospital outpatient department claims and charges accounted for, by the 40 most frequently provided procedures: 1987

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

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.
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 and 19.83 percent of all charges. Frequently provided endoscopy procedures account for only 4 percent of claims and 19.83 percent of all 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:

| HCPCS code and description | Number of claims | Percent of all claims¹ | Average charge² | Percent of all charges³ |
|---------------------------|------------------|------------------------|-----------------|------------------------|
| Surgery                   |                  |                        |                 |                        |
| 43339 Sigmoidoscopy, fibreoptic diagnostic | 4,547 | 0.97 | 266.79 | 1.60 |
| 43375 Colonoscopy, fibreoptic | 2,882 | 0.51 | 292.35 | 0.92 |
| 69684 Extracapsular cataract removal with insertion of intraocular lens prosthesis (one-stage procedure) | 4,001 | 0.99 | 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) | 5,325 | 0.75 | 436.74 | 2.03 |
| 74240 Radiologic examination, gastrointestinal tract | 4,651 | 0.99 | 111.16 | 0.88 |
| 74270 Radiologic examination, colon barium enema | 7,873 | 1.68 | 115.42 | 1.20 |
| 74289 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 |
| 75691 Mammography bilateral | 23,157 | 4.93 | 74.96 | 2.28 |
| 76700 Echography, abdominal, b-scan and/or real-time with image documentation | 3,463 | 0.74 | 144.65 | 0.68 |
| 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) | 8,525 | 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 | 139.89 | 0.57 |
| 85610 Prothrombin time | 9,174 | 1.95 | 17.76 | 0.21 |
| 88150 Cytopathology, smears, cervical or vaginal (e.g., Papanicoaulou), up to three smears | 2,839 | 0.60 | 20.73 | 0.08 |
| 88604 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.

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 | Average charge2 | Percent of all charges3 |
|--------------------------------------------------------|------------------|-----------------------|-----------------|-------------------------|
| Medicine                                               |                  |                       |                 |                         |
| 90040 Office medical service, established patient brief service | 6,399            | 1.54                  | 51.18           | 0.42                    |
| 90050 Office medical service, established patient limited service | 13,564           | 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                  | 42.76           | 0.15                    |
| 90505 Emergency department service, new patient brief service | 5,358            | 1.22                  | 47.52           | 0.69                    |
| 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            | 1.66                  | 74.54           | 0.76                    |
| 90540 Emergency department service, established patient brief service | 3,265            | 0.89                  | 36.89           | 0.16                    |
| 90560 Emergency department service, established patient limited service | 5,012            | 1.07                  | 43.16           | 0.28                    |
| 90561 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                    |
| 93017 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                    |

Note: These 40 procedures account for 62 percent of all claims.
2All averages are claims-weighted.
3These 40 procedures account for 45 percent of all charges.

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

SOURCE: 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
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 codes 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, minor eye procedures, other eye procedures, major procedures, 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), 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, endoscopy 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

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**Table 5**

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

| HCPCS group          | Claims Percent | 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         | 68              |
| 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         | 88              |
| 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.
Analysis of claims data indicates that facilities report an average of 12 treatments per claim. If submitted separately, about 11,000 additional dialysis claims because of HOPD billing practices, dialysis visits were submitted as separate claims, approximately treatments per month (Held et al., 1990). If these visits is made to facilities for dialysis services. Assuming the Medicare payment policy, a single composite payment a single claim covering multiple treatment visits. Under average charge ($1,508.20) suggests that HOPDs submit 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-

### Table 6

| Type of service               | Number of claims | Percentage of claims | Percentage of charges | Average charge1 |
|------------------------------|-----------------|----------------------|-----------------------|-----------------|
| Routine visits               | 48,610          | 10.3                 | 5.3                   | $90.81          |
| 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                  | 12.5                  | 1,157.88        |
| Other eye procedures         | 4,269           | 0.9                  | 0.2                   | 267.67          |
| Other ambulatory procedures  | 6,048           | 1.3                  | 2.0                   | 366.70          |
| Minor procedures             | 12,185          | 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             | 115,035         | 24.7                 | 16.4                  | 107.66          |
| Sonography                   | 16,355          | 3.6                  | 3.7                   | 171.70          |
| Oncology services            | 9,593           | 2.0                  | 6.2                   | 490.69          |
| Dialysis services            | 1,151           | 0.2                  | 2.3                   | 81,500.20       |
| 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          |

1All averages are claims-weighted.

2Analysis 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.
Center-specific cost-to-charge ratios were dramatically skewed.

Revenue-center CCRs were used for outpatient purposes. We truncated extreme CCRs in the interest of extreme CCRs, the choice is between eliminating them or truncating them altogether. 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 cover cases 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 Sulveta, 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. It is possible 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.

**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 cover cases 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 Sulveta, 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 DRGs.) 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:

\[ N_i = \left( \frac{(16.5) \cdot S^2}{X_i} \right)^2 \]

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. As a result, major teaching hospital average charges exceed the national average, but rural hospital average 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. 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 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. 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.

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 cost | Coefficient of variation of wage-adjusted total cost | Average wage-adjusted outlier percent |
|-----------------------------|---------------------|-----------------|----------------------|--------------------|------------------------|---------------------------|-----------------------------------------------------|--------------------------------------|
| All hospitals               | 5,207               | 469,995         | $161.72              | $95.46             | 0.59                   | $83.36                    | 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                 | 77,753          | 150.90               | 94.14              | 0.62                   | 88.11                     | 1.91                                               | 2.9                                  |
| South-Atlantic              | 770                 | 73,729          | 171.23               | 96.26              | 0.56                   | 100.07                    | 1.79                                               | 3.4                                  |
| East North Central          | 816                 | 94,297          | 153.86               | 90.55              | 0.63                   | 92.56                     | 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          | 155.64               | 95.40              | 0.62                   | 98.63                     | 1.80                                               | 3.7                                  |
| West South Central          | 744                 | 34,617          | 177.65               | 96.25              | 0.54                   | 101.65                    | 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               | 40,424          | 97.17                | 60.25              | 0.62                   | 83.80                     | 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                     | 484                 | 85,855          | 175.35               | 102.57             | 0.58                   | 98.22                     | 1.81                                               | 3.3                                  |
| 351-500                     | 294                 | 70,655          | 182.14               | 118.06             | 0.61                   | 112.25                    | 1.82                                               | 4.9                                  |
| 501 or more                 | 108                 | 38,339          | 186.03               | 121.33             | 0.65                   | 113.66                    | 1.76                                               | 5.0                                  |
| Urban-rural status          |                     |                 |                      |                    |                        |                           |                                                    |                                      |
| Rural                       | 2,552               | 126,150         | 128.83               | 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                                               | 2.4                                  |
| Other urban                 | 1,437               | 179,540         | 168.79               | 99.26              | 0.59                   | 98.62                     | 1.82                                               | 4.6                                  |
| 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                 | 192,556         | 178.39               | 107.69             | 0.80                   | 102.39                    | 1.81                                               | 3.9                                  |
| Major teaching              | 182                 | 56,852          | 137.83               | 95.25              | 0.69                   | 86.04                     | 2.10                                               | 3.6                                  |
| Disproportionate-share hospital (DSH) status | | | | | | | | |
| Non-DSH                     | 4,049               | 326,829         | 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                 | 15,950          | 129.76               | 77.41              | 0.80                   | 80.95                     | 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 other2        | 1,237               | 80,329          | 130.98               | 80.11              | 0.61                   | 81.47                     | 1.86                                               | 3.4                                  |

1Adjusted using the 1987 Health Care Financing Administration area wage index.
2The 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.
Various classes of hospitals, we assume that any adjustment 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                        | Costs truncated | Case-mix index | Number of Hospitals | Number of Claims |
|--------------------------------------|-----------------|----------------|---------------------|------------------|
|                                      | Unadjusted      | Adjusted       |                     |                  |
| All hospitals                        | 1.00            | 1.00           | 1.00                | 5,207            | 480,626          |
| Census division                      |                 |                |                     |                  |
| New England                          | 0.99            | 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                | 616              | 96,542           |
| East South Central                   | 0.92            | 0.97           | 0.95                | 459              | 32,224           |
| West North Central                   | 1.06            | 1.04           | 1.01                | 734              | 96,231           |
| West South Central                   | 1.08            | 1.08           | 1.06                | 744              | 35,134           |
| Mountain                             | 0.96            | 0.98           | 0.99                | 536              | 20,578           |
| Pacific                              | 1.06            | 0.96           | 1.09                | 596              | 54,304           |
| Bed size                             |                 |                |                     |                  |
| 50 or fewer                          | 0.69            | 1.04           | 0.85                | 1,604            | 41,785           |
| 51-100                               | 0.87            | 1.02           | 0.84                | 1,178            | 65,383           |
| 101-250                              | 0.99            | 0.99           | 1.00                | 1,539            | 173,912          |
| 251-350                              | 1.06            | 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              | 39,289           |
| Urban-rural status                   |                 |                |                     |                  |
| Rural                                | 0.90            | 1.04           | 0.85                | 2,552            | 126,624          |
| Urban                                | 1.04            | 0.99           | 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            | 233,862          |
| Teaching                             | 1.03            | 0.99           | 1.04                | 919              | 196,764          |
| Minor teaching                       | 1.09            | 0.99           | 1.10                | 737              | 135,657          |
| 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                | 4,376            | 464,810          |
| SCH                                  | 0.99            | 1.05           | 0.94                | 331              | 15,816           |
| Rural referral center (RRC) status   |                 |                |                     |                  |
| Non-RRC                              | 0.99            | 1.00           | 1.00                | 5,026            | 454,965          |
| RRC                                  | 1.12            | 1.02           | 1.08                | 181              | 25,640           |
| Type of control                      |                 |                |                     |                  |
| Voluntary, non-profit                | 1.05            | 1.00           | 1.04                | 2,955            | 348,560          |
| Proprietary                          | 0.89            | 0.94           | 0.93                | 1,015            | 50,464           |
| Government or other                  | 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\(^1\) | Coefficient of variation\(^3\) | Percentage of hospitals with costs\(^2\) | Number of hospitals |
|----------------------------------------|----------------------------------------------------------|---------------------------------|------------------------------------------|---------------------|
|                                        | Average\(^5\)  | Coefficient of variation\(^3\) | Less than 0.50 | 0.50-0.80 | 0.80-1.50 | Greater than 1.50 |                                       |
| 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    | 10.38    | 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                          | 0.85         | 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    | 5.16               | 734                                   |
| West South Central                    | 1.06           | 0.22                          | 1.61         | 20.43    | 21.51    | 6.45               | 744                                   |
| Mountain                              | 0.88           | 0.23                          | 2.08         | 20.54    | 23.51    | 5.65               | 338                                   |
| 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               | 1,039                                 |
| 251-250                               | 0.97           | 0.19                          | 0.43         | 16.59    | 6.47     | 1.06               | 464                                   |
| 351-500                               | 1.01           | 0.19                          | 0.56         | 15.65    | 8.86     | 1.02               | 234                                   |
| 501 or more                           | 1.03           | 0.22                          | 0.85         | 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    | 1.99               | 2,655                                 |
| Other urban                           | 0.99           | 0.19                          | 0.76         | 17.86    | 10.37    | 1.95               | 1,437                                 |
| Large urban                           | 0.98           | 0.21                          | 0.30         | 22.99    | 10.51    | 1.89               | 1,218                                 |
| Teaching status                       |                |                               |              |          |          |                    |                                      |
| Non-teaching                          | 1.01           | 0.20                          | 1.26         | 19.22    | 17.02    | 4.10               | 4,268                                 |
| Teaching                              | 0.99           | 0.22                          | 0.76         | 17.52    | 12.51    | 2.07               | 919                                   |
| Small teaching                        | 0.99           | 0.20                          | 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               | 4,676                                 |
| 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               | 161                                   |
| 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 gainer and loser hospitals. 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 categories of patients is likely to explain most variance in Medicare HOPD costs. Sulvett (1991) finds that classification systems with fewer 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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