Leading inpatient surgical procedures for aged Medicare beneficiaries, 1987

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Medicare program data on utilization and charges for short-stay hospital inpatient services are presented. The focus of this article is on trends in total and surgical discharges for selected years (1977-87) and highlights of regional variations in the most frequently reported (leading) surgical procedures performed on aged Medicare hospital insurance beneficiaries during 1987.

Introduction

Trend data for the U.S. census regions are presented for selected calendar years (1977, 1981, 1983, 1986, and 1987) to reflect regional variations in short-stay hospital (SSH) inpatient discharges and discharge rates (total and surgical) for aged Medicare beneficiaries (Table 1). For the 25 leading surgical procedures for aged enrollees, we focus on 1987 data to show regional variations in the number of surgical discharges and surgical discharge rates per 1,000 enrollees (Table 2), total charges and average charges per discharge (Table 3), and the number of total days of care and average length of stay per discharge (Table 4). The article includes a "Technical note" with definitions for the major surgical classifications and the 25 leading surgical procedures in 1987.

Procedure codes for the leading procedures were derived from the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) (Public Health Service and Health Care Financing Administration), and only those codes designated as operating room procedures by the Health Care Financing Administration (HCFA) were included in the leading procedures. Thus, some diagnostic and therapeutic surgical procedures may have been more frequently reported than were the leading procedures but were excluded from the list of the leading procedures because they were not performed in an operating room. Although as many as three ICD-9-CM procedure codes are reported on the HCFA Form 1450, only the principal procedure code has been used in this article.

The proportion of SSH discharges involving inpatient surgery for the aged Medicare population has increased substantially since the inception of the Medicare hospital insurance (HI) program. During the first 10 years (1967-76) of Medicare, for example, the proportion of surgical discharges for aged Medicare beneficiaries was about 32 percent of all discharges (Helbing, 1980). However, the proportion of surgical discharges for the elderly residing in all areas increased from 33 percent in 1977 to 38 percent in 1983, rose to 53 percent in 1984, and climbed steadily to 61 percent in 1987. Among the regions, the proportion of surgical discharges in the Northeast Region increased from 36 percent in 1977 to 68 percent in 1987. The South Region, which had the lowest proportion of surgical discharges (31 percent) in 1977, moved into third place (58 percent) among the regions in 1987. Large geographic variations in the incidence of surgery raise a great many questions regarding local differences in the criteria of appropriate use of surgical services or differential access to surgical specialties that cannot be addressed directly because of the lack of definitive data for measuring potentially pertinent variables.

The increased proportion of reported discharges with surgery since the late 1970s appears to be related to the introduction of the ICD-9-CM diagnostic and procedural coding system and the implementation of the Medicare prospective payment system (PPS) established by Public Law 98-21 and implemented on October 1, 1983. "The increase in the percent of discharges with surgery from 1978 to 1979 was due largely to the changes in coding and reporting practices instituted in 1979. The ICD-9-CM was used to code procedures beginning in 1979, and it was organized differently than earlier versions of the classification system, resulting in a broader definition of surgical procedures"; the ICD-9-CM also included "procedures that had not been coded previously . . ." (Pokras et al., 1989). Further, for services rendered to Medicare enrollees, changes in the way SSHs are paid under PPS encouraged hospitals to become more diligent in adhering to and applying ICD-9-CM medical coding techniques and conventions.

Prior to PPS, there was no monetary incentive for hospitals to promote either complete reporting of patient history or accurate coding of patient diagnoses and surgical procedures on Medicare claims. After PPS, however, the financial position of hospitals could be improved by promoting both reporting and coding precision. Under PPS, payment to hospitals for the care of Medicare patients is based mainly on the coding of the principal diagnosis (condition) that caused the admission of the patient to the hospital. In addition, the reporting and coding of a surgical procedure is a major factor used to determine the preset PPS payment. When hospitals began to recognize that the Medicare payment would be larger for most admissions requiring surgical procedures, the reporting and coding of these procedures began to receive top priority, thus generating the increase in reported surgeries.
Table 1
Total number of discharges, discharges with surgery, and discharge rates for aged Medicare beneficiaries receiving short-stay hospital services, by census region and selected calendar years: 1977-87

| Discharges, discharge rate, and year | U.S. census region | All areas¹ of residence | Northeast | North Central | South | West |
|-------------------------------------|--------------------|-------------------------|-----------|--------------|-------|------|
| Total discharges                     | Number in thousands |                        |           |              |       |      |
| 1977                                | 7,850              | 1,872                   | 2,174     | 2,635        | 1,173 |      |
| 1981                                | 9,400              | 1,550                   | 2,605     | 3,250        | 1,436 |      |
| 1983                                | 10,152             | 2,144                   | 2,785     | 3,631        | 1,527 |      |
| 1986                                | 8,917              | 1,991                   | 2,337     | 3,146        | 1,378 |      |
| 1987                                | 9,901              | 2,012                   | 2,341     | 3,162        | 1,486 |      |
| Percent change                      |                    |                         | 8         | 20           | 27    |      |
| Discharge rate                      | Number per 1,000 enrollees |                |           |              |       |      |
| 1977                                | 334                | 206                     | 341       | 360          | 312   |      |
| 1981                                | 387                | 325                     | 390       | 403          | 338   |      |
| 1983                                | 361                | 347                     | 403       | 424          | 339   |      |
| 1986                                | 316                | 310                     | 328       | 342          | 261   |      |
| 1987                                | 312                | 310                     | 321       | 338          | 295   |      |
| Percent change                      |                    |                         | -7        | -5           | -5    |      |
| Surgical discharges                 | Number in thousands |                        |           |              |       |      |
| 1977                                | 2,573              | 609                     | 719       | 817          | 411   |      |
| 1981                                | 3,171              | 749                     | 887       | 1,008        | 517   |      |
| 1983                                | 3,519              | 872                     | 1,045     | 1,311        | 563   |      |
| 1986                                | 5,253              | 1,297                   | 1,307     | 1,751        | 872   |      |
| 1987                                | 5,503              | 1,372                   | 1,346     | 1,824        | 935   |      |
| Percent change                      |                    |                         | 114       | 123          | 127   |      |
| Surgical discharge rate             | Number per 1,000 enrollees |                |           |              |       |      |
| 1977                                | 110                | 108                     | 115       | 112          | 109   |      |
| 1981                                | 124                | 124                     | 133       | 124          | 122   |      |
| 1983                                | 143                | 141                     | 151       | 153          | 125   |      |
| 1986                                | 186                | 202                     | 182       | 190          | 178   |      |
| 1987                                | 191                | 211                     | 185       | 194          | 186   |      |
| Percent change                      |                    |                         | 74        | 95           | 73    | 71    |
| Surgical discharges                 | Percent of all discharges |                  |           |              |       |      |
| 1977                                | 33                 | 36                      | 33        | 31           | 35    |      |
| 1981                                | 34                 | 38                      | 34        | 31           | 36    |      |
| 1983                                | 38                 | 41                      | 38        | 36           | 37    |      |
| 1986                                | 59                 | 65                      | 56        | 56           | 63    |      |
| 1987                                | 61                 | 68                      | 57        | 58           | 63    |      |

¹Includes Puerto Rico, Virgin Islands, Guam, American Samoa, and foreign countries not shown separately.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Medicare Statistical System; data development by the Office of Research and Demonstrations.

PPS also precipitated changes in SSH admission practices—changes that resulted in an overall decrease in admissions. Thus, the 7-percent decrease in the total discharge rate per 1,000 aged HI enrollees (Table 1) resulted in an increase in the proportion of discharges with surgery. The hospitals' response to PPS also shifted patient care, in some cases, to alternative treatment sites, such as ambulatory surgical centers. Thus, some procedures previously done on an inpatient basis are now being done in the outpatient setting. For instance, Kozak (1989) reports that "The decline in [inpatient] eye surgery was almost all from decreases in cataract surgeries. The rate of lens extraction fell 90 percent, and the rate of insertion of prosthetic lens dropped 88 percent from 1983 to 1987."

In addition to the increase in reported surgeries induced by the new coding system and incentives provided by PPS, a "true" increase in the number of surgical procedures for aged Medicare beneficiaries may have resulted from advances in medical technology. Such advances have made it possible to operate on elderly patients for whom surgery would previously have been considered too risky; this surgery now would necessarily be performed on an inpatient basis. For example, the National Center for Health Statistics reports that the rate of elderly patients undergoing cardiovascular surgery increased 63 percent from 1983 to 1987: "The number and rate of bypass anastomosis for heart revascularization more than doubled. The number of discharged patients 65 years of age and over who had one or
## Table 2

| ICD-9-CM codes¹ for 25 leading surgical procedures within human organ system | All areas² | U.S. census region | All areas² | U.S. census region |
|---|---|---|---|---|
| | Northeast | North Central | South | West | Northeast | North Central | South | West |
| Total, all procedures | 5,503 | 1,372 | 1,346 | 1,824 | 935 | 190.9 | 211.2 | 184.7 | 193.6 | 185.5 |
| Number of surgical discharges in thousands | | | | | | | | | | |
| Total, 25 leading procedures | 1,254 | 279 | 331 | 420 | 216 | 43.5 | 42.9 | 45.4 | 44.6 | 42.9 |
| Operations on: | | | | | | | | | | |
| Nervous system (01-05) | 114 | 24 | 29 | 39 | 21 | 3.9 | 3.7 | 4.0 | 4.1 | 4.2 |
| Eye (08-16) | 95 | 37 | 20 | 25 | 11 | 3.3 | 5.6 | 2.8 | 2.7 | 2.2 |
| Ear (18-20) | 8 | 2 | 2 | 3 | 1 | 0.3 | 0.9 | 0.5 | 0.4 | 0.2 |
| Nose, mouth, and pharynx (21-29) | 47 | 11 | 12 | 16 | 7 | 1.6 | 1.8 | 1.7 | 1.7 | 1.4 |
| Respiratory system (30-34) | 224 | 53 | 53 | 82 | 35 | 7.8 | 8.1 | 7.3 | 6.7 | 6.9 |
| Cardiovascular system (35-39) | 748 | 152 | 196 | 267 | 130 | 25.9 | 23.5 | 26.9 | 28.4 | 25.8 |
| 36.01 | 42 | 6 | 12 | 14 | 10 | 1.5 | 1.0 | 1.7 | 1.5 | 2.0 |
| 36.13 | 30 | 6 | 6 | 10 | 5 | 1.0 | 0.9 | 1.1 | 1.1 | 1.1 |
| 36.14 | 30 | 5 | 8 | 11 | 6 | 1.1 | 0.8 | 1.1 | 1.1 | 1.2 |
| 37.74 | 33 | 6 | 8 | 12 | 5 | 1.1 | 1.2 | 1.1 | 1.3 | 1.0 |
| 38.12 | 48 | 7 | 14 | 18 | 9 | 1.7 | 1.1 | 1.9 | 1.9 | 1.9 |
| 38.44 | 23 | 5 | 6 | 8 | 4 | 0.8 | 0.8 | 0.6 | 0.9 | 0.8 |
| 39.29 | 39 | 10 | 9 | 13 | 6 | 1.3 | 1.5 | 1.3 | 1.4 | 1.2 |
| Residual | 503 | 105 | 131 | 181 | 85 | 17.5 | 16.2 | 18.0 | 19.2 | 18.9 |
| Hemic and lymphatic system (40-41) | 71 | 18 | 18 | 25 | 10 | 2.5 | 2.7 | 2.5 | 2.6 | 2.0 |
| Digestive system (42-54) | 1,057 | 248 | 277 | 370 | 156 | 36.7 | 30.2 | 36.0 | 39.3 | 30.9 |
| 45.73 | 33 | 8 | 9 | 10 | 6 | 1.1 | 1.3 | 1.3 | 1.1 | 1.1 |
| 45.75 | 31 | 7 | 8 | 10 | 5 | 1.1 | 1.2 | 1.1 | 1.1 | 1.0 |
| 51.22 | 124 | 25 | 33 | 45 | 20 | 4.3 | 3.9 | 4.5 | 4.8 | 4.0 |
| 53.01 | 25 | 7 | 6 | 8 | 2 | 0.9 | 1.1 | 0.9 | 0.9 | 0.5 |
| 53.02 | 23 | 9 | 8 | 10 | 2 | 1.0 | 1.3 | 1.1 | 1.0 | 0.5 |
| Residual | 815 | 191 | 219 | 267 | 121 | 28.3 | 29.4 | 29.2 | 30.5 | 24.0 |

See footnotes at end of table.

¹ ICD-9-CM codes are used to identify the specific surgical procedures.
² All areas include the entire U.S. census region.
Table 2—Continued

Number of discharges with surgery and surgical rates per 1,000 hospital insurance enrollees for aged Medicare beneficiaries discharged from short-stay hospitals, by census region and leading surgical procedures within human organ system: Calendar year 1987

| ICD-9-CM codes for 25 leading surgical procedures within human organ system | U.S. census region | All areas | Northeast | North Central | South | West | U.S. census region | All areas | Northeast | North Central | South | West |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of surgical discharges in thousands | Surgical rate per 1,000 enrollees | | | | | | | | | | | | |
| Urinary system (55-59) | | | | | | | | | | | | | | |
| 57.49 | 248 | 63 | 51 | 68 | 27 | 8.6 | 9.7 | 7.1 |
| Residual | 51 | 15 | 12 | 15 | 9 | 1.8 | 2.3 | 1.7 |
| Male genital organs (60-64) | 294 | 63 | 76 | 101 | 52 | 25.3 | 23.5 | 25.4 |
| Residual | 49 | 14 | 14 | 20 | 10 | 5.0 | 5.2 | 4.7 |
| Female genital organs (65-71) | 95 | 20 | 25 | 32 | 18 | 5.5 | 1.6 | 1.5 |
| Residual | 29 | 5 | 8 | 9 | 6 | 1.7 | 1.5 | 1.6 |
| Musculoskeletal system (76-84) | 573 | 112 | 157 | 190 | 105 | 19.9 | 18.2 | 21.5 |
| 80.51 | 106 | 24 | 27 | 37 | 19 | 3.7 | 3.6 | 3.5 |
| Residual | 22 | 3 | 6 | 9 | 5 | 0.6 | 0.5 | 0.8 |
| Integumentary system (85-86) | 207 | 53 | 51 | 70 | 48 | 7.2 | 8.2 | 7.1 |
| 86.22 | 55 | 15 | 13 | 19 | 7 | 1.9 | 2.3 | 1.9 |
| Residual | 105 | 28 | 25 | 35 | 16 | 3.6 | 4.3 | 3.4 |
| Miscellaneous diagnostic and therapeutic procedures (57-99) | 1,706 | 361 | 515 | 320 | 592 | 78.0 | 49.5 | 54.6 |

1The classification codes for the leading surgical procedures were derived from the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) and are defined in the "Technical note." Some diagnostic procedures may have been more frequently reported than were the leading procedures, but were excluded from the list of the leading procedures because they were not performed in an operating room.

2Includes Puerto Rico, Virgin Islands, Guam, American Samoa, and foreign countries not shown separately.

3Only male population was used to calculate surgical rate per 1,000 enrollees.

4Only female population was used to calculate surgical rate per 1,000 enrollees.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Medicare Statistical System; data development by the Office of Research and Demonstrations.
Table 3
Total charges and average charge per discharge for aged Medicare beneficiaries with inpatient short-stay hospital surgery, by census region and leading surgical procedures within human organ system: Calendar year 1987

| ICD-9-CM codes¹ for 25 leading surgical procedures within human organ system | All areas² | U.S. census region | U.S. census region |
|---|---|---|---|
| | All areas² | Northeast | North Central | South | West | All areas² | Northeast | North Central | South | West |
| | Total charges in millions | Average charge per discharge |
| Total, all procedures | $46,601 | $11,624 | $11,093 | $14,813 | $8,951 | $8,467 | $8,244 | $8,120 | $9,574 |
| Total, 25 leading procedures | $12,759 | 2,863 | 3,253 | 4,149 | 2,463 | 10,175 | 10,212 | 9,878 | 9,819 | 11,403 |
| Operations on: | | | | | | | | | | |
| Nervous system (01-05) | 1,298 | 290 | 318 | 416 | 261 | 11,330 | 12,099 | 10,915 | 10,732 | 12,200 |
| Residual | 220 | 42 | 54 | 68 | 55 | 9,579 | 11,043 | 9,046 | 9,326 | 9,486 |
| Endocrine system (06-07) | 1,068 | 248 | 264 | 348 | 205 | 11,736 | 12,400 | 11,478 | 10,875 | 13,733 |
| Eye (08-16) | 338 | 125 | 73 | 89 | 46 | 3,545 | 3,426 | 3,658 | 3,593 | 4,243 |
| 13.5 | 80 | 48 | 12 | 13 | 4 | 3,030 | 3,054 | 3,321 | 2,262 | 3,165 |
| Residual | 258 | 77 | 61 | 76 | 42 | 3,739 | 3,867 | 3,812 | 3,619 | 4,200 |
| Ear (18-20) | 35 | 8 | 10 | 11 | 6 | 4,182 | 4,147 | 4,005 | 4,242 | 4,533 |
| Nose, mouth, and pharynx (21-29) | 220 | 57 | 54 | 72 | 37 | 4,889 | 5,027 | 4,351 | 4,522 | 5,197 |
| Respiratory system (30-34) | 3,141 | 752 | 734 | 1,058 | 589 | 14,050 | 14,306 | 13,816 | 12,877 | 16,930 |
| Cardiovascular system (35-39) | 10,379 | 2,120 | 2,654 | 3,469 | 2,111 | 13,879 | 13,915 | 13,553 | 12,979 | 16,236 |
| 36.0 | 488 | 59 | 130 | 147 | 121 | 11,019 | 10,667 | 10,726 | 10,681 | 12,103 |
| 36.13 | 894 | 166 | 230 | 259 | 191 | 30,056 | 29,451 | 29,087 | 28,707 | 34,799 |
| 36.14 | 929 | 167 | 235 | 301 | 223 | 30,056 | 30,918 | 28,628 | 27,881 | 37,907 |
| 37.74 | 452 | 103 | 111 | 160 | 76 | 13,803 | 13,740 | 13,713 | 13,533 | 14,833 |
| 38.12 | 408 | 62 | 115 | 150 | 81 | 8,490 | 8,798 | 8,284 | 8,427 | 8,887 |
| 38.44 | 542 | 115 | 138 | 180 | 109 | 23,235 | 22,464 | 23,352 | 21,933 | 28,597 |
| 39.29 | 566 | 160 | 130 | 178 | 97 | 14,581 | 15,921 | 14,102 | 13,372 | 15,851 |
| Residual | 6,120 | 1,278 | 1,557 | 2,054 | 1,213 | 12,167 | 12,171 | 11,685 | 11,346 | 14,271 |
| Hemic and lymphatic system (40-41) | 826 | 165 | 152 | 206 | 101 | 8,794 | 9,311 | 8,411 | 8,290 | 9,980 |
| Digestive system (42-54) | 9,830 | 2,377 | 2,429 | 3,286 | 1,709 | 9,296 | 9,577 | 8,774 | 8,873 | 10,987 |
| 45.73 | 490 | 122 | 126 | 153 | 88 | 14,802 | 14,803 | 13,702 | 15,356 | 15,785 |
| 45.75 | 445 | 114 | 110 | 142 | 79 | 14,210 | 14,591 | 13,182 | 14,287 | 15,320 |
| 55.22 | 1,129 | 234 | 282 | 408 | 200 | 9,073 | 9,306 | 8,577 | 9,102 | 9,869 |
| 53.01 | 71 | 22 | 16 | 24 | 6 | 2,835 | 2,966 | 2,764 | 2,633 | 2,845 |
| 53.02 | 83 | 27 | 21 | 28 | 8 | 2,901 | 3,116 | 2,626 | 2,860 | 3,420 |
| Residual | 7,612 | 1,858 | 1,872 | 2,531 | 1,328 | 9,340 | 9,728 | 8,789 | 8,819 | 10,975 |

See footnotes at end of table.
Table 3—Continued

Total charges and average charge per discharge for aged Medicare beneficiaries with inpatient short-stay hospital surgery, by census region and leading surgical procedures within human organ system: Calendar year 1987

| ICD-9-CM codes\(^1\) for 25 leading surgical procedures within human organ system | U.S. census region | U.S. census region |
|---------------------------------|-----------------|-----------------|
|                                 | All areas\(^2\) | Northeast | North Central | South | West | All areas\(^2\) | Northeast | North Central | South | West |
|                                 | Total charges in millions | Average charge per discharge |
| Urinary system (55-59)          | $1,599          | $427       | $391       | $524  | $250  | $6,438          | $6,786     | $6,196     | $8,203 | $6,976 |
| 57.49                           | 209             | 66         | 47         | 61    | 35    | 4,076           | 4,406      | 3,781      | 4,038  | 4,059 |
| Residual                        | 1,390           | 361        | 344        | 463   | 215   | 7,056           | 7,521      | 6,745      | 6,710  | 7,963 |
| Male genital organs (60-64)     | 1,471           | 348        | 367        | 463   | 269   | 4,908           | 5,557      | 4,898      | 4,876  | 4,963 |
| 60.2                            | 1,139           | 271        | 290        | 380   | 193   | 4,822           | 5,517      | 4,659      | 4,716  | 4,567 |
| Residual                        | 332             | 77         | 77         | 83    | 66    | 5,724           | 5,500      | 5,500      | 4,150  | 6,100 |
| Female genital organs (65-71)   | 541             | 122        | 143        | 177   | 97    | 5,673           | 5,947      | 5,641      | 5,491  | 5,943 |
| 68.4                            | 197             | 41         | 55         | 82    | 38    | 4,942           | 7,076      | 7,027      | 6,648  | 6,775 |
| Residual                        | 344             | 81         | 88         | 115   | 59    | 5,212           | 5,786      | 5,176      | 5,000  | 5,900 |
| Musculoskeletal system (76-84)  | 5,750           | 1,306      | 1,466      | 1,828 | 1,135 | 10,036          | 11,044     | 9,250      | 9,639  | 10,720 |
| 79.35                           | 1,111           | 283        | 249        | 361   | 217   | 10,439          | 11,956     | 9,384      | 9,761  | 11,441 |
| 80.51                           | 176             | 30         | 45         | 64    | 39    | 7,925           | 8,782      | 7,590      | 7,493  | 8,569 |
| 81.41                           | 831             | 145        | 264        | 245   | 175   | 13,026          | 13,744     | 12,350     | 13,034 | 13,633 |
| 81.58                           | 486             | 105        | 120        | 123   | 119   | 13,586          | 14,904     | 12,886     | 13,214 | 13,902 |
| 81.62                           | 492             | 94         | 137        | 188   | 82    | 13,730          | 14,142     | 13,114     | 13,634 | 14,563 |
| Residual                        | 403             | 96         | 101        | 140   | 64    | 10,531          | 12,223     | 9,305      | 9,569  | 12,124 |
| Integumentary system (85-86)    | 2,237           | 551        | 550        | 727   | 429   | 8,403           | 9,500      | 7,634      | 8,075  | 9,938 |
| 85.43                           | 1,672           | 488        | 390        | 521   | 269   | 8,070           | 9,152      | 7,589      | 7,459  | 8,581 |
| 86.22                           | 212             | 48         | 57         | 72    | 35    | 4,541           | 4,952      | 4,500      | 4,488  | 4,290 |
| Residual                        | 742             | 231        | 168        | 222   | 118   | 13,416          | 15,155     | 12,495     | 11,861 | 15,801 |
| Miscellaneous diagnostic and therapeutic procedures (87-99) | 718             | 209        | 165        | 227   | 116   | 6,938           | 7,464      | 6,800      | 6,485  | 7,250 |

\(^1\)The classification codes for the leading surgical procedures shown in this article were derived from the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) and are defined in the "Technical note." Some diagnostic procedures may have been more frequently reported than were the leading procedures, but were excluded from the list of the leading procedures because they were not performed in an operating room.

\(^2\)Includes Puerto Rico, Virgin Islands, Guam, American Samoa, and foreign countries not shown separately.

Source: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Medicare Statistical System; data development by the Office of Research and Demonstrations.
Table 4

Total days of care and average length of stay per discharge for aged Medicare beneficiaries with inpatient short-stay hospital surgery, by census region and leading surgical procedures within human organ system: Calendar year 1987

| ICD-9-CM codes for 25 leading surgical procedures within human organ system | All areas | U.S. census region | U.S. census region |
|---|---|---|---|
| | Northeast | Central | South | West | Northeast | Central | South | West |
| Total, all procedures | 55,271 | 16,800 | 12,956 | 17,631 | 7,649 | 10.0 | 12.2 | 9.6 | 9.7 | 8.2 |
| Total, 25 leading procedures | 13,470 | 3,631 | 3,456 | 4,444 | 1,871 | 10.7 | 13.0 | 10.4 | 10.6 | 8.7 |
| Operations on: | | | | | | | | | | |
| Nervous system (01-05) | | | | | | | | | | |
| 36.01 | 1,527 | 405 | 373 | 507 | 237 | 13.4 | 16.9 | 12.8 | 13.1 | 11.1 |
| 36.13 | 287 | 59 | 74 | 93 | 80 | 12.5 | 15.5 | 12.4 | 12.9 | 10.3 |
| Residual | 1,240 | 346 | 209 | 414 | 177 | 13.6 | 17.3 | 13.0 | 12.9 | 11.8 |
| Endocrine system (06-07) | | | | | | | | | | |
| 36.14 | 115 | 28 | 25 | 45 | 15 | 7.5 | 9.7 | 6.5 | 7.9 | 5.7 |
| 36.16 | 325 | 130 | 71 | 85 | 33 | 3.4 | 3.6 | 3.5 | 3.4 | 3.1 |
| Residual | 74 | 46 | 11 | 11 | 3 | 2.8 | 3.0 | 2.9 | 2.7 | 2.4 |
| Eye (08-16) | | | | | | | | | | |
| 36.18 | 251 | 84 | 60 | 74 | 30 | 3.3 | 4.0 | 3.7 | 3.5 | 3.0 |
| Residual | 40 | 11 | 11 | 12 | 5 | 4.7 | 5.8 | 4.5 | 4.6 | 3.5 |
| Ear (18-20) | | | | | | | | | | |
| 36.19 | 279 | 86 | 65 | 93 | 32 | 6.0 | 7.7 | 5.3 | 5.8 | 4.5 |
| Nose, mouth, and pharynx (21-29) | | | | | | | | | | |
| 36.20 | 3,309 | 965 | 761 | 1,123 | 447 | 14.8 | 18.4 | 14.3 | 13.7 | 12.8 |
| Respiratory system (30-34) | | | | | | | | | | |
| 36.21 | 7,700 | 1,893 | 2,000 | 2,683 | 1,130 | 10.3 | 12.4 | 10.2 | 9.9 | 8.7 |
| Cardiovascular system (35-39) | | | | | | | | | | |
| 36.22 | 287 | 52 | 87 | 94 | 53 | 6.8 | 8.1 | 7.1 | 6.9 | 5.3 |
| 36.13 | 487 | 94 | 134 | 161 | 77 | 15.7 | 18.7 | 16.4 | 15.5 | 14.1 |
| 36.14 | 478 | 96 | 130 | 164 | 85 | 15.7 | 17.8 | 16.0 | 15.2 | 14.5 |
| 37.74 | 207 | 89 | 73 | 107 | 36 | 9.4 | 11.9 | 9.1 | 9.0 | 6.9 |
| 36.12 | 385 | 74 | 113 | 152 | 56 | 8.2 | 10.5 | 8.2 | 8.5 | 6.0 |
| 36.44 | 342 | 85 | 86 | 118 | 53 | 14.7 | 16.5 | 14.7 | 14.4 | 12.9 |
| 39.29 | 587 | 191 | 135 | 189 | 70 | 15.1 | 19.0 | 14.7 | 14.2 | 11.5 |
| Residual | 4,837 | 1,212 | 1,242 | 1,868 | 700 | 9.6 | 11.5 | 9.4 | 9.2 | 8.2 |
| Hematopoietic system (40-41) | | | | | | | | | | |
| 36.23 | 833 | 257 | 201 | 274 | 96 | 11.7 | 14.5 | 11.1 | 11.0 | 9.5 |
| Digestive system (42-54) | | | | | | | | | | |
| 36.23 | 11,836 | 3,373 | 2,955 | 3,941 | 1,505 | 11.2 | 13.8 | 10.7 | 10.6 | 9.7 |
| 45.73 | 524 | 154 | 140 | 156 | 72 | 15.8 | 18.7 | 15.2 | 15.7 | 13.0 |
| 45.76 | 483 | 143 | 122 | 150 | 66 | 15.4 | 18.4 | 14.6 | 15.1 | 12.9 |
| 51.22 | 1,343 | 317 | 350 | 487 | 178 | 10.8 | 12.6 | 10.6 | 10.9 | 8.8 |
| 53.01 | 92 | 30 | 22 | 32 | 6 | 3.7 | 4.1 | 3.5 | 3.8 | 2.8 |
| 53.02 | 109 | 35 | 28 | 37 | 8 | 3.8 | 4.1 | 3.5 | 3.8 | 3.4 |
| Residual | 9,285 | 2,694 | 2,293 | 3,079 | 1,175 | 11.4 | 14.1 | 10.8 | 10.7 | 9.7 |

See footnotes at end of table.
| ICD-9-CM codes\(^1\) for 26 leading surgical procedures within human organ system | All areas\(^2\) | U.S. census region | U.S. census region |
|---|---|---|---|
| | | Northeast | North Central | South | West | Northeast | North Central | South | West |
| Urinary system (55-59) | | | | | | | | | |
| 67.49 | 2,130 | 670 | 519 | 699 | 235 | 8.6 | 10.6 | 8.2 | 9.2 | 6.5 |
| Residual | 1,852 | 571 | 455 | 609 | 202 | 9.4 | 11.9 | 8.9 | 8.2 | 7.5 |
| Male genital organs (60-64) | | | | | | | | | |
| 60.2 | 2,036 | 551 | 521 | 666 | 260 | 5.9 | 8.8 | 6.8 | 6.8 | 5.0 |
| Residual | 412 | 114 | 98 | 141 | 58 | 7.1 | 8.1 | 7.0 | 7.1 | 5.8 |
| Female genital organs (65-71) | | | | | | | | | |
| 68.4 | 245 | 55 | 69 | 81 | 36 | 8.5 | 9.7 | 8.7 | 8.6 | 6.8 |
| Residual | 471 | 118 | 123 | 163 | 63 | 7.1 | 8.4 | 7.2 | 7.1 | 6.3 |
| Musculoskeletal system (76-84) | | | | | | | | | |
| 57.64 | 2,385 | 1,999 | 1,844 | 2,361 | 1,047 | 12.7 | 16.9 | 11.8 | 12.4 | 9.9 |
| 79.35 | 1,591 | 496 | 352 | 517 | 221 | 15.0 | 21.0 | 13.3 | 14.0 | 11.7 |
| 80.51 | 248 | 48 | 85 | 95 | 42 | 11.0 | 13.5 | 11.0 | 11.1 | 9.1 |
| 81.41 | 391 | 154 | 264 | 239 | 131 | 12.4 | 14.6 | 12.4 | 12.7 | 10.2 |
| 81.51 | 464 | 116 | 126 | 127 | 94 | 13.5 | 16.5 | 13.3 | 13.7 | 11.0 |
| 81.59 | 489 | 111 | 137 | 172 | 68 | 13.6 | 16.6 | 13.1 | 13.9 | 10.8 |
| 81.62 | 576 | 171 | 141 | 198 | 63 | 15.0 | 21.5 | 13.0 | 14.2 | 12.0 |
| Residual | 3,126 | 905 | 759 | 1,013 | 428 | 11.5 | 15.8 | 10.4 | 11.3 | 8.9 |
| Integumentary system (85-88) | | | | | | | | | |
| 86.43 | 2,368 | 845 | 553 | 776 | 282 | 11.9 | 15.8 | 10.7 | 11.1 | 9.1 |
| 86.62 | 1,103 | 408 | 230 | 337 | 122 | 19.9 | 26.7 | 17.0 | 16.0 | 16.3 |
| Residual | 1,077 | 365 | 243 | 338 | 126 | 10.3 | 13.0 | 9.7 | 9.7 | 7.9 |
| Miscellaneous diagnostic and therapeutic procedures (87-99) | | | | | | | | | |
| | 14,670 | 5,409 | 2,864 | 4,140 | 2,225 | 8.6 | 10.7 | 7.9 | 8.0 | 6.9 |

\(^1\) The classification codes for the leading surgical procedures shown in this article were derived from the [International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)](https://www.cdc.gov/nchs/icd/icd9cm.htm) and are defined in the "Technical note." Some diagnostic procedures may have been more frequently reported than were the leading procedures, but were excluded from the list of the leading procedures because they were not performed in an operating room.

\(^2\) Includes Puerto Rico, Virgin Islands, Guam, American Samoa, and foreign countries not shown separately.

**SOURCE:** Health Care Financing Administration, Bureau of Data Management and Strategy; Data from the Medicare Statistical System; data development by the Office of Research and Demonstrations.
more bypass procedures increased from 66,000 in 1983 to 117,000 in 1987" (Kozak, 1989).

Selected data highlights

Medicare trend data for selected calendar years 1977-87 are presented in Table I to highlight utilization patterns by area of residence (U.S. census regions) for aged beneficiaries with surgery performed on an inpatient basis in SSHs. The data show that the proportion of surgical discharges for aged HI enrollees increased from 33 percent of all discharges for aged enrollees in 1977 to 61 percent in 1987 (Figure 1). The surgical rate per 1,000 aged HI enrollees increased 74 percent, indicating that the number of discharges for aged beneficiaries with surgery increased at a faster rate than the total aged HI enrollment population (Figure 2).

- For all aged Medicare beneficiaries receiving SSH inpatient services, the total number of discharges rose from 7.8 million in 1977 to 9.0 million in 1987, an increase of 15 percent.
- However, for aged beneficiaries with SSH inpatient surgery, the number of discharges rose from 2.6 million discharges in 1977 to 5.5 million in 1987, an increase of 114 percent.
- The total SSH discharge rate per 1,000 HI enrollees declined from 334 in 1977 to 312 in 1987, a decrease of 7 percent.
- In contrast, the corresponding surgical discharge rate per 1,000 aged HI enrollees climbed from 110 in 1977 to 191 in 1987, an increase of 74 percent.

Among the regions during the 1977-87 period, the increase in the surgical rate in the West (71 percent) and South (73 percent) Regions was similar to that for all areas (74 percent). The Northeast Region showed the largest increase (95 percent) in the surgical rate, from 108 discharges per 1,000 enrollees in 1977 to 211 discharges per 1,000 enrollees in 1987.

The North Central Region, however, showed an increase (61 percent) in the surgical rate per 1,000 HI enrollees that was substantially less than the increase in the surgical rate for all areas (74 percent). This lower increase reflects the fact that the North Central Region had the highest surgical rate among the regions in 1977 (115 discharges per 1,000 HI enrollees—5 percent above the rate for all areas) and the lowest rate in 1987 (185 discharges per 1,000 enrollees—3 percent below the rate for all areas).

For the 25 leading procedures (excluding those procedures not defined as operating room procedures by HCFA), data in Table 2 focus on regional variations in the types of surgery most frequently performed.

Figure 1
Total discharges and surgical discharges for aged Medicare enrollees receiving short-stay hospital inpatient services: Selected calendar years 1977-87

| Calendar year | Total discharges | Surgical discharges |
|---------------|------------------|---------------------|
| 1977          | 7,850            | 2,573               |
| 1981          | 9,400            | 3,171               |
| 1983          | 10,152           | 3,810               |
| 1986          | 8,917            | 5,253               |
| 1987          | 9,001            | 5,903               |

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy. Data from the Medicare Statistical System; data development by the Office of Research and Demonstrations.
performed on aged Medicare beneficiaries in the SSH inpatient setting. Table 2 data include the number of surgical discharges and surgical rates per 1,000 HI enrollees for aged Medicare enrollees undergoing specific surgical procedures in 1987. Surgical rates for ICD-9-CM code 60.2 (transurethral prostatectomy) are based on the number of male HI enrollees. Similarly, the number of female HI enrollees is the basis of the surgical rates for ICD-9-CM code 68.4 (total abdominal hysterectomy).

During 1987, discharges for the 25 leading procedures accounted for 23 percent (1.3 million) of all surgical discharges (5.5 million). Among the leading procedures, the largest number of discharges (236,000) was reported for ICD-9-CM code 60.2 (transurethral prostatectomy). For every 1,000 aged male HI enrollees residing in all areas, 20.3 discharges for transurethral prostatectomies were recorded. Males living in the Northeast Region (18.3 of every 1,000) were slightly less likely to have this surgery, and males living in the South Region (23.6 per 1,000 male HI enrollees) were more likely to have a transurethral prostatectomy.

After transurethral prostatectomy, the highest rates of SSH inpatient surgical procedures per 1,000 aged HI enrollees were reported for:

- ICD-9-CM code 51.22 (total cholecystectomy—4.3 of every 1,000 enrollees).
- ICD-9-CM code 79.35 (open reduction of fracture with internal fixation—3.7 of every 1,000 enrollees).
- ICD-9-CM code 81.41 (total knee replacement—2.2 of every 1,000 enrollees).

On the other hand, the lowest rates (fewer than 1 of every 1,000 HI enrollees) were reported for:

- ICD-9-CM code 03.09 (other exploration and decompression of the spinal cord).
- ICD-9-CM code 13.59 (other extracapsular extraction of lens).
- ICD-9-CM code 38.44 (resection of vessel with replacement aorta, abdominal).
- ICD-9-CM code 53.01 (repair of direct inguinal hernia).
- ICD-9-CM code 80.51 (excision of intervertebral disc).

It should be noted that during this period, the place of service for most lens surgery shifted from inpatient settings to outpatient settings of hospitals or to free-standing surgical centers.

Surgical rates for some of the leading procedures varied substantially among the census regions. For example:

- The surgical rate per 1,000 enrollees for ICD-9-CM code 13.59 (other extracapsular extraction of lens) ranged from 0.2 in the West Region to 2.4 in the Northeast, a difference of 1100 percent. This
variation may be in part the result of the relative scarcity of ambulatory surgical centers in the Northeast Region. Of all the ambulatory surgical centers (897) in the United States as of January 1988, only 97 centers were located in the Northeast Region.

- The surgical rate for ICD-9-CM code 53.02 (repair of indirect inguinal hernia) ranged from 0.5 in the West Region to 1.3 in the Northeast, a difference of 160 percent.

- Similarly, the surgical rate per 1,000 enrollees for ICD-9-CM code 53.01 (repair of direct inguinal hernia) varied 120 percent among the regions, ranging from 0.5 in the West Region to 1.1 in the Northeast Region.

Data presented in Table 3 highlight regional variations in hospital total charges and average charges per discharge. In 1987, the SSH total charges for all inpatient surgical procedures performed on aged Medicare HI enrollees amounted to $46.6 billion. More than 27 percent ($12.8 billion) of the total charges was for the 25 leading surgical procedures. The average charge per discharge for aged Medicare beneficiaries discharged from SSHs in 1987 ranged from $8,120 in the South Region to $9,574 in the West Region, a difference of 18 percent.

Regional variations in the average charge per discharge were substantial for some of the leading surgical procedures. For example:

- For ICD-9-CM code 36.14 (aortocoronary bypass of four or more coronary arteries), the highest average charge per discharge ($37,907) was recorded for the West Region and was 36 percent higher than the lowest average charge ($27,881) for enrollees residing in the South Region.

- A difference of 33 percent in the average charge per discharge was shown for ICD-9-CM code 86.22 (excisional debridement of wound, infection, or burn), which ranged from $11,861 in the South Region to $15,801 in the West.

- For ICD-9-CM code 81.62 (other replacement of head of femur), the average charge per discharge ranged from $9,305 in the North Central Region to $12,223 in the Northeast Region, a difference of 31 percent.

- ICD-9-CM code 79.35 (open reduction of fracture with internal fixation of femur) had an average charge ranging from $9,384 in the North Central Region to $11,956 in the Northeast, a difference of 27 percent.

In Table 4, we present the number of total days of care and the average length of stay (ALOS) for aged Medicare beneficiaries with inpatient surgical procedures performed during 1987. Differences in the ALOS per discharge among the census regions were substantial for many of the leading surgical procedures. For example:

- The ALOS per discharge for aged Medicare beneficiaries with surgery ranged from 8.2 days in the West Region to 12.2 days in the Northeast, a difference of 49 percent.

- The largest regional variation in ALOS for the leading surgical procedures was shown for ICD-9-CM code 60.2 (transurethral prostatectomy)—an ALOS that ranged from 4.8 days in the West Region to 8.9 days in the Northeast, a difference of 85 percent.

- For ICD-9-CM code 79.35 (open reduction of fracture with internal fixation, femur), the ALOS ranged from 11.7 days in the West Region to 21.0 days in the Northeast, a difference of 79 percent.

- Similarly, the ALOS for ICD-9-CM code 81.62 (other replacement of head of femur) ranged from 12.0 days in the West Region to 21.5 days in the Northeast, a difference of 79 percent.

Definition of terms

Short-stay hospital—General and special hospitals certified as participating facilities under Medicare and reporting average stays of fewer than 25 days.

Discharge—The formal release of an inpatient from a hospital. All discharges including those persons who died during their hospitalization are included.

Hospital charges—The hospital’s charges for room, board, and ancillary services as recorded on the billing form (HCFA-1450).

Surgery—Includes any operative procedures recorded on the patient’s billing form defined as surgery in the International Classification of Diseases, 9th Revision, Clinical Modification, Volume 3. This includes procedures involving incision, excision, amputation, introduction, endoscopy, repair, destruction, suture, or manipulation. For the purposes of this article, only the procedures classified as operating room procedures by HCFA were selected to appear in the list of the 25 leading procedures.

Annual surgical rate per 1,000 enrollees—A ratio of the total number of discharges with inpatient surgery (multiplied by 1,000) to the number of persons entitled to benefits as of July 1 of that year.

Sources and limitations of data

The data shown in this article were derived from the Health Care Financing Administration (HCFA) short-stay hospital inpatient stay record file. This file is generated by linking information from three HCFA master program files for Medicare beneficiaries. Thus, the statistical stay record provides information on the patient, the hospital, and the hospitalization.

The data are based on short-stay hospital stay records contained in the 20-percent inpatient stay record file. Therefore, the data are subject to sampling variability. Sample counts were multiplied by a factor of 5 to estimate population totals. The data were extracted from the short-stay hospital inpatient records received and processed in HCFA as of December 1988. Therefore, 1987 discharges recorded after that date were not included.

The surgical procedure information recorded on the sample discharge records used to prepare this article were coded based on the International Classification...
of Diseases, 9th Revision, Clinical Modification, Volume 3. Three- or four-digit codes were assigned for the principal surgical procedure of each sample bill record.

Incompleteness of data files

The incompleteness of the MEDPAR (Medicare provider analysis and review) stay record files used to prepare this article is a result of the inherent administrative time lag between the time when a bill (HCFA-1450) is submitted for payment and when it is posted to the central records. A complete count of Medicare discharges from short-stay hospitals in 1987 will probably amount to about 3 percent more than the total figures used in this study.

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Technical note

Definitions of the leading ICD-9-CM surgical procedures

| ICD-9-CM code | Procedure                                      |
|---------------|------------------------------------------------|
| 03.09         | Other exploration and decompression of spinal canal. |
| 13.59         | Other extracapsular extraction of lens.          |
| 36.01         | Single vessel percutaneous transluminal coronary angioplasty without mention of thrombolytic agent. |
| 36.13         | Aortocoronary bypass of three coronary arteries. |
| 36.14         | Aortocoronary bypass of four or more coronary arteries. |
| 37.74         | Insertion of replacement of epicardial lead (electrode) into epicardium. |
| 38.12         | Endarterectomy, other vessels of head and neck.  |
| 38.44         | Resection of vessel with replacement, aorta, abdominal. |
| 39.29         | Other (peripheral) vascular shunt or bypass.    |
| 45.73         | Right hemicolectomy.                            |
| 45.76         | Sigmoidectomy.                                  |
| 51.22         | Total cholecystectomy.                          |
| 53.01         | Repair of direct inguinal hernia.               |
| 53.02         | Repair of indirect inguinal hernia.             |
| 57.49         | Other transurethral excision or destruction of lesion or tissue. |
| 60.2          | Transurethral prostatectomy.                    |
| 68.4          | Total abdominal hysterectomy.                   |
| 79.35         | Open reduction of fracture with internal fixation—femur. |
| 80.51         | Excision of intervertebral disc.                |
| 81.41         | Total knee replacement.                         |
| 81.51         | Total hip replacement with use of methyl methacrylate. |
| 81.59         | Other total hip replacement.                    |
| 81.62         | Other replacement of head of femur.             |
| 85.43         | Unilateral extended simple mastectomy.          |
| 86.22         | Excisional debriement of wound, infection, or burn. |