

that generally are not published but are available to researchers on request. Other unpublished data used in the analysis were produced especially for OTA from government surveys and other studies. Appendix A lists the names and affiliations of the individuals who provided the data. The sources and characteristics of all data used in this analysis are identified when the data are presented. In contrast to the suggestion of some reviewers that the use of unpublished data compromises the validity of the analysis (69), OTA believes that the use of these data, along with the available published data, enhances the validity of the analysis and its conclusions. One of OTA's objectives in publishing this document is to make these data available to other researchers.

Several ongoing research projects will eventually provide more complete information than is now available about hip fracture outcomes. As noted earlier, the Agency for Health Care Policy and Research (AHCPR) has funded two studies on the effectiveness of in-hospital treatments for people with a hip fracture. One of these studies, an AHCPR-funded Patient Outcomes Research Team (PORT) project, which is being conducted by researchers at the University of Maryland School of Medicine, includes an extensive literature review and collection of data on outcomes for hip fracture patients treated in Maryland hospitals. A second AHCPR-funded study, which is being conducted by researchers at the Dartmouth Medical School, is also collecting data on patient outcomes following various in-hospital treatments for hip fracture. Merck Research Laboratories are also conducting a study of hip fracture outcomes.

At the National Institutes of Health, the Center for Medical Rehabilitation Research in the National Institute of Child Health and Human Development is funding a study of patient outcomes up to two years post-fracture. The National Institute on Aging is funding a study of changes in muscle strength and other factors following a hip fracture

that may account for the long-term functional impairments that often result from these fractures (78). Lastly, the National Institute of Arthritis and Musculoskeletal and Skin Diseases has formed a National Osteoporosis Data Group to promote the development of accurate information about osteoporosis, including information about the outcomes of osteoporosis-related hip fractures (120). Some preliminary information from several of these projects is noted in the following sections.

IN-HOSPITAL TREATMENT AND EXPENDITURES

In-hospital treatment for people with a hip fracture includes hospital care (e.g., room and board and nursing care), in-hospital physician services, anesthesia services, radiologic services, and physical therapy. This section presents the information OTA used to determine how many people age 50 and over with a hip fracture received each of the services and estimate 1990 expenditures for the services. OTA's principal findings based on this information were summarized earlier.

Expenditures for in-hospital treatment depend on the type of treatment received by the patient. Most hip fracture patients receive surgical treatment, but some receive nonsurgical treatment. The commonly used surgical treatments for hip fracture are: 1) reduction and internal fixation with surgical pins, nails, plates, and/or screws, and 2) partial or total hip replacement. Nonsurgical treatments for hip fracture include bed rest and traction.

In 1988, 183,354 individuals age 65 and over with a diagnosis of hip fracture received surgical treatment paid for by Medicare (12). According to the National Hospital Discharge Survey, 217,000 individuals age 65 and over were hospitalized in 1988 with a first-listed diagnosis of hip fracture (ICD-9-CM diagnostic code 820)⁶(136). Thus, 84 percent of individuals age 65 and over who

⁶ICD-9-CM diagnostic codes are codes for medical diagnoses from the *International Classification of Diseases, 9th Revision, Clinical Modification*, published in 1980.

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were hospitalized in 1988 with a first-listed diagnosis of hip fracture received surgical treatment paid for by Medicare. Of these individuals, two-thirds received reduction and internal fixation, and one-third received a partial or total hip replacement (12).

The proportion of people with a hip fracture that receives a total hip replacement varies greatly in different hospitals and different parts of the country. The number of total hip replacements performed for any condition has increased rapidly over the past 15 years (109).⁷ Researchers believe that the number of total hip replacements performed for people with a hip fracture has been increasing rapidly since about 1988, but variations in the way hip replacement procedures are coded make it difficult to document this trend (71,78).

If 84 percent of individuals age 65 and over who were hospitalized for a hip fracture in 1988 received surgical treatment paid for by Medicare, it is likely that the remaining 16 percent received either nonsurgical treatment or surgical treatment paid for by a source other than Medicare. About 4 percent of all elderly people are not enrolled in Medicare, and some Medicare enrollees age 65 and over with a hip fracture receive surgical treatment paid for by the VA, Workman's Compensation, or a private third-party insurer. These categories of individuals account for part of the 16 percent.

Individuals who received nonsurgical treatment account for another part of the 16 percent. OTA found little discussion of nonsurgical treatment for hip fractures in the medical literature, with the exception of a few studies cited later in this document that found higher in-hospital mortality for individuals who receive nonsurgical treatment and a few sources that recommend nonsurgical treatment for extremely frail patients who are poor surgical risks.⁸ On the other hand, HCFA

data show that in 1991, Medicare paid for nonsurgical treatment for more than 41,000 individuals with a fracture of the hip or pelvis (123). Some of these individuals had a pelvic fracture, not a hip fracture. Nevertheless, it appears that a considerable number and proportion of older people with a hip fracture receive nonsurgical treatment. This conclusion is supported by the findings of a review of the medical records of all hip fracture patients treated in Maryland hospitals in 1986: the review found that 9 to 10 percent of the patients received nonsurgical treatment (78). Likewise, findings of the 1984 National Hospital Discharge Survey cited by Pracon (99) show that 89 percent of the 239,000 people discharged from short-stay hospitals with a diagnosis of hip fracture in 1984 received surgical treatment, thus suggesting that 11 percent received nonsurgical treatment.

Very little research has been conducted on the characteristics of older people with a hip fracture who receive nonsurgical treatment. OTA found only one study that examined this subject as a secondary issue in the context of a review of the medical records of 2,762 hip fracture patients age 65 and over who were treated in 297 hospitals in five states (56). Of the 2,762 hip fracture patients, 175 (6 percent) received nonsurgical treatment. One-third of these individuals had very mild fractures, many of which involved only a bone chip. The remaining two-thirds had three distinguishing characteristics: 1) a new hip cancer, 2) inability to walk in the previous three months, and 3) less serious fractures. Sicker patients, patients who suffered a cardiac arrest in the emergency room, and patients with dementia were also somewhat more likely to receive nonsurgical treatment. A 1990 Institute of Medicine report emphasizes the need for research on the appropriateness of nonsurgical treatment for hip fracture (44).

⁷In 1991, DRG 209, which includes total hip replacement, was the fifth most frequently used DRG for Medicare patients. Because of this high volume and the relatively high Medicare reimbursement per case, DRG 209 had the second highest aggregate Medicare expenditure of any DRG (\$2.5 billion in 1991) (101).

⁸See, for example, Lyons and Nevins (76); Royal College of Physicians (105); Winter (141).

Compared with the available information about in-hospital treatment received by hip fracture patients age 65 and over, much less is known about the in-hospital treatment received by hip fracture patients age 50 to 64. HCFA data show that in 1988, 3,732 hip fracture patients age 45 to 64 received surgical treatment paid for by Medicare (12). According to the National Hospital Discharge Survey, 24,000 individuals age 45 to 64 were hospitalized in 1988 with a first-listed diagnosis of hip fracture (136). Thus, 15 percent of individuals age 45 to 64 who were hospitalized in 1988 with a first-listed diagnosis of hip fracture received surgical treatment paid for by Medicare. Two-thirds of these individuals received reduction and internal fixation, and one-third received a partial or total hip replacement. OTA is not aware of any national data on the types of treatment received by the remaining 85 percent of hip fracture patients age 45 to 64.

In general, individuals under age 65 are eligible for Medicare only after they have received social security disability benefits for two years. Since the 3,732 hip fracture patients age 45 to 64 who received surgical treatment paid for by Medicare were sufficiently disabled to be receiving social security disability benefits, they cannot be considered representative of all hip fracture patients age 45 to 64.

Based on the preceding discussion, OTA concludes that in 1988, 84 percent of hip fracture patients age 65 and over received surgical treatment; 10 percent received nonsurgical treatment; and the type of treatment received by the remaining 6 percent of hip fracture patients age 65 and over and by 85 percent of hip fracture patients age 45 to 64 is not known. OTA used these conclusions in developing the estimates of expenditures for in-hospital services discussed below.

The relationship of expenditures, costs, and charges is complex, and different sources use these terms differently. In the following discussion, the term *expenditure* is used to refer to the amount actually paid for a service by the purchaser (e.g., the patient, Medicare, or a private, third-party insurer). The term *cost* is used to refer to the amount spent by the provider to produce the ser-

vice; the true costs of the types of services discussed in this document often are not known. The term *charges* refers to the amount the provider bills for the services, except in the case of *Medicare allowed charges*, the term HCFA uses to refer to the amount of the Medicare payment plus the patient copayment for particular services.

I Use and Expenditures for Hospital Care

Medicare expenditures for hospital care (e.g., room and board and nursing care) depend on a patient's DRG category. As discussed earlier, hospital care for hip fracture patients generally falls into five DRGs, including four surgical DRGs (209, 210, 211, and 471) and one nonsurgical DRG (236). In 1988, the 84 percent of hip fracture patients age 65 and over who received surgical treatment paid for by Medicare were distributed as follows in the four surgical DRGs: 30 percent in DRG 209, 37 percent in DRG 210, 17 percent in DRG 211, and less than 1 percent in DRG 471 (12). The proportion of hip fracture patients in each of the four surgical DRGs differed little by age, and there was no consistent trend for increased or decreased assignment of patients to one or another DRG with increasing patient age (12).

As noted above, OTA concludes that 10 percent of hip fracture patients age 65 and over received nonsurgical treatment in 1988. The great majority of these individuals were in DRG 236. For the purpose of calculating average expenditures for hospital care and other in-hospital services, OTA assumed that all hip fracture patients age 65 and over who received nonsurgical treatment were in DRG 236. OTA does not have an age breakdown for hip fracture patients in DRG 236 or for the 6 percent of hip fracture patients age 65 and over for whom type of treatment is not known.

The proportion of hip fracture patients age 65 and over in various DRG categories differs in different parts of the country and probably also for different years. A study of 13,185 individuals age 65 and over treated for a first hip fracture in Maryland hospitals between 1984 and 1988 found that 16 percent were in DRG 209, 38 percent were in DRG 210, 21 percent were in DRG 211, less than 1

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TABLE 1: Average Medicare Submitted and Allowed Charges for the Five DRGs That Include Most Hip Fracture Patients, 1990

DRG Category description		Average Medicare submitted charges	Average Medicare allowed charges
209	Major joint and limb replacement	\$16,528	\$9,084
210	Hip and femur procedures except major joint, age greater than 69 or complications or comorbidities	14,223	8,283
211	Hip and femur procedures except major joint, age 18 to 69 without complications or comorbidities	9,493	5,773
471	Bilateral or multiple major joint procedures	28,336	15,666
236	Fractures of the hip and pelvis	6,518	3,800

DRG = diagnostic related group

SOURCE U S Department of Health and Human Services, Health Care Financing Administration, Off Ice of Research and Demonstrations, unpublished data, 1993

percent were in DRG 471, and 17 percent were in DRG 236; the remaining 6 percent were in 114 other DRGs, most of which included only one to three hip fracture patients (25). Among 185 hip fracture patients age 65 and over who were part of a population-based sample of older Iowans, 37 percent were in DRG 209, 50 percent were in DRG 210, 11 percent were in DRG 211, and 3 percent were in DRG 236 (13). The figure OTA used for the proportion of hip fracture patients age 65 and over that is in DRG 236—10 percent—is midway between the Maryland and Iowa figures, 17 and 3 percent, respectively.

OTA derived its estimate of the average expenditure for hospital care for hip fracture patients age 65 and over by calculating a weighted average of expenditures for patients in the five DRGs (209, 210, 211, 471, and 236) and a category “other,” with weighting based on the proportion of all hip fracture patients age 65 and over in each category in 1988, the only year for which OTA has this information. These proportions are: DRG 209, 30 percent; DRG 210, 37 percent; DRG 211, 17 percent; DRG 471, less than 1 percent; DRG 210, 10 percent; and “other,” 6 percent. OTA used Medicare allowed charges (i.e., the Medicare payment plus the patient copayment) to calculate expenditures for patients in the five DRGs. Table 1 shows the average Medicare allowed charges for each of the five DRGs in 1990, the latest year for which

data are available. For patients in the category “other,” which consists of individuals age 65 and over whose hospital care was paid for by a source other than Medicare, OTA used a figure based on hospital costs, discussed below. Using Medicare allowed charges for patients in the five DRGs and hospital costs for patients in the category “other,” OTA estimates that the average expenditure for hospital care for hip fracture patients age 65 and over was \$7,623 in 1990.

Medicare submitted charges are much higher than Medicare allowed charges (see table 1). It is generally accepted that Medicare submitted charges overstate the cost of hospital care for Medicare patients. If Medicare submitted charges were used to estimate the average expenditure for hospital care for hip fracture patients age 65 and over, the resulting figure would be \$13,300 for 1990; this figure is \$5,677 (74 percent) higher than OTA’s estimate.

Although an estimate of expenditures based on Medicare submitted charges is undoubtedly too high, OTA’s estimate, which is based primarily on Medicare allowed charges, might be too low for several reasons. First, it might be too low if OTA overestimated the proportion of hip fracture patients in DRG 236, since the Medicare allowed charge for DRG 236 is considerably lower than the Medicare allowed charges for the other four DRGs.

Second, OTA's estimate might be too low if Medicare allowed charges are lower than hospital costs for the care of hip fracture patients. According to PROPAC, Medicare allowed charges for all hospital stays reimbursed under the PPS were 1.5 percent lower than hospital costs in 1990 (101). If the figures OTA used to estimate the average expenditure for hospital care of hip fracture patients whose care was paid for by Medicare were increased to account for the difference between Medicare allowed charges and hospital costs, the average expenditure for hospital care would be **\$7,732** for 1990.

PROPAC's estimate that in 1990 Medicare allowed charges were 1.5 percent lower than hospital costs is not specific to the DRGs that include hip fracture patients, and the true difference between Medicare allowed charges and hospital costs for these DRGs may be greater or smaller (4). Some analysts believe that hospital charges are set so that low-cost services subsidize high-cost services and that, as a result, DRG payment rates, which are based in part on hospital charges, may overestimate the cost of low-cost services and underestimate the cost of high-cost services (10). Since hospital care for hip fracture patients is a relatively high-cost service, the true difference between Medicare allowed charges and hospital costs may be greater than 1.5 percent for 1990.

In calculating the average expenditure for hospital care for hip fracture patients age 65 and over, OTA used data from Medicare claims for all patients in the five DRGs. As noted earlier, some patients in these DRGs are not hip fracture patients. In addition, some Medicare claims for hospital care for hip fracture patients do not reflect the total charges for the patients' hospital stay. The previously cited study of 13,185 hip fracture patients age 65 and over treated in Maryland hospitals between 1984 and 1988 found that for 2,516 (19 percent) of the patients, the Medicare claim

underestimated the expenditure for hospital care; this underestimation occurred either because Medicare was not the primary payer or because the Medicare claim did not include all the charges for the patients' hospital stay (25). If these 2,516 patients are excluded and Medicare allowed charges for the remaining 81 percent of patients in the Maryland study are inflated to 1990 dollars (using the Department of Labor's Consumer Price Index for Hospitals and Related Services), the average expenditure for hip fracture patients age 65 and over would be \$10,059; this figure is \$2,431 (32 percent) higher than OTA's estimate.⁹The validity of extrapolating from the Maryland data to the population as a whole is unclear, however, because of regional differences in expenditures for all types of health care services. In addition, the Maryland data include some individuals who had a diagnosis of hip fracture but received very high-cost treatments that seem unrelated to hip fracture, for example, five individuals who received a craniotomy (DRG 2) (25).

Far less information is available to calculate the average expenditure for hospital care for hip fracture patients age 50 to 64 than for those age 65 and over. As noted earlier, in 1988, 15 percent of hip fracture patients age 45 to 64 received surgical treatment paid for by Medicare. The figures listed in table 1 for DRGs 209, 210, 211, and 471 apply to these individuals, but because OTA does not have an age breakdown for hip fracture patients in DRG 236, the proportion of the 15 percent of patients age 45 to 64 that should be allocated to each DRG category cannot be determined. OTA also does not have information about expenditures for hospital care for the remaining 85 percent of patients age 45 to 64.

A compilation of data from 1990 claims for 3.7 million individuals whose health benefits were provided by large employers shows the following

⁹Data from the Maryland study indicate that the Medicare average allowed charges for the five DRGs that include most hip fracture patients, updated to 1990 dollars, would be as follows: DRG 209, \$10,747; DRG 210, \$10,668; DRG 211, \$7,952; DRG 471, \$19,011; and DRG 236, \$8,717. These figures assume the exclusion of the 19 percent of hip fracture patients for whom Medicare was not the primary payer or whose Medicare claim did not include all the charges for their hospital care (25).

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amounts for the five DRGs that include most hip fracture patients: DRG 209, \$17,061; DRG 210, \$19,273; **DRG211, \$13,252**; DRG 471, \$21,003; and DRG 236, \$7,896 (84). These figures do not include claims by Medicare or Medicaid beneficiaries or Workman's Compensation claims. The figures are not comparable to other figures discussed in this section, however, because they include in-hospital physician services as well as hospital care.

Probably the best estimate of the average expenditure for hospital care for hip fracture patients age 50 to 64 is the figure noted earlier based on hospital costs—\$7,732 for 1990. Alternatively, one might use an amount based on the average charge for a hospital day (\$687 for 1990 (3)) multiplied by the average hospital length of stay for hip fracture patients age 45 to 64 (12.8 days in 1990 (137)).¹⁰ The latter alternative yields an average charge of \$8,794 for 1990. This amount is \$1,062 (14 percent) higher than the figure based on hospital costs and \$1,171 (15 percent) higher than OTA's estimate of the average expenditure for hospital care for patients age 65 and over, which is based primarily on Medicare allowed charges.

| Use and Expenditures for In-Hospital Physician Services

In-hospital physician services for hip fracture patients include treatment provided by surgeons and other types of physicians. (Services provided by anesthesiologists and radiologists are considered in the following sections.) Expenditures for in-hospital physician services for hip fracture patients depend on the treatment received by the patient.

To determine the average expenditure for in-hospital physician services for the 84 percent of hip fracture patients age 65 and over who received surgical treatment paid for by Medicare, OTA obtained 1990 data on average Medicare submitted charges, allowed charges (Medicare payment plus patient copayment), and number of people served for each of the surgical treatments for hip fracture listed in the 1990 CPT codebook (see table 2).¹¹ These treatments apply to DRGs 209, 210, and 211.¹² On the basis of Medicare allowed charges and number of people served, OTA estimates that the average physician payment for surgical treatment for hip fracture patients in DRGs 209, 210, and 211 was \$1,280 in 1990.

The 1990 CPT codebook does not contain a code for bilateral hip replacement, and OTA does not have information about the Medicare submitted or allowed charges for that surgical treatment, which would apply to DRG 471. Since less than 1 percent of all hip fracture patients age 65 and over are in DRG 471, the amount used for the physician payment for surgical treatment for these patients is unlikely to affect the total estimated expenditure for in-hospital physician services. In calculating this expenditure, OTA used the same amount for patients in DRG 471 as for patients in the other surgical DRGs, i.e., \$1,280 for 1990.

In addition to physician payments for surgical treatment, Medicare pays for "assistants at surgery." A RAND study of Medicare payments for assistants at surgery found that in 1986, two surgical treatments for hip fracture (CPT/HCPCS codes 27236 and 27244 (see table 2 for definitions)) were among the 20 surgical treatments for which assistants at surgery were most frequently reimbursed by Medicare (11 8). Nevertheless, in

¹⁰The American Hospital Association (AHA) does not provide information about the average expenditure for a hospital day. The figure cited here is the average charge for a hospital day for AHA's category "nonfederal short-term general and other special hospitals."

¹¹The *Current Procedural Terminology* (CPT) codebook lists codes for procedures and services performed by physicians. The Medicare coding system for the same services is called the HCFA common procedure coding system (HCPCS).

¹²The 1990 CPT codebook has a code for total hip replacement, 27130, which has a considerably higher average allowed charge, \$2,575 for 1990. The codebook notes that this procedure code does not apply to hip replacement following a hip fracture and that hip replacement following a hip fracture should be coded under 27236 (1990 CPT codebook, pp. 169, 170).

TABLE 2: Average Medicare Submitted and Allowed Charges
for Surgical Treatments for Hip Fracture, 1990

CPT/HCPCS code	Surgical treatment	Persons served	Average Medicare submitted charges	Total Medicare submitted charges	Average Medicare allowed charges	Total Medicare allowed charges
27220	Treatment of closed acetabulum (hip socket) fracture; without manipulation	880	\$545	\$479,600	\$325	\$286,000
27222	...with manipulation with or without skeletal traction	380	678	257,640	345	131,100
27224	Open treatment of closed or open acetabulum (hip socket) fracture, with or without internal or external skeletal fixation; simple	820	1,865	1,529,300	1,108	908,560
27225	...complicated, intrapelvic approach	180	2,314	416,520	1,377	247,860
27230	Treatment of closed femoral fracture, proximal end, neck; without manipulation	2,940	367	1,078,980	228	670,320
27232	... with manipulation including skeletal traction	560	864	483,840	658	368,480
27234	Treatment of open femoral fracture, proximal end, neck, with uncomplicated soft tissue closure, with manipulation, including skeletal traction	260	1,323	343,980	949	246,740
27235	Treatment of closed or open femoral fracture, proximal end, neck, in situ pinning of undisplaced or impacted fracture	10,240	1,937	19,834,880	1,260	12,902,400
27236	Open treatment of closed or open femoral fracture, proximal end, neck, internal fixation or prosthetic replacement	65,340	2,204	144,009,360	1,332	87,032,880
27238	Treatment of closed intertrochanteric, pertrochanteric, or subtrochanteric femoral fracture, without manipulation	1,480	643	951,640	295	436,600

(continued)

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TABLE 2: Average Medicare Submitted and Allowed Charges for Surgical Treatments for Hip Fracture, 1990 (cont'd.)

CPT/HCPCS code	Surgical treatment	Persons served	Average Medicare submitted charges	Total Medicare submitted charges	Average Medicare allowed charges	Total Medicare allowed charges
27240	...with manipulation (including skeletal traction)	840	1,390	1,167,600	755	634,200
27242	Treatment of open intertrochanteric, pertrochanteric, or subtrochanteric femoral fracture, with uncomplicated soft tissue closure (including traction)	400	2,216	886,400	1,170	468,000
27244	Open treatment of closed or open intertrochanteric, pertrochanteric, or subtrochanteric femoral fracture, with internal fixation	88,800	2,191	194,560,800	1,341	119,080,800
27246	Treatment of closed greater trochanteric fracture, without manipulation	1,480	508	751,840	347	513,560
27248	Open treatment of closed or open greater trochanteric fracture, with or without internal or external skeletal fixation	780	1,398	1,090,440	713	556,140
Totals		175,380		367,842,820		224,483,540

CPT/HCPCS = codes for procedures and services performed by physicians as listed in the *Current Procedural Terminology (CPT) codebook* and the HCFA common procedures coding system (HCPCS).

SOURCE U.S. Department of Health and Human Services, Health Care Financing Administration, Office of Research and Demonstrations, unpublished data, 1993.

1986, Medicare paid for assistants at surgery in only 2 percent of cases in which these two surgical treatments were used. The Medicare payment for assistants at surgery is 20 percent of the physician payment for the surgical treatment (18). Since Medicare pays for assistants at surgery in such a small proportion of cases, OTA did not include an

amount for this service in calculating the average expenditure for in-hospital physician services.¹³

In addition to physician payments for surgical treatment and payments for assistants at surgery, Medicare pays for physician hospital visits for some hip fracture patients who receive surgical

¹³Including an amount for assistants at surgery would increase the average expenditure for in-hospital physician services for hip fracture patients whose care is paid for by Medicare by 0.4 percent (2 percent x 20 percent) or \$5.12 (0.4 percent x \$1,280).

TABLE 3: Average Medicare Submitted and Allowed Charges for Physician Hospital Visits, 1990

CPT/HCPCS code	Type of physician hospital visit	Average Medicare submitted charges	Average Medicare allowed charges
90200	Initial hospital care; brief history and examination, initiation of diagnostic and treatment programs, and preparation of hospital records	\$97	\$63
90215	intermediate history and examination, initiation of diagnostic and treatment programs, and preparation of hospital records	133	90
	comprehensive history and examination, initiation of diagnostic and treatment programs, and preparation of hospital records	174	121
90240	Subsequent hospital care, each day; brief services	241	150
90250	.limited services	378	254
90260	. . Intermediate services	422	291
90270	.extended services	290	202
90280	.comprehensve services	302	203

CPT/HCPCS = codes for procedures and services performed by physicians as listed in the *Current Procedural Terminology* (CPT) codebook and the HCFA common procedures coding system (HCPCS)

SOURCE U S Department of Health and Human Services, Health Care Financing Administration, Office of Research and Demonstrations, unpublished data, 1993

treatment. Medicare requires that all necessary post-operative care be provided as part of the services covered by the physician payment for surgical treatment. Thus Medicare generally does not pay extra for hospital visits by physicians who perform hip fracture surgeries. A RAND study of Medicare payments for post-operative physician visits for patients who received various surgical treatments, including open reduction and internal fixation of a hip fracture (ICD-9-CM procedure code 79.35) and total hip replacement (ICD-9-CM procedure code 81 .5) found that in 1986, Medicare paid extra for hospital visits by the physician who performed the surgery in only 5 percent of cases (63). Since Medicare payment for hospital visits by the physician who performs the surgery is provided in such a small proportion of cases, OTA did not include an amount for this service in calculating the average expenditure for in-hospital physician services.

The RAND study cited above also found that in 1986 Medicare paid for an average of 11 post-operative physician visits for individuals who received open reduction and internal fixation and

eight post-operative visits for individuals who received total hip replacement (63). Most of these post-operative visits were provided by physicians in specialties different from the physician who performed the surgery. The RAND study does not distinguish between post-operative visits provided in the hospital and post-operative visits provided after the patient was discharged from the hospital, but all visits were provided within 30 days of the date of surgery. OTA included an amount for these post-operative physician services in its estimate of expenditures for outpatient physician visits, discussed later in this document.

In-hospital physician services for hip fracture patients who receive nonsurgical treatment include hospital visits and particular nonsurgical treatments. To determine the average expenditure for in-hospital physician services for the 10 percent of hip fracture patients age 65 and over who received nonsurgical treatment paid for by Medicare, OTA obtained 1990 data on average Medicare submitted and allowed charges for physician hospital visits (see table 3). Combining the average of the Medicare allowed charges for initial

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TABLE 4: Average Medicare Submitted and Allowed Charges for Five Physical Medicine Treatments That May Be Used for Hip Fracture Patients, 1990

CPT/HCPCS code	Physical medicine treatment	Average Medicare submitted charges	Average Medicare allowed charges
97012	Physical medicine treatment to one area: traction, mechanical	\$122	\$87
97110	Physical medicine treatment to one area, initial 30 minutes, each visit: therapeutic exercises	177	118
97114	.. functional activities	130	78
97116	..gait training	126	82
97540	Training in activities of daily living (self-care and/or daily life management skills); initial 30 minutes, each visit	106	80

CPT/HCPCS = codes for procedures and services performed by physicians as listed in the *Current Procedural Terminology* (CPT) codebook and the HCFA common procedures coding system(HCPCS).

SOURCE U S Department of Health and Human Services, Health Care Financing Administration, Office of Research and Demonstrations, unpublished data, 1993

physician hospital visits (\$91) and the average of the Medicare allowed charges for subsequent physician hospital visits (\$220), OTA estimates that the average expenditure for physician hospital visits for hip fracture patients age 65 and over who received nonsurgical treatment paid for by Medicare was \$311 in 1990.

In addition to physician hospital visits, in-hospital physician services for hip fracture patients who receive nonsurgical treatment may include traction, gait training, and other physical medicine procedures. Table 4 shows the average Medicare submitted and allowed charges for five physical medicine treatments that might be used for hip fracture patients. According to the CPT codebook, these treatments may be either performed or supervised by a physician. OTA is not aware of any information about the proportion of hip fracture patients that receives any of these treatments.

A RAND study of Medicare payments for physician hospital visits for patients in nonsurgical DRGs found that patients in the *major diagnostic category, musculoskeletal*, which includes DRG 236, received an average of 1.16 physician visits per hospital day (1 19). This average includes 1.04 visits per day for patients who received hospital visits from only one physician and 1.42 visits per

day for patients who received hospital visits from more than one physician.

To account for the use of physical medicine treatments for some hip fracture patients age 65 and over who received nonsurgical treatment, OTA added to its estimate of expenditures for in-hospital physician services an amount based on the average of the Medicare allowed charges for the five physical medicine treatments listed in table 4--\$89 for 1990--multiplied by the average number of physician hospital visits in excess of one visit per patient per day taken from the RAND study-O. 1&multiplied by the average hospital length of stay for people in DRG 236--10 days in 1990 (123). The resulting figure was \$453 for 1990.

OTA does not have information about expenditures for in-hospital physician services by sources other than Medicare. Consequently, for patients in the category "other" (i.e., patients age 65 and over whose hospital care was paid for by a source other than Medicare), OTA used an expenditure based on Medicare submitted charges for the five DRG categories as discussed below, i.e., \$1,946 for 1990.

On the basis of the expenditures for in-hospital physician services discussed thus far in this section, OTA calculated a weighted average expendi-

ture for in-hospital physician services for hip fracture patients age 65 and over, with weighting based on the proportion of all such patients in each of the five DRGs and the category “other.” The resulting average expenditure was \$1,236 for 1990.¹⁴

Medicare submitted charges for in-hospital physician services are much higher than Medicare allowed charges for these services (see tables 2,3, and 4). If Medicare submitted charges were used to estimate the average expenditure for in-hospital physician services, the resulting figure would be \$1,946 for 1990; this figure is \$710 (57 percent) higher than OTA’s estimate.

The Medicare submitted and allowed charges listed in tables 2,3, and 4 apply to the 15 percent of hip fracture patients age 45 to 64 who received surgical treatment paid for by Medicare, but OTA does not know the proportion of these individuals that should be allocated to each DRG. OTA also does not have information to determine the physician payment for the remaining 85 percent of hip fracture patients age 45 to 64. Lacking this information, OTA used the just-cited figure based on Medicare submitted charges, \$1,946 for 1990, as an estimated average expenditure for in-hospital physician services for hip fracture patients age 50 to 64. This figure probably overestimates the true expenditure for in-hospital physician services for these patients.

| Use and Expenditures for In-Hospital Anesthesia Services

Hip fracture patients who are treated surgically receive anesthesia services in addition to other in-hospital physician services. To determine the average expenditure for anesthesia services, OTA obtained 1990 data on average Medicare submitted charges, allowed charges (Medicare payment plus patient copayment), and number of

people served for all anesthesia services for procedures pertaining to the hip that are listed in the 1990 CPT codebook (see table 5). On the basis of Medicare allowed charges and the number of people served, OTA estimates that the average expenditure for anesthesia services for hip fracture patients age 65 and over in DRGs 209,210,211, and 471 was \$339 in 1990.

Hip fracture patients in DRG 236 generally do not receive anesthesia services, but some patients in the category “other” (individuals age 65 and over whose hospital care was paid for by a source other than Medicare) do receive anesthesia services. OTA does not have information about expenditures for anesthesia services by sources other than Medicare. Consequently, for patients in the category “other,” OTA used a figure based on Medicare submitted charges as discussed below, i.e., \$576 for 1990.

Using the figures discussed thus far in this section, including a zero figure for DRG 236, OTA calculated a weighted average expenditure for anesthesia services for hip fracture patients age 65 and over, with weighting based on the proportion of all such patients in each of the DRGs and the category “other.” The resulting average expenditure was \$319 for 1990.

Medicare submitted charges for anesthesia services are much higher than Medicare allowed charges for these services (see table 5). If Medicare submitted charges are used to estimate the average expenditure for anesthesia services, the resulting figure is \$576 for 1990; this figure is \$257 (80 percent) higher than OTA’s estimate, which is based primarily on Medicare allowed charges.

The Medicare submitted and allowed charges listed in table 5 apply to the 15 percent of hip fracture patients age 45 to 64 who received surgical treatment paid for by Medicare. OTA does not

¹⁴OTA computed this figure using three different assumptions about the average expenditure for in-hospital physician services for Patients in DRG 236. Assuming only one physical medicine visit per patient per hospital stay, the average expenditure would be \$1,231. Assuming five physical medicine visits per patient per hospital stay, the average expenditure would be \$1,267. Assuming 10 physical medicine visits per patient per hospital stay, the average expenditure would be \$1,311. These small changes, -\$5, +\$31, and +\$75 multiplied by 245,000 hip fracture patients age 65 and over in 1990, make a difference of -\$1,225,000, +\$7,595,000, and +\$1 8,375,000, respectively, in annual expenditures.

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TABLE 5: Medicare Submitted and Allowed Charges for Anesthesia Services for Procedures Involving the Hip Joint, 1990

CPT/HCPCS code	Anesthesia services for procedures involving the hip	Persons served	Average Medicare submitted charges	Total Medicare submitted charges	Average Medicare allowed charges	Total Medicare allowed charges
01200	Anesthesia for all closed procedures involving the hip joint	6,900	\$368	\$2,539,200	\$175	\$1,207,500
01210	Anesthesia for open procedures involving the hip joint, not otherwise specified	104,220	525	54,715,500	268	27,930,960
01214	Anesthesia for total hip replacement or revision	83,400	815	67,971,000	442	36,862,800
	Totals	194,520		125,225,700		66,001,260

CPT/HCPCS = codes for procedures and services performed by physicians as listed in the *Current Procedural Terminology* (CPT) codebook and the HCFA common procedures coding system (HCPCS).

SOURCE: U.S. Department of Health and Human Services, Health Care Financing Administration, Office of Research and Demonstrations, unpublished data, 1993

have information to determine the average expenditure for anesthesia services for the remaining 85 percent of hip fracture patients age 45 to 64. Lacking this information, OTA used the just-cited figure based on Medicare submitted charges, \$576 for 1990, as an estimated average expenditure for anesthesia services for hip fracture patients age 50 to 64. This figure probably overestimates the average expenditure for anesthesia services for these patients.

| Use and Expenditures for In-Hospital Radiologic Services

Hip fracture patients receive x-rays and may receive other radiologic services, such as bone densitometry to detect osteoporosis. To determine the average expenditure for in-hospital radiologic services, OTA obtained 1990 data on average Medicare submitted and allowed charges (Medicare payment plus patient copayment) for the diagnostic radiologic services pertaining to the hip that are listed in the 1990 CPT codebook (see table 6).

OTA does not have information about the number of x-rays received by hip fracture patients. For

this analysis, an average of four x-rays per patient was assumed.

In 1990, the only method of bone densitometry covered by Medicare was single photon absorptiometry (SPA). That year, Medicare paid for SPA for a total of 20,060 people (123). OTA does not know the proportion of these people that was in the hospital or the proportion that had a hip fracture. Medicare data show that in 1988 only 640 (less than 1 percent) of the 17,360 people who received Medicare reimbursement for SPA were in the hospital (124). Thus it is likely that very few hip fracture patients received SPA in the hospital in 1990. For this reason, OTA did not include an amount for SPA in calculating the average expenditure for in-hospital radiologic services.

In 1990, Medicare paid for computerized axial tomography of the lower extremity, another radiologic service that may be used for hip fracture patients, for about 21,000 people (123). OTA does not know the proportion of these people that was in the hospital or the proportion that had a hip fracture. Based on the findings cited above with respect to the use of SPA, OTA assumed that very

TABLE 6: Average Medicare Submitted and Allowed Charges for Diagnostic Radiology Services That May Be Used for Hip Fracture Patients, 1990

CPT/HCPCS code	Diagnostic radiology service	Average Medicare submitted charges	Average Medicare allowed charges
73500	Radiologic examination, hip; unilateral, one view	\$42	\$28
73510	..complete, minimum of two views	65	41
73520	Radiologic examination, hips, bilateral, minimum of two views of each hip, including anteroposterior view of pelvis	61	35
73525	Radiologic examination, hip, arthrography, supervision and Interpretation only	79	48
73526	..complete procedure	168	101
78350	Bone density (bone mineral content) study, single photon absorptiometry	118	71
73700	Computerized axial tomography, lower extremity, without contrast material	217	132
73701	with contrast material(s)	183	113
73702	without contrast material, followed by contrast material(s) and further sections	204	146

CPT/HCPCS = codes for procedures and services performed by physicians as listed in the *Current Procedural Terminology* (CPT) codebook and the HCFA common procedures coding system (HCPCS)

SOURCE U S Department of Health and Human Services, Health Care Financing Administration, Office of Research and Demonstrations, unpublished data, 1993

few hip fracture patients received computerized axial tomography in the hospital. For this reason, OTA did not include an amount for this service in calculating the average expenditure for in-hospital radiologic services.

For Medicare purposes, payment for the hospital costs of radiologic services, such as supplies and technicians' salaries, is considered to be included in the payment for hospital services; thus there is no additional expenditure for these components of in-hospital radiologic services for hip fracture patients whose hospital care is paid for by Medicare (i.e., 94 percent of patients age 65 and over and 15 percent of patients age 50 to 64). There is, however, an additional Medicare payment, and thus an additional expenditure, for the radiologist who reads and interprets the test for these patients. For hip fracture patients whose hospital care is paid for by a source other than Medicare (i.e., 6 percent of hip fracture patients age 65 and over and 85 percent of hip fracture pa-

tients age 50 to 64), there is an additional expenditure for radiologic services that includes both the hospital costs of the services and the radiologist's fee.

For hip fracture patients whose care is paid for by Medicare, OTA calculated an estimated expenditure for in-hospital radiologic services by multiplying four times one-half of the average of the Medicare allowed charges for the five relevant procedures (CPT/HCPCS code numbers 73500, 73510, 73520, 73525, and 73526), which yields \$102 per patient for 1990. This figure assumes that the radiologist's fee accounts for one-half of the total payment for the service. For patients whose care is paid for by a source other than Medicare, OTA calculated an estimated expenditure for in-hospital radiologic services by multiplying four times the average of the Medicare submitted charges for the same five procedures, which yields \$332 per patient for 1990.

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Since 94 percent of hip fracture patients age 65 and over have their hospital care paid for by Medicare and 6 percent do not, the average payment for radiologic services for patients age 65 and over would be \$116. Since 15 percent of the hip fracture patients age 50 to 64 have their hospital care paid for by Medicare and 85 percent do not, the average payment for radiologic services for patients age 50 to 64 would be \$298.

I Use and Expenditures for In-Hospital Physical Therapy

Many hip fracture patients receive physical therapy in the hospital. A study of 814 hip fracture patients treated in Maryland hospitals from 1984 to 1986 found that virtually all received some in-hospital physical therapy. The amount of physical therapy varied greatly, however, from one to 40 sessions per patient (79).

With the decrease in average hospital length of stay in recent years, particularly since the implementation of Medicare's prospective payment system (PPS), some observers have predicted that hip fracture patients would receive less physical therapy. Three studies examined this question in individual hospitals and found that the average number of physical therapy sessions per patient per day for hip fracture patients age 65 and over increased in the post-PPS period, but because of the shorter average hospital length of stay, the total number of physical therapy sessions per patient per hospital stay decreased (28,29,95). In these three studies, the average number of physical therapy sessions per patient per hospital stay ranged from 4.9 to 9.8 in the post-PPS period. All subjects in these three studies received surgical treatment for their hip fracture. In one of the studies in which a large proportion of the sample cases in the post-PPS period was enrolled in an HMO, the average hospital length of stay was significantly shorter for the HMO cases than the conventional

Medicare cases (7.3 versus 14.0 days, respectively), and the HMO patients received significantly fewer physical therapy sessions (3.5 versus 7.1 sessions, respectively) (29). OTA is not aware of any national data on the proportion of hip fracture patients that receives physical therapy or the number of physical therapy sessions they receive.

For Medicare purposes, payment for physical therapy is considered to be included in the payment for hospital care for hip fracture patients; thus there is generally no additional payment for in-hospital physical therapy for patients whose hospital care is paid for by Medicare. For patients whose hospital care is paid for by a source other than Medicare (i.e., 6 percent of hip fracture patients age 65 and over and 85 percent of patients age 50 to 64), there may be an additional payment for physical therapy.

OTA does not have information about the amount of payments for in-hospital physical therapy. The American Physical Therapy Association is unable to provide this information but identified as physical therapy codes the CPT/HCPCS codes for physical medicine treatments plus five additional codes not listed in the 1990 CPT codebook (92).¹⁵ Table 4 (earlier in this document) shows the average Medicare submitted and allowed charges for 1990 for five physical medicine treatments that may be used for hip fracture patients. These codes were among the codes identified by the American Physical Therapy Association as physical therapy codes. According to the CPT codebook, these treatments may be either performed or supervised by a physician.

Lacking national information about the number of in-hospital physical therapy sessions received by hip fracture patients, OTA assumed an average of seven sessions, based on the midpoint of the average number of physical therapy sessions received by patients in the three studies discussed above. Lacking information about the

¹⁵The American Physical Therapy Association identified as physical therapy codes 97010-97752 plus M0005 (Office visit, two modalities), M0006 (additional 15 minutes), M0007 (office visit and modalities and/or procedures), Q0103 (physical therapy initial evaluation), and Q0104 (physical therapy reevaluation).

TABLE 7: OTA's Estimate of Expenditures for In-Hospital Services for Hip Fracture Patients Age 50 and Over, 1990

In-hospital services	Estimated per patient expenditures	Alternate estimates
<i>For patients age 65 and over</i>		
Hospital care	\$7,623	\$7,732
In-hospital physician services	1,236	
Anesthesia services	319	
In-hospital radiologic services	116	
In-hospital physical therapy	28	
Total	9,322	
For patients age 50 to 64		
Hospital care	7,732	8,794
In-hospital physician services	1,946	
Anesthesia services	576	
In-hospital radiologic services	298	
In-hospital physical therapy	785	
Total	11,337	

SOURCE Office of Technology Assessment, 1993

amount of payments for in-hospital physical therapy, OTA used an average of the Medicare submitted charges for the five physical medicine treatments listed in table 4—\$132 per session. On the basis of these two figures, OTA estimated that the average expenditure for in-hospital physical therapy was \$924 for 1990. This figure undoubtedly overestimates the true expenditure for in-hospital physical therapy, in part because it is based on charges and in part because the average charges for physical medicine treatments, which may be provided by a physician, are likely to be higher than the average charges for treatments provided by a physical therapist.

The figure just cited—\$924 for 1990—applies only to hip fracture patients whose hospital care was paid for by a source other than Medicare. It is likely that some private, third-party insurers do not pay extra for in-hospital physical therapy; OTA assumed that half of the patients whose hospital care was paid for by a source other than Medicare had third-party insurance that pays extra for in-hospital physical therapy. Using that as-

sumption, OTA added an expenditure of \$924 to the in-hospital expenditures of half of the 6 percent of patients age 65 and over in the category “other,” whose hospital care is paid for by a source other than Medicare, and half of the 85 percent of patients age 50 to 64, whose hospital care is also paid for by a source other than Medicare. Adding an expenditure of \$924 for half of the patients in the category “other” increases the average expenditure for in-hospital services for all hip fracture patients age 65 and over by \$28. Adding an expenditure of \$924 for half of the 85 percent of patients age 50 to 64 whose care is not paid for by Medicare increases the average expenditure for in-hospital services for all hip fracture patients age 50 to 64 by \$785.

| OTA's Estimate of Total Per Patient Expenditures for In-Hospital Services

Table 7 summarizes OTA's estimate of 1990 per patient expenditures for in-hospital services for hip fracture patients age 65 and over and 50 to 64.