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of patients age 65 and over (94 percent) receive hospital care paid for by Medicare, the average Medicare allowed charge would seem to be the most accurate estimate of expenditures for these patients. If the nonreimbursed cost of hospital care for Medicare-covered hip fracture patients is shifted to hip fracture patients age 50 and over whose care is paid for by a source other than Medicare, that shifted cost is presumably included in the higher, charge-based figures OTA used for those patients. If the nonreimbursed cost of hospital care for Medicare-covered hip fracture patients is shifted to younger or older patients hospitalized for the treatment of other diseases and conditions, it is hard to imagine how that cost could be ascertained.

Another controversial aspect of OTA's estimate of expenditures for hip fracture from the perspective of some outside reviewers is OTA's decision to attribute only one year of nursing home care to hip fracture. Several reviewers pointed out that some hip fracture patients remain in a nursing home for longer than one year because of complications that develop in connection with their fracture or the treatment they receive for the fracture or because they lose their home during their nursing home stay and have no place to return to in the community. OTA's reasons for limiting to one year the amount of nursing home care attributed to hip fracture are discussed at length later in this document. Clearly, the more nursing home care that is attributed to hip fracture, the greater the total estimated per patient expenditure for hip fracture patients.

In this context, it is interesting to note that the total per patient expenditure for hip fracture patients age 65 and over includes almost equal amounts for in-hospital and post-hospital services. This distribution of expenditures results in part from the reduction in average hospital length of stay for hip fracture patients, which leads to lower expenditures for in-hospital services and

high use and expenditures for post-hospital services. The high use and expenditures for post-hospital services, including nursing home care, also reflect the impact of an acute trauma in very old people, many of whom lack the physiological reserve that would allow them to recover as quickly or completely as younger people, or in some cases, to recover at all.

Three types of approaches could be used to reduce the negative outcomes of hip fractures:

- approaches to prevent the fractures,
- approaches to improve in-hospital treatment for hip fracture patients, and
- approaches to improve post-hospital services for these patients.

Several federal agencies are currently funding research to support each of these approaches, including the projects mentioned earlier that have evaluated or are evaluating various in-hospital treatments and post-hospital services for hip fracture patients.

SOURCES OF DATA ON HIP FRACTURE OUTCOMES

The National Hospital Discharge Survey, an annual survey of discharges from a representative sample of nonfederal, short-stay hospitals in the United States, provides information about in-hospital mortality and discharge destination according to patient diagnosis. To OTA's knowledge, the survey is the only source of national data of this kind for all hip fracture patients. The potential problems in using the data are: 1) missing or incomplete data for about 10 percent of the sample cases, 2) the possibility of miscoded data, 3) the uncertainty associated with extrapolating from categories with small numbers of sample cases, for example, the category of individuals age 100 and over, and 4) lack of information about the small proportion of people with a hip fracture that is not hospitalized or is hospitalized in facilities

not included in the National Hospital Discharge Survey.²

A 1990 Health Care Financing Administration *Special Report* provides national data for 1986 on one year post-fracture mortality and hospital readmission for some types of hip fracture patients (121, 122). The data, derived from Medicare records, pertain to individuals age 65 and over with a hip fracture for whom Medicare payment was provided for one of two types of surgical treatment:

- reduction with or without internal fixation of the joint (i.e., repositioning of the bones to restore the correct alignment with or without subsequent stabilization of the joint with surgical pins, nails, plates, and/or screws) (ICD-9-CM procedure codes 79.05, 79.15, 79.25, 79.35)³; or
- partial replacement of the hip joint (i.e., replacement of one part of the joint—usually the head of the femur—with an artificial prosthesis) (ICD-9-CM procedure code 81.6).

The primary problem in using these data is the substantial number and proportion of individuals with a hip fracture that are not included. In the age group 65 and over, the categories of individuals not included in the data are Medicare beneficiaries with a hip fracture who were not treated surgically for the fracture; Medicare beneficiaries with a hip fracture who received a total hip replacement (ICD-9-CM procedure code 81.5); individuals with a hip fracture who were not enrolled in Medicare, whose Medicare claim had not been processed at the time the data were assembled, or whose hip fracture treatment was paid for by a source other than Medicare; and individuals who

were not hospitalized for their hip fracture. OTA estimates that these categories include more than 30,000 individuals—about 14 percent of all people age 65 and over with a hip fracture in 1986.⁴ The study population for the HCFA *Special Report* also does not include individuals under age 65 with a hip fracture.

The 1987 National Medical Expenditure Survey provides information about the use of and expenditures for inpatient and outpatient hospital care, physician services, and home health care for a nationally representative sample of the civilian, noninstitutionalized population by patient diagnosis. The institutional component of the survey provides information about a nationally representative sample of nursing home residents, including information about the number of residents discharged to a hospital in 1987 by their diagnosis. The primary problem in using these data is the relatively small number of hip fractures that occurred in the survey samples. The survey was designed to provide statistically valid estimates of the frequency of conditions and events that occurred at least 100 times in the survey samples. Hip fractures and the use of most types of services by hip fracture patients were “rare events” in this context, and the validity of population estimates derived from the survey data is questionable for this reason (104).

In addition to these sources of national data, information about hip fracture outcomes is available from numerous studies of patients treated in individual hospitals or hospitals in certain geographic areas. The findings from these studies are less likely than national data to be representative of the whole population. On the other hand, many of the

² Department of Veterans Affairs (VA) hospitals are not included in the National Hospital Discharge Survey, and some hip fracture patients are treated in VA hospitals. Males are much more likely than females to be treated in VA hospitals. A study in six New England states found that 4 percent of males with a hip fracture and 1 percent of females with a hip fracture were treated in VA hospitals (27). Some individuals who are treated in VA hospitals are admitted initially to a non-VA hospital, however, and may be represented in the National Hospital Discharge Survey data for this reason.

³ ICD-9-CM procedure codes are codes for surgical and nonsurgical medical procedures from the *International Classification of Diseases, 9th Revision, Clinical Modification*, Vol. 3, published in 1980.

⁴ The HCFA *Special Report* provides data on 187,739 Medicare beneficiaries age 65 and over who had a hip fracture in 1986. In contrast, the National Hospital Discharge Survey cites 218,000 persons age 65 and over with a hip fracture in 1986 (135)—a difference of 30,261.

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studies provide more detailed information or information about outcomes not addressed in the national studies. OTA used findings from studies of hip fracture patients treated in individual hospitals or in certain geographic areas to refine, verify, and expand on data from the national studies.

Lastly, some information about hip fracture outcomes is available from studies of people in particular diagnostic related groups (DRGs).⁵ Individuals with a hip fracture generally are included in one of the following five DRGs:

- DRG 209: major joint and limb reattachment procedures,
- DRG 2 10: hip and femur procedures except major joint, age greater than 69 or complications or comorbidities,
- DRG 2 11: hip and femur procedures except major joint, age 18 to 69 without complications or comorbidities,
- DRG471: bilateral or multiple major joint procedures of the lower extremities, and
- DRG 236: fractures of the hip and pelvis.

Several studies have collected detailed information about post-hospital mortality, service use, and functional impairment for people in one or more of these DRGs. The problem in using this information is that the five DRGs that include most hip fracture patients also include people who have not had a hip fracture. DRG 209, for example, includes people who have a hip replacement following a hip fracture as well as people who have a hip replacement because of arthritis or accidental injury and people who have other major joints (e.g., knees) replaced. Because the DRGs include people who have not had a hip fracture, data from studies of people in a particular DRG may be difficult to interpret with respect to hip fracture. As with the findings of studies of hip fracture patients treated in individual hospitals and hospitals in certain geographic areas, OTA used findings from studies of people in particular

DRGs to verify, refine, and expand on findings of national surveys.

The University of Minnesota's Post Acute Care Study solved the problem noted above by using diagnostic information to identify hip fracture patients within DRGs (139). The study was conducted in 1988 and 1989 and involved 606 hip fracture patients age 65 and over who were discharged alive from 52 hospitals in three metropolitan areas (Pittsburgh, Minneapolis/St. Paul, and Houston). Information was collected about hospital discharge location and patient outcomes at six weeks, six months, and one year post-discharge. OTA used the study findings extensively to estimate the proportion of hip fracture patients that uses various post-hospital services.

In analyzing the outcomes of hip fracture, OTA attempted to identify the types of services that might be used to treat hip fractures and then gathered information from any available source about actual use of and expenditures for these services. An alternate methodology, sometimes referred to as an *incidence-based cost of illness analysis*, would have involved selecting a time period around the hip fracture and gathering information about the use of and expenditures for any services provided in that time period. This methodology is being used by at least one group of researchers to calculate expenditures for hip fractures (25). The relative advantages of the two approaches are debatable. In the case of hip fractures, most of which occur in very old people, OTA is concerned that the incidence-based cost of illness methodology may result in the attribution of considerable expenditures to hip fracture which are more correctly attributable to a variety of other chronic and acute diseases and conditions that are common in very old people.

Some of the data used in this analysis are unpublished. Most of the unpublished data consist of figures from government surveys and databases

⁵DRGs are mutually exclusive categories used by Medicare and some private insurers to determine the amount of payment for particular types of hospital stays. DRGs are based on patient diagnosis, the surgical or medical procedures performed in a hospital stay, patient age, and the presence or absence of complications or comorbidities that are likely to affect the use of hospital resources.