TABLE 8: In-Hospital Mortality for Hip Fracture Patients Treated in Short-Stay Nonfederal Hospitals, by Age and Gender, 1988

Age	Number	All hip fracture patients	Male hip fracture patients	Female hip fracture patients
50-59	**8,179**	1%	—	1%
60-69	33,557	4	7%	1
70-79	62,707	3	10	<1
80-89	98,188	2	3	2
90-99	33,476	7	16	5
1 00+	1,350	77	100	—
Totals	**237,457**	**3**	**9**	**2**

SOURCE U S. Department of Health and HumarServices, Public Health Service, National Center for HealthStatistics, unpublished data from the 1988 National Hospital Discharge Survey, 1992

Alternate amounts are given for hospital care, as discussed earlier. If the alternate amounts were used, the total per patient expenditure for patients age 65 and over would be increased by $109 (1 percent) and the total per patient expenditure for patients age 50 to 64 would be increased by $1,062 (9 percent).

Contrary to what might be expected, the estimated total per patient expenditure is higher for hip fracture patients age 50 to 64 than for those age 65 and over. This finding is explained in part by the relative dearth of expenditure data for patients whose care is paid for by a source other than Medicare—predominantly those under age 65—and thus OTA's greater use of charge data for these patients. If more information about expenditures were available for patients whose hospital care is paid for by a source other than Medicare, the estimated per patient expenditure figure for those age 50 to 64 would be lower. Likewise, if the per patient expenditure for patients age 65 and over were calculated on the basis of charge rather than expenditure data, the resulting figure would be much higher.

In addition, however, the true per patient expenditure for in-hospital services may be higher for hip fracture patients age 50 to 64 than for those age 65 and over because Medicare's cost containment procedures, primarily PPS, have been effective in holding down the cost of hospital care for Medicare-covered patients. As discussed earlier, PROPAC estimates that Medicare payments were 1.5 percent lower than hospital costs in 1990; this gap increased to 3.4 percent in 1991, 6.4 percent in 1992, and 9.9 percent in 1993 (101). This difference—in effect, the cost of hospital care for Medicare-covered patients that is not reimbursed by Medicare—may be shifted to other payers. In the case of hip fracture where such a large proportion of patients age 65 and over (94 percent) receive hospital care that is paid for by Medicare, it is unclear whether nonreimbursed costs for Medicare patients may be shifted to hip fracture patients age 65 and over whose care is paid for by a source other than Medicare, hip fracture patients under age 65 whose care is paid for by a source other than Medicare, older and younger patients hospitalized for the treatment of other diseases and conditions, or a combination of the above.

IN-HOSPITAL MORTALITY

A small proportion of hip fracture patients dies in the hospital. This section presents the information OTA used to estimate in-hospital mortality for people age 50 and over with a hip fracture. OTA's principal findings based on this information were summarized at the beginning of this document.

Tables 8 and 9 show in-hospital mortality based on unpublished data from the 1988 and 1991 Na-

TABLE 9: In-Hospital Mortality for Hip Fracture Patients Treated in Short-Stay Nonfederal Hospitals, by Age and Gender, 1991

Age	Number	All hip fracture patients	Male hip fracture patients	Female hip fracture patients
50-59	**9,970**	1%	—	1%
60-69	26,272	3	5%	1
70-79	79,273	3	7	2
80-89	122,821	4	9	3
90-99	42,281	4	9	3
1 00+	1,068	29	59	22
Totals	**281,685**	**4**	**7**	**3**

SOURCE: U S Department of Health and Human Services, Public Health Service, National Center for Health Statistics, unpublished data from the 1991 National Hospital Discharge Survey, 1992

tional Hospital Discharge Surveys for people age 50 and over with a first-listed diagnosis of hip fracture (ICD-9-CM diagnostic code 820). The data show that an average of 3 to 4 percent of the patients died in the hospital. *These data and all other mortality data discussed in this section reflect all-cause mortality for hip fracture patients, not just mortality specifically attributable to the fracture.*

Table B-1 in appendix B presents data on all-cause mortality following hip fracture from numerous other studies. Many of these studies found higher average in-hospital mortality than the 1988 and 1991 National Hospital Discharge Surveys. As discussed below, differences among the studies in the characteristics of their subjects probably account for most of the differences in their findings on in-hospital mortality.

Factors That Affect In-Hospital Mortality

Numerous factors have been shown to affect in-hospital mortality following a hip fracture. Patient age is one factor. Virtually all studies of hip fracture patients show that in-hospital mortality is higher for older patients. Some of the studies in table B-1 included only individuals age 65 and over, whereas other studies also included younger people, who have lower in-hospital mortality. The differences among the studies in the age of their subjects is one reason for the differences in their findings on in-hospital mortality.

A second factor that affects in-hospital mortality is patient gender. In-hospital mortality is much higher for males than females. The 1988 and 1991 National Hospital Discharge Surveys found that average in-hospital mortality was 7 to 9 percent for males compared with 2 to 3 percent for females (see tables 8 and 9). Similarly, a study of 27,000 people with a hip fracture treated in Maryland hospitals from 1979 to 1988 found that average in-hospital mortality was 8 percent for males, compared with 4 percent for females (88). When other variables, such as patient age, number and type of other medical diagnoses, and post-operative complications, were included in the analysis, the relative risk of dying in the hospital was 1.6 for male versus female hip fracture patients. The greater in-hospital mortality of male hip fracture patients means that studies with a large proportion of males in their sample are likely to show higher average in-hospital mortality.

Race is a third factor that affects in-hospital mortality. A study of 19,000 people with a hip fracture treated in Illinois hospitals from 1980 to 1982 found that in-hospital mortality was higher for white males than black males (10.5 versus 9.3 percent, respectively) and lower for white females than black females (5.0 versus 8.2 percent, respec-

tively (59)). The study cited above of 27,000 people with a hip fracture treated in Maryland hospitals from 1979 to 1988 had similar findings (88). The findings from both studies are at least partially explained by differences in the average age at which hip fractures occur in different racial groups. After adjustment for age, the study of hip fracture patients treated in Illinois hospitals found that the relative risk of dying was only 1.02 for white males versus black males (59).

A fourth factor that affects in-hospital mortality is a patient's general physical condition and coexisting illnesses. In-hospital mortality is higher, on average, for individuals with poor pre-fracture functional status (17,142), serious coexisting illnesses (22,79,88), multiple medical diagnoses (88), and delirium (83). Studies that include a greater proportion of individuals with any of these conditions are likely to show higher average in-hospital mortality.

In-hospital mortality is often said to be higher for individuals living in a nursing home than for individuals living in the community at the time of their fracture. Although OTA found no research to substantiate this assertion, it is likely to be true because of the poorer general physical condition of nursing home residents and their greater average age. Moreover, several studies cited in the following section show that long-term mortality is higher for individuals living in a nursing home at the time of their fracture. If it is true that individuals living in a nursing home at the time of their fracture have higher in-hospital mortality, then studies that include such individuals are likely to show higher in-hospital mortality.

The exact location of an individual's hip fracture is sometimes said to affect in-hospital mortality, and many studies have compared in-hospital mortality for individuals with different types of hip fractures. The studies vary in their categorization of hip fractures, but with a few exceptions, they have found no significant difference in in-hospital mortality for different types of hip fractures (17,22,62,87,88).16

Another factor that affects in-hospital mortality is the type of treatment received. The study of 27,000 hip fracture patients treated in Maryland hospitals between 1979 and 1988 found that in-hospital mortality was lower for patients who received surgical treatment than for those who received nonsurgical treatment (4 percent versus 9 to 12 percent, respectively) (88). Several earlier studies had similar findings (70,83). In analyzing these findings, it is difficult to separate the effects of type of treatment from the effects of patient characteristics that lead to a decision to use that type of treatment. Nevertheless, studies that include individuals who receive nonsurgical treatment are likely to show higher average in-hospital mortality.

In addition to patient characteristics and type of treatment, hospital length of stay may affect in-hospital mortality. Average hospital length of stay for hip fracture patients has decreased greatly in recent years, partly in response to PPS, which was introduced in late 1983. A study of 2,762 hip fracture patients treated in 297 hospitals in five states between 1981 and 1986 found that average hospital length of stay dropped 28 percent, from 20.1 days in 1981 and 1982 to 14.5 days in 1985 and 1986 (51). According to the National Hospital Discharge Survey, average hospital length of stay for hip fracture patients age 45 and over was 13 days in 1990 (137). With the decrease in average hospital length of stay, it is possible that some hip fracture patients who would have died in the hospital if they had stayed longer instead die at home or in a nursing home after their discharge from the hospital. As a result, studies with shorter average hospital length of stay may show lower in-hospital mortality.

16 OTA is aware of two research groups that found differences in in-hospital mortality for individuals with different types of hip fractures. In a small, retrospective study, Lawton et al. (63) found higher in-hospitalmortality for persons with a trochanteric versus a cervical hip fracture. In contrast, in a slightly larger, prospective study, the same researchers found lower in-hospital mortality for persons with a trochanteric versus a cervical fracture (63). Matheny et al. (83) also found lower in-hospital mortality for persons with a trochanteric versus a cervical hip fracture.