Not all hip fractures in people age 50 and over are attributable to osteoporosis. Thus the outcomes discussed in this background paper are not entirely attributable to osteoporosis. On the other hand, osteoporosis results in many types of fractures in addition to hip fractures, and the outcomes of these other fractures add to its overall societal impact. Consequently, the outcomes of hip fracture discussed in this document are not synonymous with the societal impact of osteoporosis.

Many of the outcomes discussed in this document represent gross mortality, service use, and functional impairment for people with a hip fracture. As noted above, most people with a hip fracture are very old. Mortality, service use, and functional impairment are relatively high for very old people in general. Thus the gross estimates presented here must be considered against the background of this high mortality, service use, and functional impairment.

The first section of the background paper summarizes OTA's principal findings about the outcomes of hip fracture. Later sections discuss sources of data and detailed findings on in-hospital treatment, in-hospital and long-term mortality, post-hospital and outpatient service use, and long-term functional impairment following a hip fracture. OTA's estimates of 1990 expenditures for in-hospital, post-hospital, and outpatient services for people with a hip fracture are presented and compared with other widely cited estimates of the cost of hip fractures.

This background paper does not discuss the incidence or causes of hip fracture, nor does it analyze the effectiveness of various in-hospital treatments or post-hospital services for people with a hip fracture. Two ongoing studies funded by the Agency for Health Care Policy and Research-one at the University of Maryland School of Medicine and the other at Dartmouth Medical School—are evaluating the effectiveness of various in-hospital treatments for hip fracture. A recently published study conducted at the University of Minnesota and funded by the Health Care Financing Administration evaluates outcomes and costs associated with the use of various post-hospital services by people with a hip fracture (139). These studies provide or will soon provide information that may lead to better outcomes and more cost-effective care.

An earlier version of this background paper was reviewed by numerous outside experts on osteoporosis and hip fracture, including several individuals who are currently conducting research on hip fracture outcomes (see appendix A). OTA is grateful for their contributions to this project.

PRINCIPAL FINDINGS

Although the negative outcomes of hip fractures, including expenditures for the care of hip fracture patients, are often overstated, hip fractures have severe consequences for many older people, and public and private expenditures for the care of people with a hip fracture are significant. This section summarizes OTA's principal findings with respect to in-hospital treatment, expenditures for in-hospital services, in-hospital and long-term mortality, use of and expenditures for post-hospital and other outpatient services, and long-term functional impairment following a hip fracture.

In-Hospital Treatment

- The great majority of people with a hip fracture receive surgical treatment-either surgical pinning to stabilize the hip joint or a partial or total hip replacement.
- Total hip replacement is the newest and most costly surgical treatment for hip fracture. The proportion of hip fracture patients that receives a total hip replacement differs in different hospitals and different parts of the country but appears to be increasing.
- Nonsurgical treatment for hip fracture is rarely discussed in the current medical literature, but available data indicate that about 10 percent of hip fracture patients age 65 and over receive nonsurgical treatment. Nonsurgical treatment generally has worse outcomes than surgical treatment, but this difference is probably due to patient characteristics that lead to the use of nonsurgical treatment for a particular person, for example, characteristics that make the person a poor surgical risk.

- Average hospital length of stay for hip fracture patients, which was more than 20 days before 1980, has decreased by at least one-third. This major reduction in average length of stay has resulted in increased use of post-hospital services but no increase in in-hospital or post-hospital mortality.

Expenditures for In-Hospital Services

- OTA estimates that in 1990, the average per patient expenditure for in-hospital services was $9,322 for hip fracture patients age 65 and over and $11,337 for hip fracture patients age 50 to 64. The in-hospital services included in this estimate are hospital room and board and nursing care, in-hospital physician services, anesthesia, in-hospital radiologic services, and in-hospital physical therapy. Since 8 percent of hip fracture patients age 50 and over were age 50 to 64 and 92 percent were age 65 and over, OTA estimates that the combined average per patient expenditure for in-hospital services for all hip fracture patients age 50 and over was $9,483 in 1990.
- Medicare pays for in-hospital services for more than 90 percent of hip fracture patients age 65 and over. OTA's estimate of the average per patient expenditure for in-hospital services for hip fracture patients age 65 and over is based primarily on the Medicare payment plus the required patient copayment for the services. In contrast, most hip fracture patients age 50 to 64 are not covered by Medicare, and far less information is available about expenditures for their care. As a result, OTA's estimate of the average per patient expenditure for patients age 50 to 64 is based primarily on provider charges.
- In 1990, provider charges were 57 to 80 percent higher than the Medicare payment plus the patient copayment for in-hospital services. The unexpected finding noted above—that 1990 per patient expenditures for in-hospital services were higher for hip fracture patients age 50 to 64 than for those age 65 and over—results in part from the lack of expenditure data for patients in the younger age group and thus OTA's greater use of charge data for these patients. The higher average per patient expenditure for patients age 50 to 64 probably also reflects the effectiveness of Medicare's cost-containment procedures that have held down the cost of in-hospital services for Medicare-covered hip fracture patients.

In-Hospital and Long-Term Mortality

- An average of 4 percent of hip fracture patients age 50 and over die in the hospital. In-hospital mortality increases with age and is two to three times higher for male than female hip fracture patients. Average in-hospital mortality for female hip fracture patients is very low (2 percent or less) until after age 80. *These figures represent all-cause mortality for hip fracture patients, not just mortality attributable to the fracture.*
- An average of 24 percent of hip fracture patients age 50 and over die in the year following their fracture. Mortality increases with age and is much higher for male than female hip fracture patients in each age group. *This figure represents all-cause mortality, not just mortality attributable to the fracture.*

  Average mortality by one year post-fracture is considerably higher for hip fracture patients than for people of the same age and gender who have not had a hip fracture. In 1988, for example, average mortality by one year post-fracture was 26 percent higher for male hip fracture patients age 75 to 84 than for males of the same age who did not have a hip fracture. For females age 75 to 84, average mortality by one year post-fracture was 12 percent higher for those who had a hip fracture than for those who did not.
- Many patient characteristics in addition to age and gender are associated with long-term mortality following a hip fracture. These factors include race, general physical condition, coexisting illnesses, and residence in a nursing home or in the community at the time of the fracture. The type and timing of in-hospital

treatment may also affect in-hospital and long-term mortality.

- The higher mortality of hip fracture patients in comparison with people who have not had a hip fracture persists for one year or less following the fracture and then returns to normal for females. For males, elevated mortality may persist to the middle of the second year post-fracture.

I Functional Impairment Following a Hip Fracture

- Many hip fracture patients experience severe functional impairment following their fracture, and most never recover their pre-fracture level of functioning. Older age, poorer pre-fracture physical and mental condition, operative and post-operative complications, and many other factors predict greater functional impairment following a hip fracture.
- In two longitudinal studies, hip fracture was more likely than other serious medical conditions, including heart attack, stroke, and cancer, to lead to functional impairment.

Use and Expenditures for Post-Hospital and Other Outpatient Services

- OTA estimates that in 1990 the average per patient expenditure for post-hospital and other outpatient services was $9,852 for people age 50 and over with a hip fracture. The post-hospital and outpatient services included in this estimate are nursing home and inpatient rehabilitation services, home health care, nonmedical home care, physician visits, outpatient physical therapy, emergency room, and ambulance services.

The extent and type of post-hospital service use by hip fracture patients varies depending on patient characteristics, such as age, gender, general physical condition, and coexisting illnesses. Post-hospital service use also varies depending on the availability y of different types of services, the availability of reimbursement for services, and prevailing referral practices in different communities.

- In 1990, an average of 41 percent of hip fracture patients age 50 and over were discharged from the hospital to a nursing home. By one year post-discharge, two-thirds of the patients had gone home or died, and one-third were still in the nursing home. The hip fracture patients who were still in the nursing home one year post-discharge constituted 14 percent of all hip fracture patients age 50 and over in that year.

Nursing home residents with a primary diagnosis of hip fracture constitute a very small proportion of all nursing home residents. In 1985, nursing home residents with a primary diagnosis of hip fracture constituted only 1.8 percent of all nursing home residents. Nursing home residents with a primary diagnosis of hip fracture also have a shorter average length of stay than other nursing home residents.

In 1990, an average of 12 percent of hip fracture patients age 50 and over were discharged from the hospital to a rehabilitation facility or another short-stay hospital. The average length of stay in these facilities was short (about nine days), and virtually all the patients had gone home or to a nursing home by six weeks post-discharge.

- In 1990, one-third of hip fracture patients received paid home health services. The use of these services was concentrated in a short period following a patient's discharge from the hospital. Many hip fracture patients also received nonmedical home care services, for example, homemaker services, meals on wheels, and assistance with chores, but a large proportion of these individuals had also been receiving nonmedical home care services before their fracture.

Many hip fracture patients receive informal (nonpaid) assistance from family and friends, but most of these patients also received informal assistance before their hip fracture. Thus, it is difficult to document significant changes in

the amount of informal assistance received by these patients before and after their fracture.

Comparison of OTA's Estimate with Other Estimates of the Cost of Hip Fractures

OTA's estimates of expenditures for in-hospital and post-hospital care of people with a hip fracture are considerable y lower than other frequently cited estimates of the cost of hip fractures. Combining the figures for in-hospital and post-hospital services noted above, OTA estimates that the total average per patient expenditure for hip fracture patients age 50 and over was $19,335 for 1990. In 1990, there were about 281,000 people with a hip fracture in the United States; thus OTA's per patient estimate translates to a total societal expenditure of $5.4 billion, assuming that the per patient expenditure for people under age 50 with a hip fracture is equal to the expenditure for people over age 50. This assumption is probably false, since hip fracture patients under age 50 are far less likely than older hip fracture patients to use nursing home and other post-hospital long-term care services. Thus the $5.4 billion figure represents an upper limit estimate for 1990.

The most frequently cited estimate of the cost of hip fractures comes from a 1984 report prepared for the American Academy of Orthopedic Surgeons that analyzes the impact of various musculoskeletal conditions for people of all ages (40). The 1984 report concludes that the annual cost of hip fractures was $7.3 billion, or approximately $29,400 per patient, in 1984. A 1992 update of the 1984 report, also prepared for the American Academy of Orthopedic Surgeons, concludes that the annual cost of hip fractures was $8.7 billion, or approximately $34,400 per patient in 1988 (100). A third report, prepared for the National Institutes of Health, concludes that the per patient cost of hip fractures in 1988 ranged from $41,723 for females age 50 to 54 to $37,968 for females age 85 and over (14).

All three of these estimates are higher than OTA's estimate even though they are for earlier years and therefore would be expected to be lower than OTA's estimate. One reason for the differences between OTA's estimate and these other estimates is that some of the other estimates use old data on hospital length of stay, resulting in an overestimation of expenditures for hospital care. A second reason for the differences is that some of the other estimates include items that OTA did not include, for example, lost productivity of wage earners and homemakers. A third reason is that OTA's estimate is based primarily on expenditures, whereas the other estimates are based primarily on charges. These and other reasons for the differences among OTA's estimate and the estimates from the other sources are discussed at greater length at the end of this document.

Probably the most controversial aspect of OTA's estimate of expenditures for hip fractures from the perspective of some outside reviewers is OTA's use of Medicare allowed charges (the Medicare payment plus the required patient copayment) to estimate average expenditures for in-hospital services. Several of the reviewers pointed out that Medicare allowed charges are currently lower than hospital costs for many hospital services and that the nonreimbursed costs of care for Medicare-covered patients are shifted to other patients, thus raising the charges for the other patients' care. As discussed later in this document, the Prospective Payment Assessment Commission (PROPAC) has estimated that in 1990, Medicare payments were 1.5 percent lower than hospital costs for all hospital stays reimbursed under Medicare's prospective payment system (PPS) and that this gap had increased to almost 10 percent by 1993 (101).

The gap between Medicare allowed charges and hospital costs raises a difficult conceptual question with respect to the true expenditures for in-hospital services for people with a hip fracture, and OTA considered various options to address this question. As noted in table 7 later in this document, OTA developed an alternate figure for the average expenditure for in-hospital services to reflect the 1.5 percent gap between Medicare allowed charges and hospital costs. In the case of hip fracture, however, where such a large proportion