# Early discharge of hip fracture patients from hospital

## Transfer of costs from hospital to nursing home

Romke van Balen[1], Ewout W Steyerberg[2], Herman J M Cools[3], Johan J Polder[2] and J Dik F Habbema[2]

[1]Geriatric Centre and Nursing Home Antonius Binnenweg, Nieuwe Binnenweg 33, NL-3014 GC Rotterdam. R.van Balen@kvv.nl, Departments of [2]Public Health, Faculty of Medicine and Health Sciences, Erasmus University, P.O. Box 1738, NL-3000 DR Rotterdam, [3]General Practice and Nursing Home Medicine, University of Leiden, P.O. Box 2088, NL-2301 CB Leiden, The Netherlands
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**ABSTRACT – Hip fracture patients occupy more and more hospital beds. One of the strategies for coping with this problem is early discharge from the hospital to institutions with rehabilitation facilities. We studied whether early discharge affects outcome and costs. 208 elderly patients with a hip fracture were followed up to 4 months after the fracture. First, a group of 102 patients stayed in our hospital for the usual period (median 18 days). Then, 106 patients were assigned to a group for early discharge (median 11 days). We measured disabilities, health-related quality of life and cognition at 1 week, 1, and 4 months after hospitalization. To calculate total societal costs, inpatient days, the efforts of professionals in- and outside institutions, and interventions/examinations were recorded during this 4-month period. At 4 months, we found no differences in mortality, ADL level, complications, quality of life, and type of residence. More patients in the early discharge group were discharged to nursing homes with rehabilitation facilities (76% versus 53%), but the median total stay in hospital and nursing home was the same (26 days). Early discharge from hospital did not substantially reduce the total costs (conventional management ∈ 15,338 per patient and early discharge ∈ 14,281 per patient), but merely shifted them from the hospital to the nursing home.**

The increased number of elderly people has markedly increased the need for hip fracture beds (Melton 1996). Various strategies, such as new surgical techniques, early mobilization of patients (Ceder et al. 1987), joint orthopedic-geriatric rehabilitation (Murphy et al. 1987), and "hospital at home" teams (Pryor et al. 1988) have reduced the length of hospital stay. However, conflicting results have been reported as regards mortality, discharge status, and functional outcome (Gilchrist et al. 1988, Kennie et al. 1988, Reid and Kennie 1989).

In a prospective study, we evaluated how early discharge from hospital to a special rehabilitation ward in a nursing home affected the outcome and costs.

## Patients and methods

Between October 1996 and October 1998, we prospectively recruited consecutive patients over 65 years of age, who were admitted with a recent hip fracture to the university hospital and a general hospital in Rotterdam, The Netherlands. Patients with a hip fracture because of metastatic cancer or multitrauma were excluded. Of the first 130 eligible patients who formed the conventional management group, 102 (78%) agreed to participate in the study. Thereafter, the discharge policy was changed (early) for the next 124 eligible patients of whom 106 (85%) agreed to participate. A sample size of 2 × 100 patients was calculated to provide 80% power for a 5-day shorter hospital stay. Since we did not know what differences to expect in outcome or costs, no other power analyses were done.

Discharge was hastened by management measures, initiated by the investigator and implemented by the hospital staff. These included a decision protocol for discharge where ward physicians were encouraged to make a decision regarding the discharge destination on day 5 after surgery. Procedures were speeded up to indicate the type of care, both for discharge to home or transfer to a rehabilitation ward of a nursing home. One investigator interviewed and evaluated all patients, using a standard protocol at 1 week, 1 month, and 4 months after admission to the hospital. Walking ability was evaluated on a 5 grade scale; ADL and instrumental ADL with the Rehabilitation Activities Profile (Bennekom et al. 1995); health-related quality of life with the Nottingham Health Profile (Hunt et al. 1980) and the Dartmouth COOP Functional Health Assessment Charts (WONCA) (Nelson et al. 1990); cognitive status with the Mini-Mental State Examination (Folstein et al. 1975).

Comorbidity and complications were classified using a severity rating scale (Bernardini et al. 1995). All medical events during the 4-month follow-up that required therapeutic intervention were recorded as complications. Type of fracture and surgery, and length of stay were obtained from medical charts and health professionals.

Activities of doctors, nurses, and therapists were recorded in minutes per day. The number of laboratory and radiographic examinations and other interventions were obtained from the hospital administration. Total costs in hospital, nursing home, and home for the elderly were calculated by adding hotel costs. Hotel costs for inpatient days were estimated by including overhead and indirect costs but with the exclusion of all direct costs that were analyzed separately. We distinguished 6 categories of care: 1) inpatient days (hospitals, nursing homes and homes for the elderly), 2) nursing (hospitals, nursing homes, homes for the elderly, and at home), 3) health practitioners (physicians, therapists and others), 4) medical procedures (therapeutic, diagnostic and laboratory), 5) traveling (ambulance, taxi, other), and 6) informal care and other costs, such as meal service at home and adjustment of the housing conditions. We also divided the data into 8 periods based on the location of the patient: 1) before hospital admission, 2) from admission to day 5 after hip surgery, 3) from day 6 until discharge from hospital, 4) nursing home, 5) home for the elderly, 6) home, 7) readmission to hospital or nursing home and 8) transfer from the two participating hospitals to other hospitals. Costs up to 3 months before admission were calculated according to information from the patient or a proxy. Costs were expressed in 1998 Euros.

### *Statistics*

We used the Student's t-test, ANOVA, Wilcoxon matched pairs signed rank test, Mann-Whitney U-test, and the chi-square test in the statistical analysis. Logistic regression was used to analyze differences in mortality and type of residence at 1 month and 4 months and linear regression was used to analyze differences in function (RAP score at 1 month and 4 months) and total costs with the following independent variables: age, sex, type of fracture, type of treatment, number of comorbidities, the presence or absence of the diagnosis dementia on hospital admission, residence before fracture, type of discharge arrangement (conventional or early), function before fracture (RAP score), and cognitive status after 1 week (MMSE score). Data were analyzed separately in the two groups of patients.

## Results

There were no major differences in the characteristics of the two groups. Mean age was 83 years with a female predominance; 41% of patients were institutionalized before fracture. Cardiovascular diagnoses were recorded in half of the patients, musculoskeletal in almost half, and neuropsychiatric diseases in one third. Cognitive reduction was present in one fifth. Patients had, on average, 2.3 comorbid conditions and only one fifth were totally ADL-independent. On average, patients stayed 13 days less in hospital in the early discharge group, the median stay was 18 versus 11 days (Table 1, $p < 0.001$). At 1 month after fracture, more patients in the early discharge group were in a nursing home and more in the hospital in the conventional management group. However, this difference as regards residence completely disappeared after 4 months. In both groups, patients stayed, on average, the same time (mean 36 days, median 26

**Table 1. Length of hospital and nursing home stays, discharge arrangements, and residence. Comparison of conventionally-managed and earlier-discharged patients**

| Variable | Conventional management (n =102) | Early discharge (n = 106) | Significance of differences p-value |
|---|---|---|---|
| Days in hospital | | | |
| mean | 26 | 13 | < 0.001 |
| median (25th–75th percentile) | 18 (13–29) | 11 (9–15) | |
| Discharged from hospital to (%) | | | 0.001 |
| died in hospital | 6 | 0 | |
| own home | 25 | 14 | |
| home for the elderly | 17 | 9 | |
| nursing home | 53 | 76 | |
| Days in nursing home | | | |
| mean | 43 | 39 | 0.6 |
| median (25th–75th) | 40 (27–52) | 36 (22–57) | |
| number of discharged surviving patients | 17 | 42 | |
| Days in institution [a] | | | |
| mean | 38 | 34 | 0.5 |
| median (25th–75th) | 24 (14–53) | 27 (12–51) | |
| Residence at 1 month (%) | | | < 0.001 |
| died | 4 | 3 | |
| own home | 23 | 21 | |
| home for the elderly | 15 | 8 | |
| nursing home | 35 | 62 | |
| hospital | 23 | 6 | |
| Residence at 4 months (%) | | | 0.9 |
| died | 20 | 19 | |
| own home | 36 | 41 | |
| home for the elderly | 17 | 14 | |
| nursing home | 28 | 26 | |

[a] hospital and nursing home

days) in an institution (hospital and nursing home) until discharge. The mortality was 3% at 1 month and 19% at 4 months. Independent predictors for mortality were age, number of comorbidities, and cognitive status after 1 week.

The groups did not differ in walking ability at 4 months. Only one third had then regained their prefracture walking ability. No functional differences were found between the groups. Overall predictors for function at 4 months were age, number of comorbidities, cognitive status after 1 week, and function before fracture. At 4 months, only one fifth had achieved their previous ADL level. There were no clear differences in quality of life scores.

Patients had, on average, 3 complications. Only 8% of patients had no complication at all. The most frequent complications were postoperative anemia (half of the patients, mostly treated with a blood transfusion) and urinary tract infection (half of the patients, all treated with antibiotics). As regards the consequences of functional impairment, psychiatric complications were severest (one fifth of the patients of whom half developed acute confusion or delirium). One fifth had local surgical complications. Readmission to the hospital was necessary for 8 patients in the conventional management group and for 16 in the early discharge group (p = 0.2). For 3 and 5 patients, respectively the readmissions were due to surgical/orthopedic complications.

Costs generated by early discharge patients were, on average, ∈ 1,057 less than by conventionally-managed patients (Table 2). After correction for costs before admission and function before admission, the estimated difference was ∈ 1,223. Overall predictors for costs were prefracture residence in a home for the elderly, number of comorbidities, function before fracture, and dementia. Transfer of costs (5 days after surgery) occurred especially from the hospital to the nursing home. Early discharge generated more costs up to day 5 after admission (p = 0.003), less from day 6 until discharge from hospital (p < 0.001), and more in the nursing home (p = 0.02).

## Discussion

We found no clear advantage of discharging hip fracture patients 13 days earlier from the acute hospital. Unlike Fitzgerald et al. (1988) and Jalovaara et al. (1992), the type of rehabilitation protocol had no effect on the outcome. Our study has several limitations. First, we had only relatively few patients (208) due to the time-consuming follow-up. More cases might have shown differences

**Table 2. Average costs per hip fracture patient up to 4 months after hospital admission in 1998 Euros (∈)**

| Period | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| Hospital first 5 days | 2,665 | 771 | 2,193–3,098 | 17 | 3,064 | 960 | 2,369–3,738 | 21 | 0.003 |
| Hospital after 5 days | 4,570 | 6,033 | 1,319–4,826 | 30 | 1,360 | 1,262 | 606–1,796 | 9.5 | < 0.001 |
| Nursing home | 4,991 | 6,432 | 0–9,371 | 33 | 6,281 | 6,108 | 1,016–10,338 | 44 | 0.02 |
| Home for the elderly | 1,767 | 3,836 | 0–98 | 11.5 | 1,436 | 3,694 | 0–0 | 10 | 0.3 |
| Own home | 847 | 2,546 | 0–842 | 5.5 | 692 | 1,311 | 0–1,106 | 4.8 | 0.5 |
| Readmission to hospital | 424 | 1,790 | 0–0 | 2.8 | 887 | 3,021 | 0–0 | 6.2 | 0.1 |
| Readmission to nursing home | 74 | 835 | 0–0 | 0.5 | 46 | 472 | 0–0 | 0.3 | 1 |
| Transfer to other hospital | 0 | 0 | 0–0 | | 516 | 4,305 | 0–0 | 3.6 | 0.2 |
| Total | 15,338 | 7,765 | 8,203–20,947 | 100 | 14,281 | 7,647 | 7,742–19,177 | 100 | 0.3 |

A Conventional management
B SD
C 25th–75th percentile
D % of total costs
E Early discharge
F SD
G 25th–75th percentile
H % of total costs
I Significance of difference, p-value

since the variations were usually large. Secondly, the design was not randomized and some variables (such as type of treatment and length of hospital stay) may have changed during the study independently of the intervention.

The shorter hospital stay was mainly achieved by discharging more patients who came from their homes (from 17% to 67%) or a home for the elderly (from 30% to 50%) to the rehabilitation ward of a nursing home. The stay of institutionalized patients did not change. We had expected that patients who came from home would benefit particularly from the early discharge program. Although their walking ability and ADL level were better at 1 month, no difference was found at 4 months.

The high frequeny of general complications (on average 3) may be due to our operational definition and the careful follow-up in this study; the incidence of adverse events is probably often underestimated.

Early discharge did not substantially cut costs, it merely transferred them from the hospital to the nursing home. After day 5 in hospital (when the discharge protocol started), hip fracture patients generated low medical costs in hospital. Secondly, the costs of medical interventions and examinations in the first 5 days after surgery were higher in the early discharge group. These patients apparently need a certain number of medical procedures and examinations. Therefore, cost savings from early hospital discharge can easily be overestimated by using average bed costs a day (Hollingworth et al. 1993, French et al. 1995). We found that the total costs per patient of early discharge were ∈ 1,100 less, but this did not reach statistical significance, because of the wide variations in costs (Polder et al. in press). Therefore, we could not confirm the assumed cost-saving by earlier transfer to nursing homes (Laet et al. 1996). On the other hand, this study showed no increase in costs, as reported by Strömberg et al. (1997), who reported higher costs with earlier and more discharges to geriatric wards after changes in the reimbursement system.

An obvious advantage of early discharge from the hospital is the freeing of orthopedic and surgical beds, which may reduce the waiting lists for orthopedic surgery. 3–4 beds a year are now free for other admissions in each of the two participating hospitals. With an average stay of 13 days, it is theoretically possible to admit 100 more patients per hospital.

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# Functional outcome after displaced femoral neck fractures treated with osteosynthesis or hemiarthroplasty

## A matched-pair study of 714 patients

Juha Partanen[1], Ismo Saarenpää[1], Tero Heikkinen[1], Hans Wingstrand[2], Karl-Göran Thorngren[2] and Pekka Jalovaara[1]

Departments of Orthopaedics, [1]University of Oulu, Kajaanintie 50, P.O. Box 22, FI-90221, Finland, [2]University of Lund, SE-22185 Lund, Sweden. pekka.jalovaara@oulu.fi
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**ABSTRACT – Osteosynthesis (OS) and hemiarthroplasty (HA) are the commonest treatments for displaced cervical hip fractures in the elderly, but there is no consensus as to which is better. In this prospective matched-pair study we compared these methods as regards functional outcome. In 1989–1996, using the same standardized forms, all displaced cervical hip fractures were prospectively registered in the university hospitals of Oulu in Finland and Lund in Sweden. Osteosynthesis was performed in Lund and hemiarthroplasty in Oulu. Cross-matching, done for age, sex, preoperative residence, and ambulatory ability, resulted in 357 pairs of displaced fractures.**

**More OS than HA patients could manage in their own homes or live semi-independently at 4 months after the fracture. OS patients had better ambulatory ability (p = 0.001) and used walking aids less than HA ones (p = 0.001). The reoperation rates at 4 months were the same among HA and OS patients, but at 1 year, OS patients had a higher reoperation rate (17%) than HA ones (9.5%).**

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Hemiarthroplasty has been the preferred treatment for displaced cervical fractures of the femoral neck in Europe and USA, but closed reduction and internal fixation is preferred in most Scandinavian countries (Parker et al. 1997). Despite many comparative studies, no consensus has been reached as to which is better, and the results have been conflicting (Parker et al. 1997). Most studies have compared aspects such as mortality, reoperation rate, fracture healing, complications and cost (Boyd and Salvatore 1964, Hunter 1969, 1974, Raine 1973, Johnson and Crothers 1975, Söreide et al. 1979, 1980, Sikorski and Barrington 1981, Stewart 1983, Rodriguez et al. 1987, Van Vugt et al. 1993, Berglund-Röden et al. 1994, Hui et al. 1994). Functional results have received less attention (Koval and Zuckermann 1994). The aim of this prospective case-control study was to determine whether one of these methods has a better functional outcome.

## Patients and methods

In 1989–1996, all cervical hip fractures were prospectively registered at the university hospitals of Oulu in Finland and Lund in Sweden by dedicated nurses trained for this work. They prospectively filleld in the same multicenter hip-fracture forms with data concerning the patient's background, hospital stay, need for resources and quality of life, i.e., information about their place of residence, need for institutional care as well as pre- and postoperative ADL functions (the patients were asked whether they could dress and undress themselves without help) and about their locomotor ability (Table 2). During the 4-month follow-up, we recorded the reoperation rate, mortality and the

**Table 1. Cross-matched data of patients with cervical hip fracture treated with hemiarthroplasty (HA) in Oulu and osteosynthesis (OS) in Lund**

| | Type of operation | |
|---|---|---|
| | HA (%) | OS (%) |
| Male | 70 | 70 |
| Female | 287 | 287 |
| All | 357 | 357 |
| Mean age (years) | 82 | 82 |
| range | 63–98 | 63–98 |
| *Admitted from* | | |
| Own home | 232 (65) | 232 (65) |
| Convalescent home | 7 (2) | 0 (0) |
| Full-service unit | 92 (26) | 99 (28) |
| Geriatric department, nursing home | 24 (6.7) | 24 (6.7) |
| Other | 2 (0.6) | 2 (0.6) |
| Total | 357 | 357 |
| *Ambulatory ability before the fracture* | | |
| Could walk alone outdoors | 192 (54) | 192 (54) |
| Could walk outdoors only supported by another person | 48 (13) | 48 (13) |
| Could walk alone indoors, but not outdoors | 92 (26) | 92 (26) |
| Could walk indoors only supported by another person | 23 (6.4) | 23 (6.4) |
| Could sit on a chair, but not walk | 2 (0.6) | 2 (0.6) |
| Bedridden | 0 | 0 |
| Total | 357 | 357 |

same functional parameters as before surgery. The mortality and re-operation rate were also recorded at 1 year after the fracture.

In Lund, almost all displaced cervical hip fractures were treated with osteosynthesis (OS), using two LIH hook-pins (1,277 patients), but in Oulu, uncemented Austin-Moore hemiarthroplasty (HA) was the commoner method (546 patients). When performing LIH osteosynthesis, we aimed at atraumatic insertion and firm intracapital fixation (Strömqvist et al. 1987, 1992). Hemiarthroplasty was always performed via a posterior approach. Full weight bearing was allowed on the first postoperative day for all patients who were encouraged to walk as soon as possible. The aftertreatment policy differed in Lund and Oulu. In Lund, patients were treated in the primary hospital until they could return to their original residence, but in Oulu, nearly all patients were discharged to health care center hospitals or rehabilitation units as soon as possible.

Cross-matching of OS patients in Lund and HA patients in Oulu was done for age (± 2 years), sex, preoperative residence, ambulatory ability and type of fracture, classified according to fracture displacement into undisplaced (Garden 1 and 2) and displaced (Garden 3 and 4) fractures (Garden 1964). 357 pairs of displaced fractures were found (Table 1).

The data processing and statistical analyses were performed by a statistician, using the SPSS statistical software (SPSS, SPSS Inc., 1998, 8.0.2 Standard Version for Windows). All statistical analyses were done with Breslow and Day's method (1980) for matched-pair studies, comparing the pair members to each other with McNemar`s test for dichotomous variables and with marginal homogeneity test for multiple categorical variables. Only the pairs with complete data were considered in the statistical analyses (Breslow and Day 1980) and given in the tables. This explains the wide variation in numbers of observations. $P < 0.05$ was considered significant.

**Table 2. Background variables**

| | Type of operation | | |
|---|---|---|---|
| | HA (%) | OS (%) | P-value |
| *Walking aids before the operation* | | | 0.5 [a] |
| Can walk without aids | 195 (56) | 201 (58) | |
| 1 stick | 72 (21) | 61 (18) | |
| 2 sticks | 7 (2.0) | 4 (1.1) | |
| 1 stick and 1 tripod | 1 (0.3) | 1 (0.3) | |
| 2 tripods | 0 (0.0) | 2 (0.6) | |
| Rollator/walking frame | 69 (20) | 70 (20) | |
| Wheelchair | 3 (0.9) | 5 (1.5) | |
| Unable to walk | 1 (0.3) | 4 (1.1) | |
| Total | 348 | 348 | |
| *ADL skills before the fracture* | | | 0.001 [b] |
| Yes | 251 (70) | 283 (79) | |
| No | 106 (30) | 71 (20) | |
| System missing | 0 | 3 (0.8) | |
| Total | 357 | 357 | |

[a] Marginal homogeneity test
[b] McNemar test

**Table 3. Hospital stay in the primary hospital, discharge after first admission and resindence and walking ability at 4 months in HA and OS patients**

| | Type of operation | | |
|---|---|---|---|
| | HA (%) | OS (%) | P-value [a] |
| *Hospital days in the primary hospital* | | | |
| mean | 6.7 | 12.6 | |
| median | 5.0 | 10.0 | |
| *Discharged after first admission to* | | | 0.001 |
| Own home | 8 (2.4) | 97 (29) | |
| Convalescent home | 0 (0.0) | 22 (6.6) | |
| Full-service unit | 7 (2.1) | 71 (21) | |
| Geriatric department | 279 (83) | 16 (4.8) | |
| Nursing home | 4 (1.2) | 92 (28) | |
| Acute hospital | 18 (5.4) | 13 (3.9) | |
| Other | 14 (4.2) | 18 (5.4) | |
| Another clinic | 5 (1.5) | 6 (1.8) | |
| Total | 335 | 335 | |
| *Residence at 4 months* | | | 0.03 |
| Own home | 107 (47) | 135 (60) | |
| Convalescent home | 3 (1.3) | 2 (0.9) | |
| Full-service unit | 46 (20) | 56 (25) | |
| Geriatric department | 65 (29) | 1 (0.4) | |
| Nursing home | 0 (0.0) | 26 (12) | |
| Acute hospital | 3 (1.3) | 2 (0.9) | |
| Other | 3 (1.3) | 5 (2.2) | |
| Total | 227 | 227 | |
| *Ambulatory ability at 4 months* | | | 0.001 |
| Could walk alone outdoors | 32 (16) | 72 (35) | |
| Could walk outdoors only supported by another person | 24 (12) | 21 (10) | |
| Could walk alone indoors, but not outdoors | 74 (36) | 61 (30) | |
| Could walk indoors only supported by another person | 51 (25) | 31 (15) | |
| Could sit on a chair, but not walk | 18 (8.7) | 21 (10) | |
| Bedridden | 7 (3.4) | 0 (0.0) | |
| Total | 206 | 206 | |
| *Walking aids at 4 months* | | | 0.001 |
| Can walk without aids | 17 (8.3) | 36 (18) | |
| 1 stick | 34 (17) | 44 (22) | |
| 2 sticks | 10 (4.9) | 5 (2.4) | |
| 1 stick and 1 tripod | 2 (1.0) | 6 (2.9) | |
| 2 tripods | 0 (0.0) | 13 (6.3) | |
| Rollator/walking frame | 109 (53) | 78 (38) | |
| Wheelchair | 21 (10) | 16 (7.8) | |
| Unable to walk | 12 (5.9) | 7 (3.4) | |
| Total | 205 | 205 | |

[a] Marginal homogeneity test

## Results

### *Hospital stay and place of residence after discharge*

The median duration of hospitalization after the first admission to the primary hospital was longer for OS patients than for HA ones, but more OS patients were discharged directly to their own home from the primary hospital (Table 3). The differences are a consequence of the different rehabilitation methods in the two hospitals.

### *Residence at 4 months*

More OS patients than HA ones lived in their own home or semi-independently in a convalescent home or full-service unit at 4 months (Table 3).

71% of the HA patients and 87% of the OS ones, who had been living in their own home at the time of the fracture, had returned to their own home at 4 months.

### *Ambulatory ability and walking aids at 4 months*

OS patients had better ambulatory ability and used fewer walking aids than HA patients (Table 3). When asked if they walked as well at 4 months as before the fracture, OS patients were better (Table 4).

### *ADL skills and pain at 4 months*

OS patients had better ADL skills, but this was also the case before the fracture, and had less pain in the involved hip than HA ones (Table 4).

### *Re-operations and mortality*

The reoperation rates were similar in both groups at 4 months, while at 1 year, OS patients had a higher reoperation rate (17 %) than HA ones (10 %) (Table 4).

We found no statistically significant difference in mortality between the groups.

## Discussion

Although the OS and HA patients were treated

**Table 4. Outcome at 4 months and 1 year in HA and OS patients**

| | Type of operation | | |
|---|---|---|---|
| | HA (%) | OS (%) | P-value |
| *Walks as well at 4 months as before the fracture* | | | 0.002 [a] |
| yes | 22 (11) | 32 (16) | |
| no, because of the hip | 137 (68) | 120 (60) | |
| no, other reason | 42 (21) | 49 (24) | |
| Total | 201 | 201 | |
| *ADL skills at 4 months* | | | 0.001 [b] |
| yes | 102 (51) | 144 (72) | |
| no | 99 (49) | 57 (28) | |
| Total | 201 | 20 | |
| *Use of pain-killers* | | | 0.8 [b] |
| yes | 120 (60) | 123 (62) | |
| no | 80 (40) | 77 (39) | |
| Total | 200 | 200 | |
| *Pain in hip* | | | 0.007 [b] |
| marked | 25 (13) | 32 (16) | |
| some | 109 (55) | 89 (45) | |
| not at all | 66 (33) | 79 (40) | |
| Total | 200 | 200 | |
| *Mortality at* | | | |
| 4 months | 52 (15) | 38 (11) | 0.1 [b] |
| 1 year | 96 (27) | 78 (22) | 0.1 [b] |
| *Reoperation rate at* | | | |
| 4 months | 29 (8) | 35 (10) | 0.5 [b] |
| 1 year | 34 (10) | 60 (17) | 0.005 [b] |

[a] Marginal homogeneity test
[b] McNemar test

in different hospitals and countries, both are university hospitals in Scandinavia, where the mean lifetimes, housing conditions, social welfare system and care facilities are relatively similar. Their staffs are very familiar with their respective method of treatment of cervical hip fractures.

At the 4-month follow-up, more data were missing in Lund. This may be because Lund mainly used mailed forms filled in by the patient, while in Oulu, the patients who failed to return the follow-up forms were given a telephone interview. This should not affect the main results, since only the complete pairs of patients were considered in the statistical analysis.

We also cross-matched the data for walking ability, which reflects the patient's general condition and concurrent diseases. Since we found no differences in the other background factors, the pairs presumably were reliably matched and comparable. No controlled comparison of OS and HA seems to have been done at this level of matching in the literature. Therefore we could not compare our data adequately with other published results. The findings concerning functional outcome in earlier reports have been disputed.

The duration of treatment after the primary admission was longer for OS patients, but this reflects the different after-care policies in Lund and Oulu. Oulu has numerous local hospitals in the vicinity, that can admit the patients almost immediately after surgery, but in Lund, rehabilitation begins in the primary hospital. This is also reflected by the wide variation in places of residence or care after discharge from the primary hospital. More OS patients were discharged to their own homes or to semi-independent living.

Ambulatory ability was better among our OS than among HA patients. The better function of OS patients may be partly due to less pain associated with OS, which has also been reported elsewhere (Skinner et al. 1989). On the other hand, Berglund-Röden et al. (1994) noted that functional outcomes (walking and ADL ability) were similar at 4 months in both groups. Söreide et al. (1979) similarly found no difference in walking ability and the use of walking aids at 14 months. Young et al. (1996) reported no differences between OS and HA patients as regards overall physical activities of daily living, and instrumental activities of daily living in the 1-year functional outcome and, in a recent randomized study by Parker and Pryor (2000), the final functional outcomes were the same for OS and HA patients. The differences between our findings and those of others may be because no randomization or matching was done in some of them and that far fewer patients were included in previous studies than in ours.

In a prospective randomized comparison by Skinner et al. (1989) of total hip replacement, hemiarthroplasty and osteosynthesis, total hip replacement resulted in the least pain and best mobility at 1 year, while hemiarthroplasty was worst in these respects. On the other hand, Broos et al. (1987) reported that HA patients had less pain and better function at the 1-year follow-up than OS patients.

A lower mortality has been reported in OS patients than in HA ones in most studies (Hunter 1969, 1974, Raine 1973, Broos et al. 1987, Rodriguez et al. 1987, Berglund-Röden et al. 1994). However, some prospective trials (Söreide et al.1979, Sikorski and Barrington 1981, Skinner et al. 1989) have shown no difference in mortality after internal fixation or hemiarthroplasty. Our findings, with a slightly, but not statistically significant, higher mortality in HA patients than in OS ones, agree with the former reports.

Most previous studies have shown a higher reoperation rate in OS than in HA patients (Lu-Yao et al. 1994). We found no differences in this rate at 4 months after the fracture, but at 1 year, it was higher among OS patients than among HA ones. Late complications after OS are due to nonunion or avascular necrosis (Parker et al. 1997).

We conclude that the functional outcome is better after OS than HA as regards a greater likelihood of return to the previous place of residence, better ambulation, less use of walking aids and less pain, although OS is associated with a higher reoperation rate. We recommend osteosynthesis as the primary method of treatment for displaced cervical hip fractures.

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