Postoperative mental impairment in hip fracture patients

A randomized study of reorientation measures in 223 patients

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Mental impairment is a common and serious complication in geriatric surgery. We studied 223 hip fracture patients. They were over 64 years of age (mean 81), with no history of mental deterioration and acutely admitted to hospital from independent living conditions. They were randomized into two groups. One of these was subjected to reorientation measures during the perioperative phase, i.e., presurgery admission to the orthopedic ward, accompanied home visits during the hospital stay and access to reorientation devices—they received a large clock, calendar, radio, TV-set, telephone and were encouraged to wear their own clothing. Otherwise, there were no differences in the treatment given to the two groups. We used monitoring of cognitive function with the Short Portable Mental Status Questionnaire (SPMSQ) and a feedback program for evaluation of the treatment results.

There was a low incidence of postoperative cognitive deterioration in both groups, compared with historical controls. However, no difference in mental status was noted when we compared the two groups. The conclusion is that attributes were less important than the psychological environment for postoperative mental deterioration. The mean total continuous hospitalization (transfers between departments and hospitals included) in the reorientation group was 22 (95% CI: 17–43) days, the corresponding figures for the controls were 30 (14–29) days.

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Cognitive impairment is a common and serious complication when treating elderly patients with hip fracture. It has been noted in one third to one half of the patients on admission to hospital (Gustafson et al. 1991, Ogilvie-Harris et al. 1993). An equally large number of patients have been found to develop mental deterioration postoperatively (Williams et al. 1985, Gustafson et al. 1988). This is associated with an increased incidence of local and systemic complications (Berggren et al. 1987, O´Brien et al. 1993, Svensson et al. 1996).

Previously, delirium (acute confusion)—a syndrome with considerable variations (APA 1994)—has been thought to be related to surgery and anesthesia, although several authors have shown that modern anesthetic techniques do not appear to cause confusion (Berggren et al. 1987, Williams-Russo et al. 1992). The factors of importance may rather be the organization and treatment on the hospital ward. Williams et al. (1985) showed a positive effect with increased continuity and education of the nurses. So-called active reorientation measures have proved to be valuable after open heart surgery (Budd and Brown 1974). Similarly, home visits (Rosenblatt et al. 1986, Dacher 1989, Ward et al. 1990) and access to reorientation devices, e.g., clocks, calendars, radios, TV-sets and telephones (Remakus and Shelly 1981, Williams et al. 1985, Sullivan et al. 1991) have been thought to improve cognitive function.

Focusing on postoperative confusion, we investigated the impact of reorientation procedures on cognitive state and outcome in elderly hip fracture patients.

Patients and methods

440 consecutive patients, more than 64 years old,

Table 1. Age, sex and diagnosis of the patients

	n	Mean age (95% CI)	Women	Cervical fracture
Total number of eligible patients	440	80	328 (75%)	220 (50%)
Excluded				
No bed available in the HFU	70	79 (77–81)	51	38
No randomization [a]	101	80 (78–81)	74	50
Pathological fracture	2	75	2	0
No communication in Swedish	11	80 (73–86)	6	4
History of mental deterioration or SPSMQ score < 3	33	86 (84–87)	25	20
Included				
Intervention group	116	80 (79–81)	88 (76%)	55 (47%)
Control group	107	82 (80–84)	82 (77%)	53 (50%)

[a] No HFU nurse available for the randomization in the emergency department.

residents in the Stockholm County Council area, were acutely admitted for a hip fracture from an independent living situation to the Orthopedic Department of Huddinge Hospital between January 1991 and December 1992 (Table 1). They were treated in accordance with the current treatment philosophy: immediate weight bearing following surgery, early mobilization and rapid discharge to the prefracture residence (Ceder et al. 1980, Bauer et al. 1986, Holmberg et al. 1989). Operation within 24 hours was favored. Cognitive status was assessed on admission with the Short Portable Mental Status Questionnaire (SPSMQ) (Pfeiffer 1975).

70 patients treated on ordinary orthopedic wards, due to lack of available beds in a specialized hip fracture unit (HFU), were not included in the study. An initial cognitive assessment in the emergency department was performed by a nurse from the orthopedic ward. This was not feasible at all hours. Therefore, patients who arrived in the late evenings, nights and on Saturdays and Sundays, as well as those arriving during the periods of reduced capacity in the summers, were generally not included (101 patients).

2 patients with pathological fractures and 11 patients unable to communicate in Swedish were also excluded, leaving 256 patients for the study. Finally, 33 patients, for whom accompanying relatives or caregivers reported a history of mental deterioration or who scored < 3 points of 10 on the SPMSQ at the initial interview, were excluded.

The remaining 223 patients (108 cervical fractures of whom 2 underwent arthroplasty and 115 trochanteric fractures) were randomized into 2 groups. The study was approved by the local Ethics Committee. Informed consent was obtained from the patients or, in case of mental deterioration, from accompanying relatives. The randomization was performed in the emergency department by a nurse from the HFU, when a bed in the unit was available, inclusion criteria were met and the initial assessment was performed. Sealed numbered envelopes with group allocation were used. A random table had been used for group allocation. The interval from arrival in hospital to the first assessment of cognitive function was 4.1 (SEM 0.2) h. The effect of a reorientation protocol comprising 3 measures was studied: 1) presurgery admission to the orthopedic ward, 2) accompanied home visits and 3) access to reorientation devices. The patients in the reorientation group (n 116) were brought by the interviewing nurse from the emergency department directly to the orthopedic ward. They received a large clock, calendar, radio, TV-set, telephone and were encouraged to wear their own clothing. Within a couple of days after surgery, the patients went on a home visit with their nurse (in a wheel-chair and a transport minibus) and 1 week after discharge, the nurse checked the patient at a second home visit. The control group (n 107) was transferred from the emergency department to an admission ward, where they were prepared for surgery. After surgery and postoperative monitoring, they were taken to the HFU in the orthopedic department, on average 27 h after admission.

Table 2. Presence of cognitive impairment (SPSMQ points < 8 of 10) after hip fracture in patients 65 years old or more, admitted from independent living conditions. Only patients discharged alive are included

	n	On admission	After surgery	At 1 week	On discharge	4-month follow-up [a]
Entire material						
Intervention	112	36 (32%)	27 (24%)	19 (17%)	11 (10%)	16 (14%)
Control	102	25 (25%)	29 (28%)	16 (16%)	9 (9%)	12 (12%)
Mental score 8–10 on admission						
Intervention	76	–	9 (12%)	2 (3%)	1 (1%)	2 (3%)
Control	76	–	10 (13%)	3 (4%)	1 (1%)	5 (7%)
Mental score < 8 on admission						
Intervention	36	100%	18 (50%)	17 (47%)	10 (28%)	14 (39%)
Control	26	100%	19 (73%)	13 (50%)	8 (31%)	7 (27%)

Not significant differences
[a] Only patients residing in own home at 4-month follow-up are included.

All patients were treated in a densely staffed (1.6 nurses/aids per bed compared to 1.2 nurses/aids in conventional orthopedic wards), specialized 12-bed hip fracture unit. They remained in the unit for as long as improvement could be noted or until they could return home. The program focused on: a) continuity (the patients remained with the same nurses throughout the hospital stay and, with few exceptions, the patients were not transferred to rehabilitation units outside the orthopedic department), b) routine daily assessments of cognitive function and ADL-ability during the entire stay and c) a feedback program for evaluation of treatment results (a home visit 4 months after the operation and a telephone interview after one year).

Table 3. Residence and health care consumption during 1 year after the hip fracture in intervention study patients and controls, 65 years old or more and admitted from independent living

	Intervention (n 116)	Control (n 107)
Discharged to own home	106 (91%)	90 (84%)
In-hospital mortality	4 (3%)	5 (5%)
Residence at 1 year, own home	97 (84%)	81 (76%)
Residence at 1 year, institution	6 (5%)	12 (11%)
1-year mortality	13 (11%)	14 (13%)
Duration of stay in orthopedic department [a]	17 (14–19)	15 (13–18)
Continuous hospitalization following hip fracture [a,b]	22 (14–28)	31 (17–44)
Total bed-day consumption during 1-year follow-up [a,c]	43 (31–54)	52 (36–67)

Not significant differences.
[a] Mean days and (95% confidence interval)
[b] Continuous hospitalization following hip fracture refers to length of stay from the patient's perspective, regardless of transfers between departments and institutions.
[c] Total 1-year bed-day consumption includes all institutional care, regardless of diagnoses or type of institution.

Cognitive impairment was defined as < 8 SPSMQ points of 10. These patients were also part of a descriptive study of the natural course of cognitive impairment (Strömberg et al. 1997b). For the evaluations, the assessment of cognitive function on the second day after surgery was used, to minimize possible adverse effects of anesthesia. Assessments at 1 week after surgery and on the day of discharge were also used.

Analysis of variance and $\chi 2$ -test with a rejection level of 5% were employed for the statistical analysis. The 95% confidence interval was calculated.

Results

There was no difference between the groups in the rate of postoperative cognitive impairment. The rate of cognitive impairment did not increase postoperatively in any of the groups. Postoperative cognitive impairment was present in 26%, compared to 29% on admission. Approximately 13% in both groups deteriorated mentally between ad-

Table 4. Outcome after hip fracture with regard to type of fracture for 223 hip fracture patients with no previous history of mental deterioration

	Cervical fracture	Trochanteric fracture	Subtrochanteric fracture
n	107	100	16
Age (95% confidence interval)	81 (79–82)	81 (80–83)	82 (79–84)
Mental score < 8 on admission	28 (26%)	30 (30%)	7 (44%)
Mental score < 8 after surgery [a]	26 (25%)	32 (32%)	3 (21%)
Discharged to own home	100 (93%) [b]	83 (83%)	13 (81%)
In-hospital mortality	4 (4%)	4 (4%)	1 (6%)
Residence own home at 1 year	87 (81%)	78 (78%)	13 (81%)
Dead at 1 year	12 (11%)	12 (12%)	3 (19%)
Duration of stay in orthopedic department [c]	14 (12–17) [b]	18 (15–20)	17 (12–22)
Continuous hospitalization following hip fracture [c, d]	18 (11–25) [b]	36 (22–50)	18 (13–23)
Total bed-day consumption during 1-year follow-up [c, e]	38 (28–48) [b]	59 (42–77)	30 (17–42)

[a] Only patients alive after surgery (n 219)
[b] Significant difference, cervical fracture vs. trochanteric fracture
[c] Mean days and (95% confidence interval)
[d] Continuous hospitalization following hip fracture refers to length of stay from the patient's perspective, regardless of transfers between departments and institutions
[e] Total 1-year bed-day consumption includes all institutional care, regardless of diagnoses or type of institution.

mission and the postoperative evaluation. Around half the number of those cognitively impaired on admission in both groups became lucid within the first week (Table 2).

Outcome regarding discharge destinations, bed-day consumption, residence and mortality are given in Table 3. The continuous stay (transfers between departments and hospitals included) in the reorientation group was mean 22 (95% CI: 14–43) days, the corresponding figures for the controls were 30 (17-43) days. This difference in health care consumption remained also at 1 year. There were no differences in mental score on admission or after surgery when the patients were categorized according to type of fracture, but significant differences were seen in the duration of the stay in the orthopedic department, the continuous hospitalization following hip fracture and total bed-day consumption during 1-year follow-up. However, social prognosis, i.e., ability to maintain independent living conditions did not differ between the diagnoses (Table 4).

Discussion

Fewer patients deteriorated mentally after surgery in our study than in two earlier intervention studies (Williams et al. 1985, Gustafson et al. 1991). Both of them reported a more than 50% increase in the number of patients who deteriorated mentally after admission. We found no difference in postoperative confusion between our randomized groups. In previous studies, reorientation devices such as telephones, newspapers and TV-sets as well as early home visits were thought to improve the mental state (Remakus and Shelly 1981, Sullivan et al. 1991). Ward et al. (1990) noted higher test-scores when hospitalized demented patients were tested in their homes, but this may not apply to acute cognitive impairment. Many rehabilitation programs emphasize continuity as a means to improve the patients' cognitive state (Dubrovskis and Wells 1988, Zuckerman et al. 1993), but no hard data are available. The reorientation devices are probably not unimportant, but our findings suggest that it is rather the overall rehabilitation program—the high level of staffing, the continu-

ity and the personal feedback—that is most important. For practical and ethical reasons, we could not restrict communication between patients and caregivers. For reasons of continuity, the ward nurse who made the initial interview/randomizing in the emergency room continued to have the main responsibility for the care of the patient throughout the stay and therefore it was not possible to keep the groups separated on the ward. Since all patients were treated on the same ward, there was probably a spill-over effect, since the repeated cognitive assessments focused attention on mental status, so that the control group also benefited from the increased attention. However, attitudes and communication were not on trial in this study—only the reorientation measures. As for the reorientation devices, the controls, as in most wards, had access to telephone, radio and TV-set, but the intervention patients received their own. Controls who actively chose to wear their own clothing of course did so, but the intervention patients were encouraged to do so. It is also likely that the focus on ADL-abilities affected the cognitive state: dressing, going to the toilet, eating meals in the lounge, etc., even if partially assisted, may have enhanced the sense of reality in acutely confused patients. To summarize, these and other findings suggest that postoperative confusion can be prevented at least in part. In the intervention study by Williams et al. (1985), the regular staff assessed the cognitive function in the intervention group, thereby providing important knowledge and emotional feed-back, whereas in their control group this was done by an independent observer. In the study by Gustafson et al. (1991), the intervention group was kept on one ward, unlike the control group, thus improving continuity.

The incidence of cognitive impairment on admission was about the same as in previous studies (Williams et al. 1985, Gustafson et al. 1991). As in our study, Williams et al. (1985) used the SPMSQ screening test, including only patients with no history of mental deterioration. Gustafson et al. (1991) used another test with similar questions—i.e., orientation in time, place and person (Berggren et al. 1987). The study by Gustafson et al. (1991) was restricted to femoral neck fractures. In this study, including both cervical and trochanteric fractures, we found no differences between the fracture groups regarding the mental state. Although, significant differences were found regarding health care consumption, in reasonably mentally healthy patients, these differences did not affect long-term social prognosis.

A surprising finding was that so many of those confused on admission regained normal cognitive test-scores during the first postoperative week and that approximately 9 of 10 were able to return home directly from the orthopedic ward after slightly more than 2 weeks. This emphasizes the need for routine monitoring of cognitive function and the importance of tinguishing between demented and acutely confused patients even in the immediate perioperative phase. Being acutely confused, regardless of cause, may very well be the reason for the fall and the fracture, but it is apparent that this is largely reversible, and in such cases no major obstacle to successful rehabilitation.

Almost all patients in our study had spinal anesthesia. All initially lucid patients who became postoperatively confused (19 after surgery and 1 at 1 week) had spinal anesthesia. 18/20 age-, sex- and diagnosis-matched patients who remained lucid during the stay, also had spinal anesthesia. This is reported in a previous study (Strömberg et al. 1997b).

About one third of the patients who met the inclusion criteria were not included in the study. It is possible that the exclusion of patients arriving at night, on weekends and during part of the summers may have affected the overall results. The exclusion of 33 patients (15%) with a history of mental deterioration,—i.e., dementia, although almost never formally diagnosed—is in accordance with previous findings regarding the prevalence of dementia (Schneider and Guralnik 1990) and was thought appropriate, as the aim of the intervention was to prevent postoperative mental deterioration.

The trend towards shorter hospitalization in the reorientation group might be associated with home visits during the hospital stay, as well as shortly after discharge. Increased knowledge of the patients' home situation may have improved the timing for discharge. In a previous study (Strömberg et al. 1997a), we found that an average acute hospital or geriatric bed-day costs approximately USD 350, therefore the intervention resulted in substantial savings.

APA. American Psychiatric Association. Diagnostic and statistical manual of mental disorders, fourth edition. Washington DC, American Psychiatric Association 1994.

Bauer G, Ceder L, Hansson L, Holmberg S, Lidgren L, Strömqvist B, Thorngren K-G. Comprehensive care of hip fractures. Primary nailing, scintimetry, immediate mobilization and home rehabilitation. Acta Orthop Scand 1986; 57: 252.

Berggren D, Gustafson Y, Eriksson B, Bucht G, Hansson L I, Reiz S, et al. Postoperative confusion after anesthesia in elderly patients with femoral neck fractures. Anesth Analg 1987; 66: 497-504.

Budd S, Brown W. Effect of a reorientation technique on postcardiotomy delirium. Nurs Res 1974; 23: 341-8.

Ceder L, Thorngren K-G, Wallden B. Prognostic indicators and early home rehabilitation in elderly patients with hip fractures. Clin Orthop 1980; 152: 173-84.

Dacher J E. Rehabilitation and the geriatric patient. Nurs Clin North Am 1989; 24: 225-37.

Dubrovskis V, Wells D. Hip fractures in the elderly. Can Nurse 1988; 84: 20-2.

Gustafson Y, Berggren D, Brännström B, Bucht G, Norberg A, Hansson L, et al. Acute confusional states in elderly patients treated for femoral neck fractures. J Am Geriatr Soc 1988; 36: 525-30.

Gustafson Y, Brännström B, Berggren D, Ragnarsson J I, Sigaard J, Bucht G, et al. A geriatric-anesthesiologic program to reduce acute confusional states in elderly patients treated for femoral neck fractures. J Am Geriatr Soc 1991; 39: 655-62.

Holmberg S, Agger E, Ersmark H. Rehabilitation at home after hip fracture. Acta Orthop Scand 1989; 60: 73-6.

O'Brien L A, Grisso J A, Maislin G, Chiu GY, Evans L. Hospitalized elders- risk of confusion with hip fracture. J Gerontol Nurs 1993; 19: 25-31.

Ogilvie-Harris D J, Botsford D J, Worden Hawker R. Elderly patients with hip fractures: Improved outcome with the use of care maps with high-quality medical and nursing protocols. J Orthop Trauma 1993; 7: 428-37.

Pfeiffer E A. A short portable mental state questionnaire for the assessment of organic brain deficit in elderly patients. J Am Geriatr Soc 1975; 23: 433-41.

Remakus B L, Shelly R M. How to prevent confusion in hospitalized elderly. Geriatrics 1981; 36: 121-5.

Rosenblatt D E, Campion E W, Mason M. Rehabilitation home visits. J Am Geriatr Soc 1986; 34: 441-7.

Schneider E L, Guralnik J M. The aging of America. Impact on health care costs. JAMA 1990; 263: 2335-40.

Strömberg L, Öhlén G, Svensson O. Prospective payment systems and hip fracture treatment costs. Acta Orthop Scand 1997a; 68: 6-12.

Strömberg L, Lindgren U, Nordin C, Öhlén G, Svensson O. The appearance and disappearance of cognitive impairment in elderly patients during treatment for hip fracture. Scand J Caring Sci 1997b; 11: 167-75.

Sullivan E M, Wanich C K, Kurlowicz L H. Nursing assessment, management of delirium in the elderly. AORN J 1991; 53: 820-8.

Svensson O, Strömberg L, Öhlén G, Lindgren U. Prediction of the outcome after hip fracture. J Bone Joint Surg (Br) 1996; 78: 115-8.

Ward H W, Ramsdell J W, Jackson J E, Renwall M, Swart J O, Rockwell E. Cognitive function testing in comprehensive geriatric assessment. J Am Geriatr Soc 1990; 38: 1088-92.

Williams M A, Campbell E B, Raynor W J, Mlynarczyk S M, Ward S E. Reducing acute confusional states in elderly patients with hip fractures. Res Nurs Health 1985; 8: 329-37.

Williams-Russo P, Urquhart B L, Sharrock N E, Charlson M E. Postoperative delirium: predictors and prognosis in elderly orthopedic patients. J Am Geriatr Soc 1992; 40: 759-67.

Zuckerman J D, Fabian D R, Aharanoff G, Koval K J, Frankel V H. Enhancing independence in the older hip fracture patient. Geriatrics 1993; 48: 76-8.