Chapter 4.
Early discharge of hip fracture patients from hospital. Transfer of costs from hospital to nursing home

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 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 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.

4.1 Introduction

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.

4.2 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 x 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 period 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) travelling (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 patient or proxy. Costs were expressed in 1998 Euros.

Statistics

We used 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.

4.3 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

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 until discharge			
mean	43 d	39 d	0.6
median(25th-75th)	40 d (27-52)	36 d (22-57)	
number of discharged surviving patients	17	42	
Days in institution *			
mean	38 d	34 d	0.5
median (25-75)	24 d (14-53)	27 d (12-51)	
Residence at 1 month (%)			< 0.001
dead	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
dead	20%	19%	
own home	36%	41%	
home for the elderly	17%	14%	
nursing home	28%	26%	

* hospital and nursing home

disappeared after 4 months. In both groups, patients stayed, on average, the same time (mean 36 days, median 26 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 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 patients in the early discharge group ($p = 0.2$). For 3 and 5 patients respectively the readmissions were due to surgical/orthopaedic complications.

Costs generated by early discharge patients were, on average, € 1057 less than by conventionally-managed patients (Table 2). After correction for costs before admission and function before admission, the estimated difference was € 1223. Overall predictors for costs were prefracture residency in an home for the elderly, number of comorbidities, function before fracture, and dementia. Transfer of costs occurred especially (5 days after surgery) 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 ($p = 0.02$).

4.4 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 did not affect the outcome. Our study has several limitations. First, we had only relatively few patients (208) due to the time-consuming

Table 2.
Average Costs per Hipfracture Patient Up To 4 Months After Hospital Admission in Euros (€).

Period	Conventional Management	SD	25-75 percentile	% of Total Costs	Early Discharge	SD	25-75 percentile	% of Total Costs	Significance of Difference p - value
Hospital first 5 days	2,665	771	2,193 – 3,098	17.4%	3,064	960	2,369 – 3,738	21.4%	0.003
Hospital after 5 days	4,570	6,033	1,319 – 4,826	29.8%	1,360	1,262	606 – 1,796	9.5%	< 0.001
Nursing home	4,991	6,432	0 – 9,371	32.5%	6,281	6,108	1,016 – 10,338	44.0%	0.02
Home for the elderly	1,767	3,836	0 - 98	11.5%	1,436	3,694	0 - 0	10.1%	0.3
Own home	847	2,546	0 - 842	5.5%	692	1,311	0 – 1,106	4.8%	0.5
Readmission hospital	424	1,790	0 - 0	2.8%	887	3,021	0 - 0	6.2%	0.1
Readmission nursing home	74	835	0 - 0	0.5%	46	472	0 - 0	0.3%	0.97
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

follow up. More cases might have shown differences 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 particularly benefit 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 frequency of general complications (on average 3) may be due to our operational definition and by 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 hospital to 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 variation 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.

References:

1. Bennekom C A M, Jelles F, Lankhorst G J. Rehabilitation Activities Profile: The ICIDH as a framework for a problem-oriented assessment method in rehabilitation medicine. Disabil Rehabil 1995; 17: 169-75.
2. Bernardini B, Meinicke C, Pagani M, Grillo A, Fabbrini S, Zaccarini C, Corsini C, Scapellato F, Bronacorso O. Comorbidity and adverse clinical events in the rehabilitation of older adults after hip fracture. J Am Geriatr Soc 1995; 43: 894-9.
3. Ceder L, Strömquist B, Hansson L I. Effects of strategy changes in the treatment of femoral neck fractures during a 17-year period. Clin Orthop 1987; 218: 53-7.
4. Fitzgerald J F, Moore P S, Dittus R S. The care of elderly patients with hip fracture. Changes since implementation of the prospective payment system. N Eng J Med 1988; 21 : 1392-7.
5. Folstein M F, Folstein S E, McHugh P R. "Mini-mental State": A practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res. 1975; 12: 189-98.
6. French F H, Torgerson D J, Porter R W. Cost analysis of fracture of the neck of femur. Age Ageing. 1995; 24: 185-9.
7. Gilchrist W J, Newman R J, Hamblen D L, Williams B O. Prospective randomised study of an orthopaedic geriatric inpatient service. BMJ 1988; 297: 1116-8.
8. Hollingworth W, Todd C, Parker M, Roberts J A, Williams R. Cost analysis of early discharge after hip fracture. BMJ 1993; 307: -903-6.
9. Hunt S M, McKenna S P, McEwen J, Backett E M, Williams J, Papp E. A quantitative approach to perceived health status: a validation study. J Epidemiol Community Health. 1980; 34: 281-6.
10. Jalovaara P, Berglund-Rödén M, Wingstrand H, Thorngren K-G. Treatment of hip fracture in Finland and Sweden. Prospective comparison of 788 cases in three hospitals. Acta Orthop Scand 1992; 63: 531-5.
11. Kennie D C, Reid J, Richardson I R, Kiamari A A, Kelt C. Effectiveness of geriatric rehabilitative care after fractures of the proximal femur in elderly women: a randomised clinical trial. BMJ 1988; 297: 1083-6.
12. Laet C E D G de, Hout B A van, Hofman A, Pols H A P. Kosten wegens osteoporotische fracturen in Nederland; mogelijkheden voor kosten beheersing. Ned Tijdschr Geneeskd 1996; 140: 1684-8.
13. Melton L J 3rd. Epidemiology of hip fractures: implications of the exponential increase with age. Bone 1996; 18: 121S-125S.
14. Murphy P J, Rai G S, Lowy M, Bielawaska C. The beneficial effects of joint orthopaedic-geriatric rehabilitation. Age Ageing 1987; 16: 273-8.
15. Nelson E C, Landgraf J M, Hays R D, Wasson J H, Kirk J W. The functional status of patients. How can it be measured in physicians' offices ? Med Care 1990; 28:1111-26.
16. Polder J J, Balen R van, Steyerberg E W, Cools H J M, Habbema J D F. A cost-minimisation study of alternative discharge policies after hip fracture repair. Health Econ. In press.
17. Pryor G A, Myles J W, Williams D R R, Anand J K. Team management of the elderly patient with hip fracture. Lancet 1988;1 (8582): 401-3.
18. Reid J, Kennie D C. Geriatric rehabilitative care after fractures of the proximal femur: one year follow up of a randomised clinical trial. BMJ 1989; 299: 25-6.
19. Strömberg L, Öhlen G, Svensson O. Prospective payment systems and hip fracture treatment costs. Acta Orthop Scand 1997; 68: 6-12.

Addendum:

The results of the prospective invention study comparing the outcome of the conventionally and the early discharged patients were presented in a journal article (chapter 4). For the interested reader 3 not published tables are added:

Table 1.
Patient Characteristics of Conventionally Managed and Early Discharged Patients with Hip Fracture.

Variable	Conventional Management n = 102	Early Discharge n = 106	Total n = 208	Significance. of Differences Between Groups (p - value)
Mean age years	83 y	84 y	83 y	0,3 (t-test)
median (25th-75th percentile)	83 (77-88)y	84 (79-90)y	84 y	
Percentage women	84%	74%	79%	0,06 (X^2)
Admitted from(%)				0,9 (X^2)
own home	58%	61%	60%	
home for the elderly	27%	25%	26%	
nursing home	16%	14%	15%	
Fracture type (%)				0,1 (X^2)
cervical	43%	51%	47%	
trochanteric	49%	47%	48%	
subtrochanteric	8%	2%	5%	
Operation type (%)				0,06 (X^2)
hemiarthroplasty	25%	29%	27%	
dynamic hip screw	19%	23%	21%	
hansson pins	13%	12%	13%	
gamma-nail	37%	20%	28%	
other		4%	11%	8%
not operated	3%	5%	4%	
Comorbidity (% of patients)				
cardiovascular	45%	44%	45%	
musculoskeletal	42%	41%	41%	
neuropsychiatric	38%	30%	34%	
neurologic	26%	30%	28%	
respiratory	16%	8%	12%	
metabolic and endocrine	16%	17%	16%	
gastrointestinal	9%	8%	8%	
urogenital	8%	6%	7%	
Number of comorbidities (% of patients)				0,6 (X^2)
0	6%	6%	6%	
1	27%	24%	25%	
2	20%	29%	25%	
3	30%	26%	28%	
>3	17%	15%	16%	
mean	2,4	2,2	2,3	0,8 (M-WU)
(with functional limitation)	(1,1)	(1,2)	(1,1)	0,7 (M-WU)

Addendum:

Table 2. Follow up in Walking Ability, (Instrumental) Activities of Daily Living Management, Quality of Life, and Cognitive Status. Comparison of Conventionally Managed (n= 102) and Early Discharged (n= 106) Patients.

outcome	Before Fracture Conventional Management n = 102	Before Fracture Early Discharge n = 106	1 Week Conventional Management n = 102	1 Week Early Discharge n = 106	1 Month Conventional Management n = 97	1 Month Early Discharge n = 102	4 Months Conventional Management n = 82	4 Months Early Discharge n= 86
Walking ability (%)								
not	0%	0%	39%	38%	30%	27%	15%	21%
with help	3%	5%	29%	31%	18%	18%	10%	8%
walking frame	26%	23%	29%	29%	47%	44%	42%	37%
crutches	8%	17%	2%	2%	3%	9%	7%	14%
no walking aids	64%	56%	1%	0%	2%	3%	27%	20%
RAP cmp score (mean) 0-36	9,3	9,9	22,6	22,5	18,9	18,3	14,5	14,9
RAP occupation (0-9)	5,1	5,3	--	--	7,4	7,1	6,2	6,2
NHP (mean) 0-100								
physical mobility	--	--	83	84	73	71	57	59
pain	--	--	55	52	42	35	27	27
sleep	--	--	33	36	30	27	22	26
energy	--	--	62	58	59	48	44	43
social isolation	--	--	35	34	28	29	27	29
emotional reaction	--	--	34	33	29	31	26	27
COOP/WONCA charts (mean) 1-5								
physical condition	--	--	4,9	4,9	4,8	4,7	4,5	4,5
emotional condition	--	--	2,6	2,6	2,4	2,3	2,2	2,4
daily work	--	--	--	--	4,1	4,1	3,5	3,8
pain	--	--	2,8	3,0	2,9	2,7	2,4	2,5
general condition	--	--	3,8	3,7	3,4	3,4	3,3	3,4
change in condition	--	--	4,0	4,0	2,5	2,6	2,9	2,9
social activities	--	--	--	--	2,6	2,2	2,0	2,3
MMSE (mean) 0-29			17,7	17,9	18,9	18,9	20,8	20,6

no differences between conventional management and early discharge with $p < 0,05$ (Mann Whitney U test)

RAP = Rehabilitation Activities Profile (higher figures indicate worse health status)

NHP = Nottingham Health Profile (higher figures indicate worse health status)

COOP/WONCA charts = Dartmouth COOP Functional Health Assessment Charts revised by the World Organization of National Colleges, Academies and Academic Associations of General practitioners and Family Physicians (WONCA)

MMSE = Mini-mental State (higher figures indicate better cognitive status)

Addendum:

Table 3. Patients pre-fracture living at home. Follow up in Walking Ability, (Instrumental) Activities of Daily Living Management, Quality of Life, and Cognitive Status. Comparison of Conventionally Managed (n= 59) and Early Discharged (n= 65) Patients.

outcome	Before Fracture		1 Week		1 Month		4 Months	
	Conventional Management n = 59	Early Discharge n = 56	Conventional Management n = 59	Early Discharge n = 65	Conventional Management n = 57	Early Discharge n = 63	Conventional Management n = 52	Early Discharge n= 57
Walking ability (%)								
not	0%	0%	32%	29%	21%	9%	6%	10%
with help	2%	0%	25%	28%	14%	16%	8%	4%
walking frame	14%	12%	39%	40%	58%	56% *	37%	39%
crutches	8%	23%	3%	3%	5%	14%	10%	17%
no walking aids	76%	65%	0%	0%	2%	5%	40%	30%
RAP cmp score (mean) 0-36	5,6	6,3	21,2	20,2	16,3	14,7 #	11,4	11,0
RAP occupation (0-9)	3,8	3,9	--	--	7,0	6,4 #	5,3	5,3
NHP (mean) 0-100								
physical mobility	--	--	79	79	67	63	48	48
pain	--	--	52	51	36	32	24	24
sleep	--	--	38	39	33	28	22	26
energy	--	--	53	50	47	35	36	31
social isolation	--	--	29	28	23	22	18	22
emotional reaction	--	--	29	26	25	25	21	22
COOP/WONCA charts (mean) 1-5								
physical condition	--	--	4,9	4,9	4,7	4,5	4,3	4,3
emotional condition	--	--	2,4	2,4	2,1	1,8	1,9	2,0
daily work	--	--	--	--	3,9	3,8	3,2	3,3
pain	--	--	2,7	2,9	2,8	2,6	2,3	2,5
general condition	--	--	3,7	3,6	3,2	3,2	3,1	3,1
change in condition	--	--	3,9	4,0	2,3	2,2	2,8	2,9
social activities	--	--	--	--	2,2	1,8 *	1,8	1,7
MMSE (mean) 0-29			21,5	23,0	22,5	23,5	23,8	24,7

no differences between conventional management and accelerated discharge with $p < 0,05$ (Mann Whitney U test)

* $p = 0,05$

\# $0,05 > p < 0,1$, after correction for differences in RAP score before fracture

RAP = Rehabilitation Activities Profile (higher figures indicate worse health status)

NHP = Nottingham Health Profile (higher figures indicate worse health status)

COOP/WONCA charts = Dartmouth COOP Functional Health Assessment Charts revised by the World Organization of National Colleges, Academies and Academic Associations of General practitioners and Family Physicians (WONCA)

MMSE = Mini-mental State (higher figures indicate better cognitive status)