Japanese Journal of Comprehensive Rehabilitation Science (2012)

Original Article

Approaches to hip fractures in convalescent rehabilitation wards – Consideration of length of stay, number of sessions, and discharge destination

Shinichiro Maeshima, MD, PhD,[1] Aiko Osawa, MD, PhD,[1] Daisuke Nishio, RPT, MA,[2] Yoshitake Hirano, RPT,[2] Hiroshi Kigawa, MD[2]

[1]Department of Rehabilitation Medicine, Saitama Medical University International Medical Center
[2]International Rehabilitation Center, Hanno Seiwa Hospital

ABSTRACT
Maeshima S, Osawa A, Nishio D, Hirano Y, Kigawa H. Approaches to hip fractures in convalescent rehabilitation wards – Consideration of length of stay, number of sessions, and discharge destination. Jpn J Compr Rehabil Sci 2012; 3: 72–77.
Purpose: Factors that influence activities of daily living (ADL) and the discharge destination of hip fracture patients hospitalized in convalescent rehabilitation wards were examined from the viewpoint of the amount of time spent in rehabilitation sessions and the duration of hospitalization.
Methods: The study subjects were 50 patients suffering from hip fracture. We evaluated the pre-injury condition, cognitive function, uninjured side leg extensor muscle strength, and activities of daily living (ADL) for each patient. The discharge destination was generally divided into a "home" group and a "facility/hospital transfer" group, and a comparative examination was carried out regarding the relationship between the overall number of rehabilitation sessions conducted, including physiotherapy and occupational therapy, and the daily number of sessions.
Results: FIM efficiency declined greatly from 0.32 (n = 30) for the 4th through 6th weeks after hospitalization to 0.11 (n = 20) for the 6th to 8th weeks, and in a post hoc test, a significant difference (p = 0.0069) was observed in FIM efficiency between weeks 2–4 and weeks 6–8.
Conclusion: The results suggest that for hip fracture patients, about 6 weeks after being admitted to a convalescent rehabilitation ward, post-discharge guidance including nursing care service and family coaching is necessary.
Key words: hip fractures, convalescent rehabilitation wards, number of sessions, length of stay

Correspondence: Shinichiro Maeshima, MD, PhD
Department of Rehabilitation Medicine, Saitama Medical University International Medical Center, 1397–1 Yamane, Hidaka, Saitama 350–1298, Japan
E-mail: maeshima@saitama-med.ac.jp
Accepted: September 2, 2012
No benefits in any form have been or will be received from a commercial party related directly or indirectly to the subject of this manuscript.

Introduction

Aging in Japan continues to advance rapidly. With 29.58 million citizens aged 65 and older [1], making up 23.1% of the population, we have become a super-aging society. Under such circumstances, an increasing number of elderly people require nursing care and assistance due to factors such as falls and bone fractures. According to a basic survey on the lives of the citizens, 10.2% of all factors resulting in the need for nursing care were bone fractures and falls [2]. In recent years, hip fractures in particular have increased among bone fractures in the elderly [3]. Surgical treatment is frequently applied, followed by rehabilitation, but the level of activity prior to the injury is low in elderly patients, and it is not uncommon to encounter difficulties in recovery.

On the other hand, the goal focused upon by convalescent rehabilitation wards is improvement in activities of daily living (ADL) and returning home, but regardless of the fact that hip fracture is a chronic disease among the elderly, there are few reports on the amount of rehabilitation training and functional prognosis. We have compared the pre- and post-hospitalization ADL of hip fracture patients hospitalized in convalescent rehabilitation wards, and examined the factors that influence the ADL at discharge and returning home, from the viewpoint of the number of rehabilitation sessions (1 session = 20 minutes of rehabilitation) and days hospitalized.

Methods

The subjects were 50 patients (13 males and 37 females) with hip fracture who were hospitalized in convalescent rehabilitation wards during a period of 3 years. Their ages ranged from 56 to 97 years (81.1 ± 8.6). Twenty-two patients had "neck" hip fractures, and 28 had "trochanteric" hip fractures; 21 were right-side fractures, and 29 left-side fractures. In terms of other medical conditions, 9 patients had diabetes, 12 had hypertension, 7 had suffered a stroke, and 7 had a history of leg fracture. Pre-injury scores on the modified Rankin Scale (mRS) were 0 (19 patients), 1 (7 patients), 2 (10 patients), and 3 (14 patients).

For these patients, in addition to such attributes as age, gender, number of days from onset of hip injury until hospitalization in a convalescent rehabilitation ward (days from onset), number of days hospitalized in a convalescent rehabilitation ward (hospitalization period), number of family members living with them and the key person therein, coexisting and past illnesses, and mRS, we also evaluated the uninjured side leg extensor muscle strength (kg/kg: knee extensor strength divided by body weight) and cognitive function (mini-mental state examination (MMSE)). Using the Functional Independence Measure (FIM) every two weeks starting from hospitalization, the ADL evaluation was calculated from the FIM efficiency for each period (number of FIM points for each period/number of days). We also calculated the FIM gain (FIM score at discharge minus FIM score on admission) and the FIM efficiency (FIM gain/number of days hospitalized).

Additionally, we surveyed the overall number and daily number of rehabilitation sessions conducted, including physiotherapy and occupational therapy, and examined the factors that influence ADL improvement. Furthermore, we generally divided the patients into a "home" group and a "facility/hospital transfer" group, and conducted a comparative examination into the factors that influence the discharge destination.

Rehabilitation procedure

We generally followed a team approach, and intervention was conducted from hospitalization to discharge by attending physicians, rehabilitation specialists, ward nurses, physiotherapists, occupational therapists, speech-language pathologists, medical social workers, etc. Within one week of hospitalization, a conference was held with the rehabilitation team, the patients, and their families in order to discuss the treatment plan. The number of prescribed physiotherapy (PT) intervention sessions was normally a maximum of 4 to 5 sessions, and occupational therapy (OT) a maximum of 2 to 3 sessions, and the amount of PT and OT training for each patient was adjusted based on the amount of time since the injury and the patient's abilities, etc. Speech therapy (ST) was prescribed as needed in cases of aphasia and difficulty swallowing. As for PT, moving around in the bed, ambulatory mobility, standing, walking, and physical strength enhancement training were carried out, as well as prevention/guidance on contraindicated leg positions for the prevention of dislocation in patients with femoral head replacement. As for OT, self-care guidance such as changing clothes, posture, using the toilet, and bathing was carried out, and the ward nurses simultaneously conducted direct guidance in an ADL context. Also, we recommended that the key person from the patient's family be present during the rehabilitation sessions in the training room, at which time we coached them regarding the assistance methods such as for transfer and walking. Once the scheduled treatment plan was completed and either the patient was capable of independent ADL or the family was capable of caring for the patient by themselves, or when it was no longer possible to improve the FIM, a final discharge date was determined, and the patient was discharged upon confirmation that their house or other living environment (or the preparations for the facility to which they were going to transfer) was in proper order.

Results

1. Demographics of the patients with hip fracture

The average number of days from injury until surgery was 7.7 ± 6.8, and the type of surgery was osteosynthesis for 31 patients and femoral head replacement for 19. The average number of days from injury to hospitalization in a convalescent rehabilitation ward was 31.5 ± 13.9, and the average period of hospitalization was 49.3 ± 19.8 days (the average period from injury to discharge was 80.9 ± 24.0 days). The average number of family members living at home was 3.4 ± 1.8 persons, and the respective key persons were sons for 18 patients, daughters for 13, husbands for 8, wives for 5 and other relatives for 6. PT and OT were carried out for all patients, and the total number of rehabilitation sessions during hospitalization was 383.1 ± 165.5 (from 101 to 760 sessions), while the daily average number of sessions was 7.7 ± 1.1 (5.4 ± 1.1 PT and 2.3 ± 0.6 OT sessions). Also, ST was carried out only for the 3 patients (average 1.9 ± 0.2 sessions) who were shown to have aphasia and difficulty swallowing.

2. Factors that influence ADL improvement

The average FIM score on admission was 75.7 ± 21.9, and the average FIM score at discharge was 92.2 ± 22.0, meaning an average FIM gain of 16.5 ± 11.7. The FIM efficiency for each respective period was 0.67 (n = 50) for weeks 0−2 after hospitalization, 0.35 (n = 44) for weeks 2−4, 0.32 (n = 30) for weeks 4−6, 0.11 (n = 20) for weeks 6−8, and 0.11 (n = 7) for weeks 8−10. In other words, the sooner after hospitalization,

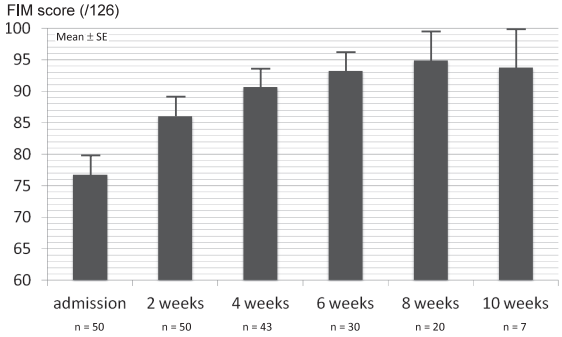

Figure 1. Clinical course of FIM during convalescent rehabilitation ward hospitalization.
The sooner after hospitalization, the larger the FIM efficiency was, after which it gradually became smaller.

the larger the FIM efficiency was, after which it gradually became smaller ($F = 7.98$, $df = 4$, $p < 0.0001$). Upon carrying out a post hoc test in the respective periods, the first 2 weeks of hospitalization clearly showed a higher value (weeks 2–4, $p = 0.0217$; weeks 4–6, $p = 0.0012$; weeks 6–8, $p < 0.0001$). Also, a difference in FIM efficiency was seen between weeks 2–4 and weeks 6–8 ($p = 0.0069$). On the other hand, weeks 4–6, 6–8, and 8–10 showed no difference in FIM efficiency. The FIM on admission as well as at discharge both showed a negative correlation to the pre-injury mRS, while the uninjured side leg extensor muscle strength showed a positive correlation to MMSE (Table 1). Also, the FIM on admission and the FIM at discharge showed a negative correlation. On the other hand, the amount of improvement of ADL during hospitalization—that is to say, the FIM gain (FIM at time of discharge minus FIM at time of hospitalization)—showed a positive correlation with the number of days of hospitalization and the total number of rehabilitation sessions. mRS at the time of discharge was 1 (7 patients), 2 (21 patients), 3 (11 patients), 4 (9 patients), and 5 (2 patients). Compared to the pre-injury mRS, the value decreased in 29 patients, among which 18 showed a significant decrease of 2 levels or more. The value stayed the same in 19 patients, and improved in 2 patients, compared to the pre-injury value.

3. Factors that influence discharge to home

The discharge destination was "home" for 42 patients and "facility/hospital" for 8 patients. No difference was observed between the two groups in age, gender, side of fracture, number of days from injury to surgery, type of surgery, number of days between injury and hospital transfer, coexisting and past illnesses, pre-injury mRS, and number of family members living at home. The uninjured side leg extensor muscle strength, MMSE, and FIM score at the time of hospitalization were more favorable in the home group. Of the 36 patients who were capable of independent ADL pre-injury, 31 (86.1%) were discharged home, while 5 were transferred to facilities/hospitals. Of these 5 patients, 4 had injuries resulting in the need for ADL assistance.

On the other hand, of the 14 patients who were not capable of independent ADL pre-injury, 11 (78.6%) were discharged home, while 3 were transferred to facilities/hospitals. There was no difference in the total number of rehabilitation sessions implemented during hospitalization, but the number of PT sessions per day was higher in the home group. The number of days of hospitalization was clearly longer for the facility/hospital transfer group, and the FIM score at discharge and FIM efficiency were lower.

Discussion

The estimated number of hip fracture cases in Japan is 150,000 per year (2007) [3], and the incidence of hip fracture sharply increases after age 70 [4]. Post-operative rehabilitation is vital to prevent an increase in the number of bedridden elderly as well. The

Table 1. Relationship between FIM on admission, at discharge and FIM gain.

	FIM score on admission	FIM score at discharge	FIM gain
Age	–0.18	–0.39	–0.26
Time from injury to surgery	0.01	–0.05	–0.03
Time from injury to hospital transfer	–0.14	–0.20	–0.13
Uninjured side extensor strength	0.53 ***	0.55 ***	–0.01
MMSE	0.50 ***	0.66 ***	0.25
Family members living at home	–0.20	–0.18	0.05
Pre-injury mRS	–0.44 ***	–0.43 ***	–0.14
Duration of hospitalization	–0.29 *	0.04	0.49 ***
Total number of rehabilitation sessions	–0.20	0.11	0.53 ***
Number of PT sessions per day	0.01	0.15	0.28
Number of OT sessions per day	0.16	0.20	0.17

Spearman's rank correlation.
* <0.05, ** <0.01, *** <0.005.

Table 2. Comparison between home group and facility/hospital transfer group.

	Home (N = 42)	Facility/hospital (N = 8)
Age (years)	79.3 (10.7)	81.5 (8.2)
Gender (men/women)	9/33	4/4
Fracture side (right/left)	17/25	4/4
Time from injury to surgery (days)	7.4 (7.1)	9.5 (4.4)
Type of surgery (osteosynthesis/replacement)	26/16	5/3
Time from injury to hospital transfer (days)	31.0 (14.4)	34.3 (11.1)
Past illness (stroke/fracture)	6/7	1/0
Complications (hypertension/diabetes)	11/8	1/1
MMSE (/30) **	21.5 (5.9)	14.6 (5.1)
Family members living at home	3.5 (1.7)	2.7 (2.0)
Pre-injury mRS (0/1/2/3/4/5)	17/7/7/11/0/0	2/0/3/3/0/0
Duration of hospitalization (days) *	46.0 (2.9)	66.5 (6.5)
Uninjured side extensor strength (kg/kg) *	0.25 (0.11)	0.16 (0.06)
Total number of rehabilitation sessions	367.4 (165.2)	465.9 (149.6)
Number of PT sessions per day *	5.5 (0.9)	4.5 (1.4)
Number of OT sessions per day	2.3 (0.6)	2.0 (0.5)
Number of ST sessions per day	1.9 (0)	1.9 (0.2)
FIM score on admission ***	80.1 (19.1)	52.3 (21.5)
FIM score at discharge ***	97.3 (18.0)	65.3 (22.6)
mRS at discharge (0/1/2/3/4/5) *	0/6/21/8/6/1	0/1/0/3/3/1
FIM gain	17.1 (12.3)	13.0 (8.0)
FIM efficiency *	0.39 (0.28)	0.20 (0.13)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.0005$.

recently recommended team approach has brought reports of such results as a reduction in the number of days of hospitalization, increased ADL scores, reduction of deaths during hospitalization, and increase in home discharges [5, 6]. In Japan, convalescent rehabilitation wards have been established to promote this kind of team treatment by a variety of professionals and to carry out concentrated rehabilitation. According to a survey by the Kaifukuki Rehabilitation Ward Association in Japan [7], the total number of rehabilitation sessions conducted for one group of orthopedic patients including hip fracture patients, the subject of this research, was 243.6 sessions, with 4.3 average sessions per day. In contrast, the total number of rehabilitation sessions that we carried out was 383.1 (an average of 7.7 sessions per day), and despite the concentrated rehabilitation, there is no large difference from the previous report [7], and there was no connection between the number of rehabilitation sessions per day and the FIM gain either. This is likely influenced by the ceiling effect of FIM, but regarding the relationship between the amount of rehabilitation training and functional prognosis, there are reports showing that even twice the daily concentrated PT is not more effective in functional recovery than simple daily PT [8], as well as reports that the amount of time spent conducting PT does not affect the outcome [9]. On the other hand, Hoeing et al. [10] reported that frequent training of 5 times or more per week increased the walking ability and survival rate, and Bischoff-Ferrari et al. [11] stated that compared with normal PT for 30 minutes each day, conducting expanded PT consisting of 60 minutes of daily PT with an additional home program resulted in a 25% reduction in falls. There are also reports that post-surgery OT has led to prompt ADL recovery and returning home [12, 13]. Our own experimental examples have also shown that intervention with OT enables direct ADL training moving toward discharge including changing clothes and posture, and house survey/guidance, suggesting that in the future it is necessary to examine not only the quantity of time spent training but also the quality of the training.

The next point is the hip fracture hospitalization period. Based on a multicenter report on general hospitals by Tsushima et al. [14], the average number of days until discharge was 57.2 ± 21.5. In a report by Ito et al. [15], the average number of days of hospitalization after surgery was 36.9 days (41.5 days from injury), and 75% of the patients were discharged to home. Also, Kurokawa et al. [16] reported that the number of days of hospitalization in convalescent rehabilitation wards attached to acute hospitals was 31.7 days (49.8 days from injury). In contrast, convalescent rehabilitation wards report that in most cases, there is a tendency toward long periods of hospitalization of 60−80 days. In fact, in convalescent rehabilitation wards it is not uncommon for discharge

to be postponed for such reasons as processing of nursing insurance services or home renovations, even after the ADL goal has been achieved. In our experiments as well, considering the fact that longer periods of hospitalization correlated to higher FIM gain values, it would seem that a certain period of hospitalization is necessary for hip fracture. Kagaya et al. [21] stated that functional recovery can be gained up to 6 months after injury, but not much thereafter. In this study, until 6 weeks after hospitalization in the convalescent rehabilitation ward, the FIM efficiency was over 0.3, but then it decreased to 0.11. Taking these facts into consideration, it is necessary to consider the patients' lives in their homes while planning effective ADL improvement, and to rethink the rehabilitation programs to allow such things as the introduction of nursing care insurance, home renovation, and family guidance. Also, cognitive function and uninjured side leg extensor muscle strength on admission stood out as factors relating to the FIM at the time of hospitalization and discharge, and these were more favorable in the home group than the facility/hospital transfer group. It is therefore advisable to create the rehabilitation program after evaluating such items as cognitive function and uninjured side leg extensor muscle strength on admission.

Regarding the connection with pre-hospitalization lifestyle, one report [20] states that the ratio of hip fracture patients who were living in their homes pre-injury and were discharged to their homes was 60.1–81.9%. In our experiments, 84.0% of all patients were discharged home, and there was no difference in pre-injury mRS between the home group and facility/hospital transfer group. Four of the 5 patients capable of independent ADL pre-injury but who were transferred to facilities/hospitals post-injury went on to require ADL assistance due to the injury, and it is possible that the hip fracture injury and subsequent hospitalization facilitated the end of their living at home. On the other hand, most of the patients who required ADL care from before their injuries had such environmental considerations as families with a good understanding of their declining physical functions and nursing insurance, so by vigorously conducting assistance training with the goal of reducing the amount of assistance, relatively quick reception was possible. Even in earlier research, more than the bodily functions of the patients themselves, inhibitory factors of home discharge are specified to be insufficient cohabiters [20], increased age of the caregivers, and deficiencies in receptive structure such as a lack of caregivers [22], indicating not only a lack of training given to the patients themselves but to the family members as well. Also at issue is how, after being discharged, the patients maintain and further improve the ADL that they improved while hospitalized in convalescent rehabilitation wards, and an approach that gives plenty of guidance to the family members who are capable of being caregivers will be necessary going forward.

Acknowledgment

We thank the rehabilitation staff at Hanno-Seiwa Hospital for their cooperation in our study.

References

1. Cabinet Office: White paper on aging society 2011. pp. 2–7 Available from:http://www8.cao.go.jp/whitepaper/w-2011/zenbun/23pfd_index.html (cited 2012 Feb14).
2. Ministry of Health, Labour and Welfare. IV Situation of nursing care. Available from: http://www. mhlw.go.jp/toukei/saikin/ hw/k-tyosa10 (cited 2012 Feb14).
3. Japanese Orthopaedic Association: Clinical guideline on the diagnosis, treatment of femoral neck and trochanteric fractures, 2nd edition. Nankodo, Tokyo, 2011.
4. Hagino H, Furukawa K, Fujiwara S, Okano T, Katagiri H, Yamamoto K, et al. Recent trends in the incidence and lifetime risk of hip fracture in Tottori, Japan. Osteoporos Int 2009; 20: 543–8.
5. Handoll HHG, Cameron ID, Mak JCS, Finnegan TP. Multidiciplinary rehabilitation for older people with hip fractures (Cochrane review). Cochrane Database of Systematic Reviews; 2009.
6. Cameron ID, Lyle DM, Quine S. Accelerated rehabilitation after proximal femoral fracture: A randomized controlled trial. Disabil Rehabil 1993; 15: 29–34.
7. Kaifukuki rehabilitation ward association: 2011 Annual report from the annual survey committee of Kaifukuki rehabilitation ward association. Tokyo, February, 2012.
8. Karumo I. Recovery and rehabilitation of elderly subjects with femoral neck fractures. Ann Chir Gynaecol 1977; 66: 170–6.
9. Lauridsen UB, de la Cour BB, Gottschalck L, Svensson BH. Intertensive physical therapy after trochabtric femoral fracture. A randomized trial. Ugeskr Laeger 2002; 164: 1040–4.
10. Hoenig H, Rubenstein LV, Sloane R, Horner R, Kahn K. What is the role of timing in the surgical and rehabilitation care of community-dwelling older persons with acute hip fracture? Arch Intern Med 1997; 157: 513–20.
11. Bischoff-Ferrari HA, Dawson-Hughes B, Platz A, Orav EJ, Stähelin HB, Willett WC, et al. Effect of high-dosage cholecalciferol and extended physiotherapy on complications after hip fracture: a randomized controlled trial. Arch Intern Med 2010; 170: 813–20.
12. Hagsten B, Svensson O, Gardulf A. Early indivisualized postoperative occupational therapy training in 100 patients improves ADL after hip fracture: a randomized trial. Acta Orthop Scand 2004; 75: 177–83.
13. Tanaka K, Saura R, Takahashi N, Akagi J, Fujiwara E, Kawatsu S. Early intervention of occupational therapy for femoral neck fracture. J Clin Rehabil 2010; 19: 992–5.
14. Tsushima E, Futatuya M, Sakano S, Asahi S, Mita R.

The influence of intelligence upon activities of daily living in elderly patients with hip fracture. Rigakuryoho Kagaku 2005; 20: 143−7.
15. Ito J, Shirai T, Sato M, Kaneko K, Kitagawa T. The relationship between walking exercise and walking ability at discharge or discharge to home in patients following surgery for hip fracture. Fracture 2010; 32: 849−52.
16. Kurokawa Y, Kido K, Tominaga T, Kunishi Y. The effect of the physical and occupational therapy to the femoral neck fracture in the convalscence rehabilitation ward. JJOMT 2005; 53: 45−8.
17. Kikuchi K, Narita K, Terasaki A, Kondo Y. An examination of factors associated with our subacute rehabilitation unit influencing return home of postoperative proximal femoral fracture. J Akita Phys Ther Assoc 2010; 18: 39−41.
18. Yamashita H, Hagino H, Katagiri H, Kawaguchi K, Yamane K, Endo K, et al. Efforts in liaison clinical pathway of hip fracture. Orthop Traumatol 2008; 57: 377−80.
19. Noguchi Y, Rikimaru S, Hotokezaka S, Mae T, Sasaki K, Iguchi T, et al. Length of hospital stay and final discharge destination of hip fracture patients with relation surgical methods and regional liaison pathway. Orthop Traumatol 2011; 60: 495−501.
20. Bunno K, Sato S, Tsubahara A, Aoyagi Y, Hiraoka T. Examination of the thighbone fracture patient who was not able to home leave hospital. J Clin Rehabil 2009; 18: 470−3.
21. Kagaya H, Shimada Y. Treatment and rehabilitation after hip fracture in the elderly. Crit Rev Phys Rehabil Med 2007; 19: 97−113.
22. Tsujimura Y, Takada N. Problems in gait independence and home discharge in elderly patients aged over 90 years after femoral neck fracture. Phys Ther Jpn 2006; 33: 303−6.