The management of elderly patients with femoral fractures

A randomised controlled trial of early intervention versus standard care

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Abstract

Objective: To determine the effect of an early intervention program in an acute care setting on the length of stay in hospital of elderly patients with proximal femoral fractures.

Setting: Acute orthopaedic ward of a large teaching hospital.

Design and participants: A randomised controlled trial comparing 38 Intervention patients with 33 Standard Care patients.

Intervention: Early surgery, minimal narcotic analgesia, intense daily therapy and close monitoring of patient needs via a multidisciplinary approach versus routine hospital management.

Main outcome measures: Length of stay (LOS); deaths; level of independent functioning.

Results: Mean LOS was shorter in the Intervention group than in the Standard Care group (21 days v. 32.5 days; $P < 0.01$). After adjusting for other factors that could affect LOS (eg, age, sex, pre-trauma functional levels, pre-trauma comorbidity and postsurgical complications), the Intervention program was significantly predictive of shorter LOS ($P = 0.01$). The Intervention group did not experience greater numbers of deaths, deterioration in function or need for social support than the Standard Care group.

Conclusion: This early intervention program in an acute care setting results in significantly shorter length of hospital stay for elderly patients with femoral fractures.

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Proximal femoral fractures are fairly common events among elderly people, and their incidence is expected to increase as the proportion of the population in the age group at risk increases. These patients have traditionally required relatively lengthy hospital stays and have consequently consumed a significant proportion of hospital resources.[1,2]

There has been increasing interest in ways to reduce the length of hospital stay of these patients over the past decade. Efforts have focused on geriatric inpatient rehabilitation services and rehabilitation conducted in the patient's home.[3,4] Within Australia, programs such as the Domiciliary Rehabilitation and Support Program[5] at Sir Charles Gairdner Hospital (WA), the Fractured Hip Management Programme[6] at Westmead Hospital (NSW) and the Accelerated Discharge Program[7] at Hornsby Ku-Ring-Gai Hospital (NSW) have shortened hospital stays for patients while allowing them to continue rehabilitation at home.

We used another approach. The Orthopaedic Management Patient Focused Care Project was based at the Royal Brisbane Hospital (Qld), a large teaching hospital with 750 beds (50 in the orthopaedic ward). We examined the effect of an early intervention program conducted entirely within an acute care setting to determine if such a program would reduce the length of stay in hospital of elderly patients with femoral fractures.

Methods

Our study was a randomised controlled clinical trial conducted from October 1994 to July 1995. A full-time physiotherapist, occupational therapist, clinical nurse consultant and a half-time social worker were recruited for the study, and a geriatrician and an orthopaedic surgeon from the hospital completed the multidisciplinary team. Funding for the project was provided by the Medicare Incentives Hospital Access Program (1993–1998).

Patients

Patient eligibility criteria were: age 55 years or older; non-pathological fracture; residing at home or in a hostel; independently mobile (with or without a walking aid); able to give informed consent; accessible for follow-up (ie, residing in the Brisbane area); and public patients. Patients with dementia, with inadequate English to give informed consent or residing in a nursing home were excluded.

Eligible patients who came to the Accident and Emergency Department

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or who were admitted to the orthopaedic ward were identified to the trial coordinator, who, having sole possession of the treatment codes, obtained consent then randomised each patient to one of the treatment arms. Six eligible patients who either refused to participate or who were admitted during holiday periods were not entered in the trial.

All patients were treated according to the protocol for the group to which they had been randomised, and were analysed accordingly. No participants were lost to follow-up.

Treatment programs

Standard orthopaedic management comprised:

- surgery by registrars and management by hospital orthopaedic staff;
- anaesthesia and analgesia as determined by the anaesthesiologist and orthopaedic surgeon;
- daily visits by the physiotherapist rostered to the orthopaedic wards;
- social worker or occupational therapist as requested by hospital staff or the patient;
- geriatrician consultation for rehabilitation on referral;
- orthopaedic ward round;
- weekly discharge planning meeting;
- home visit as requested by the social worker;
- referral to community services as needed; and
- organisation of equipment as needed.

Early intervention provided by the multidisciplinary team comprised:

- early surgery by the registrar assigned to and supervised by the orthopaedic surgeon;
- regional anaesthesia and local analgesia where possible;
- early mobilisation (first day after surgery if possible), and twice-daily, intense sessions by the physiotherapist;
- daily assessment, treatment or counselling by the occupational therapist and social worker;
- review by geriatrician on next working day after surgery;
- two additional ward rounds attended by all staff;
- weekly case conference attended by all staff;
- coordination of care by the trial coordinator;
- postoperative care by orthopaedic unit involved in project;
- home assessment visit before discharge;
- community services referrals and equipment arranged by team members as needed; and
- follow-up at one and six months after discharge.

Data collection

Length of stay for each patient was defined as the number of days from admission until discharge home or to hostel, death or to approval of residential care. To eliminate the possibility of bias in the determination of which patients could be discharged, specific discharge criteria (ie, medically stable and able to transfer and walk independently with or without aids) were established and used for all patients in the study.

The functional ability of each patient was assessed using the Modified Barthel Index (MBI).[8] Physical strength and mobility were assessed by manual muscle tests and tests of balance.[9] The Mini-Mental State examination was used to assess cognitive state and dementia.[10] Data on living arrangements, accommodation and use of community services were also collected. Each patient's medical history and current medical status, surgery details, complications during and after surgery, and postdischarge clinical assessments were obtained from the hospital medical record.

Intervention patients were followed up at six months while attending an outpatient clinic. Standard Care patients were either similarly followed up at an outpatient clinic, or the trial coordinator telephoned them or their carers to obtain six-month information.

Statistical analysis

Univariate comparisons between the treatment groups were made using 2-sample independent *t* tests, Wilcoxon rank sum tests and contingency table analyses with Yates' correction as appropriate, using Systat for Windows.[11] Time-to-event analyses, in which discharge from hospital was defined as the event of interest, and Cox regression analyses were carried out using Egret.[12,13] The 0.05 level of significance was used throughout the analyses and all *P* values reported are two-sided.

Power analysis: The standard deviation for 1993 provided by the hospital for length of stay for all patients with proximal femoral fractures was 25.7 days. This figure reflects patient heterogeneity and is similar to other reports of this type.[3,5,7] No information was available about subgroups of patients at that time, so we estimated that about half the patients would be eligible and variability would be reduced. We used an estimated standard deviation of 13 days to determine that 120 patients (60 per treatment arm) in a randomised controlled trial would have sufficient power (0.80) to detect a reduction in mean length of stay of seven days at the 0.05 level of significance.

1: Sociodemographic characteristics at admission of patients with proximal femur fracture assigned to each treatment group

	Intervention (n=38)	Standard care (n=33)
Men:women	11:27	5:28
Mean age in years (95% CI)	78.5 (75.3–81.7)	77.8 (74.0–81.6)
Mean Modified Barthel Index (95% CI)	97.6 (96.1–99.1)	95.4 (93.0–97.9)
Mean Mini-Mental State Exam Score (95% CI)	25.3 (23.9–26.6)	24.3 (22.3–26.2)
Living arrangements		
Number at home (%)	35 (92.1%)	29 (87.9%)
Number in hostel (%)	3 (7.8%)	4 (12.1%)
Social support		
None	15 (39.5%)	12 (36.4%)
Family only	11 (28.9%)	5 (15.2%)
Family and community	3 (7.9%)	5 (15.2%)
Community only	9 (23.7%)	9 (27.3%)
Not known	0	2 (6.1%)

CI = confidence interval.

Ethical approval

A formal protocol was established for the project, which was approved by the Royal Brisbane Hospital Ethics Committee. Patient information sheets were devised for the recruitment process and written informed consent was obtained from all patients treated.

Results

Seventy-one patients (38 intervention and 33 standard care) were entered into the trial. The patients in each group at the time of admission were similar with respect to age, sex ratios, pre-admission functional levels, cognitive levels, accommodation type and social support needed (Box 1).

Length of stay

Mean length of stay (LOS) was 32.5 days (95% confidence interval [CI], 24.2–41.1 days) for Standard Care patients compared with 21 days (95% CI, 17.2–24.4 days) for Intervention patients ($P < 0.01$). Median LOS was reduced from 24 days for the Standard Care patients to 17 days for the Intervention patients ($P < 0.01$). Regression analyses (Box 2) showed that, after adjusting for other factors that could affect LOS, such as age, sex, pre-trauma functional levels (MBI), pre-trauma comorbidity and postsurgical complications, the Intervention program was significantly predictive of shorter LOS ($P = 0.01$). One patient in each group was in hospital longer than the definition of LOS, but inclusion of these longer times in the analysis did not affect the results.

Outcomes

Surgery was carried out within 48 hours of admission for 90% of Intervention patients and 80% of Standard Care patients. Delays beyond this time were owing to admissions after 5 pm or on a weekend and being put on the next available operation list, or owing to another medical condition. Postsurgical mortality in hospital was low (Box 3). Four patients died in the first six months after hospital discharge, one (2.5%) in the Intervention group and three (9%) in the Standard Care group, all from causes unrelated to their original admission.

Mean functional levels at discharge were higher for Intervention patients than for Standard Care patients (92.8 v. 85.6; $P = 0.004$). Mean test times for dynamic balance, measured as the time taken to walk a distance of 10 m and return, were shorter for Intervention patients than for Standard Care patients (44.8 s v. 59.1 s; $P = 0.07$).

All Intervention patients received daily or near-daily attention from the occupational therapist, the social worker and the geriatrician. Most Standard Care patients received referrals for occupational therapy (Box 3), but only a third received referrals for social work or geriatrician review, and each referral resulted in only one or two visits.

Upon discharge from hospital, most patients returned to their same pre-admission place of residence (Box 3). Lower proportions of Intervention patients than Standard Care patients were admitted to a hostel or to a nursing home.

The proportions of each group that needed assistance from community services were similar over time (Box 3), but the number of service providers helping varied. During the course of the study, 14 potential community service providers were identified (Box 4). At hospital discharge, Intervention patients were helped by 11 (78.9%) of these services, while Standard Care patients were helped by eight (57.1%). This

2: Proportional hazards modelling of length of stay for patients treated for proximal femur fracture

Term	Coefficient (SE)	P	Relative risk (95% CI)
Treatment	−0.74 (0.29)	0.01	0.48 (0.27–0.85)
Sex	0.25 (0.31)	0.43	1.28 (0.69–2.37)
Age	0.003 (0.01)	0.82	1.00 (0.98–1.03)
Modified Barthel Index	−0.84 (0.30)	0.78	0.92 (0.51–1.65)
Comorbidity	0.50 (0.32)	0.12	1.65 (0.88–3.06)
Intra-/postoperative complications	−0.92 (0.32)	< 0.01	0.40 (0.21–0.75)

SE = standard error of the coefficient. CI = confidence interval

3: Outcomes for patients treated for proximal femur fracture

	Intervention ($n = 36$)	Standard Care ($n = 31$)
Median days to surgery (range)	1 (1–9)	2 (2–15)
Deaths in hospital	2/38 (5.2%)	2/33 (6.1%)
Number of patients receiving		
Occupational therapy	36 (100%)	27 (87.1%)
Social work	36 (100%)	11 (35.5%)
Geriatrician	36 (100%)	11 (35.5%)
Mean days to discharge (95% CI)	21 (17.2–24.4)	32.5 (24.2–41.1)
Median days to discharge (range)	17 (3–57)	24 (3–103)
Mean Modified Barthel Index (95% CI)	92.8 (90.0–95.6)	85.6 (81.3–89.8)
Living arrangements		
As at admission	34 (94.4%)	26 (83.9%)
Hostel	1 (2.8%)	3 (9.7%)
Nursing home	1 (2.8%)	2 (6.5%)
Community support		
None	3 (8.3%)	4 (12.9%)
Family only	11 (30.6%)	8 (25.8%)
Family and community	14 (38.9%)	12 (38.7%)
Community only	8 (22.9%)	7 (22.6%)

CI = confidence interval.

4: Community service providers identified during the study

- Home help
- Community options
- Community transport
- Meals on Wheels
- Domiciliary nursing
- Home maintenance
- Respite care at home
- Respite care away
- Day centre
- Day hospital
- Domiciliary rehabilitation
- Family/friends/neighbours
- Hostel staff
- Social group

decreased over time for Intervention patients to seven services (50%) at six months, whereas it increased over time for the Standard Care patients to 11 (78.9%) services at six months.

Discussion

Our study demonstrates that length of hospital stay in elderly patients with femoral fractures can be significantly reduced through an early intervention program conducted entirely within the hospital acute orthopaedic ward. In this study, the reduction in LOS was accomplished with no increase in mortality while in hospital or after discharge.

The study design allowed for a 12-month accrual period in which to recruit the 120 patients expected from the sample size calculations to be needed. The timetable for the study, however, was defined by the Medicare Incentives Hospital Access Program, and an assessment phase was set to begin on 1 July 1995. Accrual began two months later than expected, continued slowly for the next four months and was ended in May 1995 to allow sufficient time for patients to be discharged before the assessment phase began. The final patient numbers did not reach those defined at the study outset for these reasons; however, the difference in LOS was much greater than expected and was demonstrable with this smaller number of patients.

A concern with reduced LOS is the potential increase in demands on nursing homes and community services when these patients leave hospital. The impact on nursing home occupancy rates was lower in the Intervention group than in the Standard Care group, and most patients in both groups returned to their pre-admission place of residence. Most patients needed some form of community assistance after discharge. Intervention patients were helped by more services initially after discharge and needed fewer over time. In contrast, the Standard Care patients were helped by fewer services following discharge, but needed help from more services over time.

The pattern and timing of need for community assistance for the Intervention patients from discharge onwards reflects the level of involvement of the social worker and the multidisciplinary team approach in discharge planning for these patients. Similarly, the pattern and timing of assistance needed by the Standard Care patients reflects the referral-based involvement of social workers and other therapists, through which some problems may not be identified until after the patient has returned home.

At least 30% of patients who needed help at the time of admission had been receiving this help from family, either solely or with community support, and more than 50% of patients were being similarly helped at discharge and afterwards.

In contrast to the acute care setting of our study, other Australian studies of early discharge for elderly patients with femoral fractures incorporate community-based rehabilitation programs. Using a triage system at admission related to the anticipated length of stay for each patient, the Domiciliary Rehabilitation Program reduced average length of stay from 28 days in the year before its introduction to 19.8 days in its first year.[5] The Fractured Hip Management Program reported reducing length of stay from 28.2 days in control patients to 21.5 days in program patients.[6] Through a randomised controlled trial of an accelerated discharge program compared with standard care, Cameron and co-workers reported a significant reduction in length of stay from an average of 29 days in standard care to 19 days in the accelerated program.[7]

The important distinction between our program and these others is the timing of the rehabilitation and discharge for the patients. The other reported rehabilitation programs were begun after the patients had become medically stable (ie, about eight days after surgery), and had been transferred to a dedicated geriatric or rehabilitation ward. Some of these programs continued after patients had returned home,[6,7] while another program did not begin until patients had returned home.[5] While length of hospital stay was shortened in these studies, functional recovery of the patients was not effectively achieved until an additional four to six weeks after the patients had returned home. In our study, rehabilitation began within 24 hours of surgery and all patient-related activities were conducted entirely within the acute care ward while they were in hospital. Patients had regained functional ability and required no additional therapy after returning home, hence functional recovery had been achieved by the time patients were discharged from hospital.

Timely management of intercurrent medical problems, early mobilisation, avoidance of delays in the rehabilitation process and coordinated discharge planning contributed to shortened length of stay. The limited number of rehabilitation beds in this hospital were more available for other patients (eg, stroke patients), and bed use in the orthopaedic ward improved with reduced numbers of orthopaedic patients accommodated in non-orthopaedic beds and fewer cancelled elective operations. This model of patient care could be extended to patients with other diagnoses (eg, strokes, vascular disease) and is suitable for hospitals which do not have separate rehabilitation facilities. It may also be integrated with "clinical pathways", an approach which was explored, but not implemented, in this study.

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