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Re-admissions following hip fracture surgery

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ABSTRACT

INTRODUCTION Hip fractures in the elderly are a growing problem with a predicted incidence of 117,000 cases per year by 2016. Re-admission following a healthcare episode is an important outcome measure, which reflects non-fatal adverse events and indicates the natural history of disease. The purpose of this observational, multicentre audit was to examine rates and reasons for re-admission following hip fracture, to identify areas in the index admission and rehabilitation care that could be improved to prevent re-admission.

PATIENTS AND METHODS A total of 535 patients (> 65 years old) in two district general hospitals in the UK who underwent hip fracture surgery were recruited into the study.

RESULTS Of the study cohort, 72 patients (13.5%) died during their index admission and 88 (19.0%) of 463 patients were re-admitted once within 3 months. Causes of re-admission were attributed to medical (54.8%), failure to rehabilitate (23.8%), orthopaedic (19.0%) and surgical (2.4%) reasons. Infection was the most common (31.0%) reason for re-admission and arguably the most treatable. During the 3-month postoperative period, the mortality rate was 21.3%, increasing in those re-admitted to 35.1% representing the frailty of this group of patients.

CONCLUSIONS High rates of re-admission are seen following discharge in elderly patients with hip fractures. Re-admitted patients have high mortality rates. Understanding causes of re-admission may help to reduce this burden.

KEYWORDS

Hip fracture outcome – Neck of femur fracture – Postoperative complications – Re-admission rate – Mortality rate – Morbidity rate – Postoperative infection – Healthcare statistics

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Hip fractures in the elderly are a growing problem with a predicted incidence of 117,000 cases per year by 2016.[1] Hip fractures account for more than 20% of the orthopaedic bed occupancy in the UK.[2] The number of hip fractures in 2008 is predicted to be 70,000 rising by 2% each year,[3] and the cost to the NHS and social care services is at least £1.73 billion per year.[4] Each hip fracture costs the NHS on average £12,000,[4] which equates to an NHS in-patient cost of £720 million per year. The UK trend is reflected in the US where Medicare payments rose 167% from 1984 to 1994 and it is expected that the incidence of hip fractures will increase by 250% over 25 years from 1997.[5]

Mortality following hip fracture is well documented: 30-day mortality is 12%, 1-year mortality for males is 38% and females is 29%.[6] Peri-operative (30-day) morbidity is 58%[6] and this is mostly treated at primary care level. Morbidity requiring admission has been estimated at 14%.[7] Re-admission rates are an important outcome event and are used to measure quality of care following treatment/intervention. They measure significant non-fatal adverse events in patient care and have huge cost implications.

The purpose of our observational, multicentre study was to examine rates and reasons for re-admission following hip fracture to help understand the natural history of the disease and to identify areas of index admission and rehabilitation care that could be improved to prevent re-admission by improving morbidity and mortality rates.

Patients and Methods

We postulated that the 3-month period following surgery will identify the majority of re-admissions secondary to hip fracture surgery.

The study was conducted by the same researcher in two district general hospitals (Hospital 1 and Hospital 2) in the north of England. At each hospital following approval from the hospital audit department, all elderly (> 65 years) patients who underwent surgery for proximal hip fractures

Table 1 Index admission operation and stay

	Hospital 1	Hospital 2	Total
Total patients	267	268	535
Hemi-arthroplasty (cemented or bipolar)	101	96	197
Dynamic hip screw	145	157	302
Cannulated hip screw	14	12	26
Intramedullary nail	7	3	10
F:M ratio	3:1	3:1	3:1
Average age (years) [range]	80.5 [65–102]	78.7 [65–96]	79.6 [65–102]
Average stay (days)	19.0	27.0	23.0

(intracapsular and intertrochanteric) in one calendar year (July 2001 to June 2002) were included. Exclusion criteria were major surgery, including joint replacement surgery in the preceding 3 months and pre-existing thrombo-embolic disease. Standard thrombo-embolic chemoprophylaxis was a single dose of low molecular weight heparin daily starting 8 h after surgery until discharge. All patients received at least one pre-operative and two postoperative doses of intravenous antibiotics on induction of anaesthesia, 8 h and 16 h post surgery. These were standard unit protocols.

All records were examined to identify any episodes of patient contact with the hospital services within 3 months of the index admission. The information was collated (statistics for index and subsequent admission stay and operation type, morbidity requiring re-admission and mortality) and recorded. Death certificates were used to determine the official cause of death both in hospital and in the community.

Results

A total of 535 (Hospital 1, 267; Hospital 2, 268) sequential patients were recruited into the study, with 29 exclusions (Hospital 1, 15; Hospital 2, 14). All patients received follow-up as defined above. Of these, 197 (Hospital 1, 101; Hospital 2, 96) had cemented hemi-arthroplasty (bipolar hemi-arthroplasty for physiologically fitter patients), 302 (Hospital 1, 145; Hospital 2, 157) had dynamic hip screw (DHS), 26 (Hospital 1, 14; Hospital 2, 12) had cannulated hip screws (CHS), 10 (Hospital 1, 7; Hospital 2, 3) had an intramedullary nail (IM nail) as a form of fixation. Average age was 79.6 years (range, 65–102 years). The average length of stay during the index admission was 23.0 days (Hospital 1, 19 days; Hospital 2, 27 days; Table 1). A total of 72 patients (Hospital 1, 43; Hospital 2, 29) died during their index admission, constituting 13.5% of the study's patients (Table 2).

Table 2 Mortality rates

	Hospital 1	Hospital 2	Total
No. Index admission patients	267	268	535
Emergency second admission patients	46	38	84
Index admission mortality	43 (16.1%)	29 (10.8%)	72 (13.5%)
Second admission mortality	15 (32.6%)	12 (31.6%)	27 (32.1%)
Overall mortality whilst in-patient	58 (21.7%)	41 (15.3%)	99 (18.5%)
Mortality within 3 months	66 66 (24.7%)	48 48 (17.9%)	114 (21.3%)
Mortality in community	8 (3.0%)	7 (2.6%)	15 (2.8%)

Table 3 Re-admission rates

	Hospital 1	Hospital 2	Total
Patients discharged following index admission	224	239	463
Re-admission within 3 months	48 (21.4%)	40 (16.7%)	88 (19.0%)
Patients admitted more than twice in 3/12	0	0	0
Elective	2 (0.9%)	2 (0.8%)	4 (0.9%)
Emergency	46 (20.5%)	38 (15.9%)	84 (18.1%)

Overall, 463 (Hospital 1, 224; Hospital 2, 239) out of 535 patients (86.5%) were discharged following their index admission. Eighty-eight (Hospital 1, 48; Hospital 2, 40) patients were re-admitted within 3 months. This constituted 19.0% of those discharged initially. Of these, four (Hospital 1, 2; Hospital 2, 2) were for planned elective procedures and 84 (Hospital 1, 46; Hospital 2, 38) were unplanned emergency admissions; unplanned re-admissions representing 95.5 % of the total re-admissions (Table 3). No patients were admitted more than twice during the 3-month period.

Reasons for re-admission can be seen in Table 4. Medical causes were the most prevalent with 46 patients (54.8%)

Table 4 Causes for emergency re-admission

	Hospital 1	Hospital 2	Total
Orthopaedic causes	**9 (19.6%)**	**7 (18.4%)**	**16 (19.1%)**
Fractures	4	5	9
Contralateral hip fracture	3	3	6
Periprosthetic fracture	1	1	2
Fracture elsewhere	0	1	1
Superficial surgical site infection	2	0	2
Prosthesis infection	2	0	2
Dislocation	0	1	1
Implant cutout	1	1	2
Medical causes	**24 (52.2%)**	**22 (57.9%)**	**46 (54.8%)**
Infective	11	11	22
Diarrhoea and vomiting	2	1	3
Respiratory tract infection	5	7	12
Urinary tract infection	4	2	6
Septicaemia	0	1	1
Thrombo-embolism	8	3	11
DVT negative but had been suspected	5	2	7
DVT confirmed	1	1	2
Pulmonary embolism	2	0	2
Cerebrovascular accident	2	4	6
Myocardial events	2	3	5
Myocardial infarct (MI)	1	1	2
Non-MI; atrial fibrillation, failure	1	2	3
Diabetic collapse (NIDDM)	0	1	1
Inflammatory bowel disease exacerbation	1	0	1
Surgical causes	**1 (2.2%)**	**1 (2.6%)**	**2 (2.4%)**
Perforated intestine	0	1	1
Ischaemic foot	1	0	1
Rehabilitation failure causes	**12 (26.1%)**	**8 (21.1%)**	**20 (23.8%)**
Falls	7	7	14
Incontinence	1	0	1
Dehydration	0	1	1
Morphine overdose	1	0	1
Inability to cope/deterioration	3	0	3

Figures in parentheses represent percentage of re-admissions.

Table 5 Second admission causes of death

	Hospital 1	Hospital 2	Total
Pneumonia	5	4	9
Old age	3	2	5
Cerebrovascular accident	2	2	4
Myocardial events	1	2	3
Pulmonary embolism	2	0	2
Lung cancer	1	1	2
Colon cancer	1	0	1
Septicaemia	0	1	1
Total	15	12	27

with the subgroup of infective causes such as diarrhoea, vomiting, urinary and respiratory tract infections and septicaemia constituting 22 patients (26.2%). Deep vein thrombosis was suspected in nine cases (10.7%) but only confirmed in two (2.4%). Two patients (2.4%) died from pulmonary emboli confirmed by ventilation/perfusion scan. Other medical causes for re-admission included cerebrovascular accident (n = 6; 7.1%), myocardial events (n = 5; 6.0%), diabetic collapse (n = 1; 1.2%) and exacerbation of inflammatory bowel disease (n = 1; 1.2%).

Failure of rehabilitation in the community required re-admission for 20 patients (23.8%). Fourteen falls constituted 16.7% of re-admissions; incontinence (n = 1; 1.2%), dehydration (n = 1; 1.2%), morphine overdose (n = 1; 1.2%) and inability to cope/deterioration (n = 3; 3.6%).

Orthopaedic causes for re-admission represented 16 patients (19.05%). Seven (8.3%) patients were re-admitted in this group with different fractures elsewhere indicating that their original fracture was not directly attributable to their re-admission. There were two (2.4%) periprosthetic fractures, superficial surgical site infection (n = 2; 2.4%), deep prosthetic infection (n = 2; 2.4%), implant cutout (n = 2; 2.4%) and dislocation (n = 1; 1.2%).

Finally, general surgical re-admission accounted for two (2.4%) re-admissions. Despite the multifactorial causes for re-admission, following review of the notes we felt that hip fracture could have in some way contributed to 69 (Hospital 1, 37; Hospital 2, 32) out of the 84 patient re-admissions (78.4%).

Of the 88 patients re-admitted, 27 (32.1%) died whilst in hospital (Table 2). Table 5 shows the death certificate documented causes for this mortality. Nine (10.7%) patients with pneumonia, old age (n = 5; 6.0%), cerebrovascular accident (n = 4; 4.8%), myocardial event (n = 3; 3.6%), pulmonary emboli (n = 2; 2.4%), lung cancer (n = 2; 2.4%), colon cancer

(n = 1; 1.2%) and septicaemia (n = 1; 1.2%). Interestingly, none of these cases mentioned hip fracture as a contributing cause of death on the certificate which we feel in a minor part misrepresented the cause of death in at least 19 (Hospital 1, 10; Hospital 2, 9) out of the 27 cases (70.3%).

Discussion

A combination of orthopaedic injury, old age, male sex,[8] multiple medical co-morbidity, dementia, delay in operative treatment,[9,10] and slow postoperative rehabilitation[11] are all risk factors that lead to poor outcomes following hip fracture surgery. Mortality following hip fracture is well documented. A New Zealand study[6] quoted 30-day mortality at 12%; observed 1-year mortality for males is 38% (mean age, 79 years) and females 29% (mean age, 84 years) compared to New Zealand census data for a normal aged-matched population of 7% and 6.4% mortality, respectively.[6]

Mortality rates range from 21% at 120 days post operation[12] to 22.3% at 1 year.[13] These are comparable to our series. Koval *et al.*[14] noted in a literature review that mortality rates ranged from 14% to 36% at 1 year after which the risk approached an age- and sex-matched population. In our series, 3-month postoperative mortality following hip fracture surgery was 21.3%. A majority (63.2%) of these occur in the hospital setting during the first admission, and 23.7% during the re-admission, with a minority of 13.1% occurring in the community setting. Our study showed that mortality rates during second admission episodes were more than double compared to the index admission episode (13.5% to 31.2%) as the patients often had multiple combinations of risk factors mentioned above.

Patients are often re-admitted into specialities other than orthopaedics more appropriate to their acute complaint; it is unlikely, therefore, that we as orthopaedic surgeons can appreciate the 18.1% emergency re-admission rate we found within 3 months. We looked at records for all episodes of patient contact with the hospitals and would have picked up admissions in other specialties Other studies show re-admission rates range from 34%[7] at 4 weeks to 16.7%[5] over 6 months. Of re-admissions in our study, 81.0% were for non-orthopaedic causes and just over a quarter of all re-admissions (26.2%) were due to non-surgical site infection. Similarly, Boockvar *et al.*[7] found 89% of re-admissions were due to non-surgical problems and mostly infections (21%).

Unfortunately, our study may have underestimated the number of re-admissions. Whilst we are confident that we followed any re-admissions to our two hospitals, it is entirely possible that patients who were admitted to us in their index admission were re-admitted elsewhere and, therefore, not picked up in our study. However, patients studied included an elderly population which are not geographically mobile and one of our hospitals is geographically isolated. To a large degree, they depend on the local ambulance network to deliver them to a local hospital, which would usually be the same hospital as at the time of their index admission.

Our mean length of stay was 23 days. Beringer *et al.*[13] noted 38 days including stay in rehabilitation unit. Huusko *et al.*[15] randomised postoperative care of 243 patients which resulted in median length of stay of 34 days with intensive geriatric rehabilitation and 42 days in the control group of standard hospital ward care. Reasons for variation include the local availability of nursing homes and intermediate care beds.

Of re-admissions, 78.6% were directly attributed to medical or rehabilitation issues in our study. Young *et al.*[6] showed that the use of the POSSUM (physiological and operative severity score for the enumeration of morbidity and mortality) scoring system, predicted these higher risk groups.

Meta-analysis[16] of 11 randomised, controlled trials with 2177 patients showed that patients who received multidisciplinary care were at a lower risk of a 'poor outcome' and more likely to stay at home once discharged. Vidan *et al.*[17] showed that early orthogeriatric care with hip fracture patients, resulted in a 45% lower probability of death or major complications. Kuisma[18] showed that five visits by a physiotherapist in the patient's home following discharge after a hip fracture yielded statistically better ambulation ability than one month in an institutional based rehabilitation unit. Those patients who undergo a longer than average index admission stay, are at higher risk of re-admission.[19] Those patients who have poor postoperative mobility at 2 weeks are associated with poorer outcomes.[11] Hospital at-home schemes are recognised to reduce the length of index admission stay but are associated with increased re-admission rates, but lower overall cost.[20,21] It has been shown that an early out-patient appointment following discharge home from index admission does not affect re-admission rates.[22,23] Our study revealed that exactly 50% of re-admissions were due to potentially avoidable adverse clinical outcomes related to medical related infection (26.2%) and rehabilitation issues (23.8%). It has been shown that the most minor active clinical issues such as low oxygen saturations, tachycardias, low-grade pyrexias, if left untreated prior to discharge, can lead to morbidity (as per Table 4) requiring re-admission.[24] It is important to identify and manage any grumbling medical, rehabilitation and social issues prior to discharge to prevent re-admission due to progression of these co-morbid conditions, 33.3% of which are represented by infection. It is the authors' experience that, in most units that they have worked, the most junior, inexperienced, orthopaedic staff provide the majority of front-line care. However, the role of multidisciplinary teams led by orthogeriatricians is a crucial addition in this respect.

Of re-admissions, 8.3% were due to a second osteoporotic fracture elsewhere in the skeleton. Use of bisphosphonates and fall-prevention strategies following initial fracture may prevent future fractures.

For those patients who died during their second admission, it was noted on death certificates that none of the 27 patients who died had their hip fracture documented as a contributory cause of death. As all these patients died within 3 months of surgery and after careful review of their cases, we feel this misrepresents the cause of death in at least 19 (70.3%) cases. Other studies have shown that at least 50% of re-admissions are due to new problems.[25] Using death certificate statistics would, therefore, mislead the direction of healthcare resources away from care of hip fracture patients. It also highlights the errors that normally occur in completing death certificates. These are official documents that should require careful consideration to complete.

Conclusions

This study shows that re-admission following hip fracture surgery is common within 3 months (19.0%). Expected mortality rates within 3 months of hip fracture surgery are 21.3%. The most common reasons for re-admission relate to medical and rehabilitation issues (78.6%); arguably this is, therefore, where efforts to improve patient care in the index admission should be targeted to reduce morbidity, and subsequent re-admission and related mortality. More specifically, infection is the most common (33.3%) reason for re-admission and also the most treatable. Multidisciplinary treatment may help improve patient outcome but not replace basic orthopaedic care. It is important to document cause of death accurately so that the natural history of hip fractures may be appreciated in national statistics to allow for better resource planning.

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