Impact of organisational changes on fracture neck of femur management

Emad Mallick, Abhinav Gulihar, Grahame Taylor, Andrew Furlong, Radhakant Pandey

Leicester Royal Infirmary, University Hospitals Leicester, Leicester, UK

INTRODUCTION In 2005, University Hospitals of Leicester formed a Fracture Neck of Femur (#NOF) project group to improve care of this group of patients.

SUBJECTS AND METHODS The salient changes effected by the group were the appointment of designated orthogeriatricians, trauma co-ordinators, clinical aides, and discharge nurses.

RESULTS As a result of these measures, the number of patients going to theatre within 48 h of admission rose from 38.5% in 2005/6 to 90% in 2007/8. In-hospital mortality decreased from 16.5% in 2005/6 to 10.9% in 2007/8. The 30-day mortality dropped from 13% in 2005/6 to 10.9% in 2007/8. Hospital stay reduced from 29 days in 2005/06 to 17 days in 2007/8.

CONCLUSIONS Re-organisation of available resources has a positive impact on reducing mortality and in-hospital stay of fracture neck of femur patients.

KEYWORDS

Fracture – Neck of femur – Management – Re-organisation

Accepted 28 September 2010; published online 15 October 2010

CORRESPONDENCE TO

Emad Mallick, E: emdmallick@hotmail.com

Fractured neck of femur is a major cause of morbidity and mortality in elderly people. Age-specific incidence rates have increased substantially in most Western populations in recent decades.^{1–4} With an increasingly elderly population in the UK, it is estimated that there will be 120,000 hip fractures annually by 2015.⁵ A Good Hospital guide published by Dr Foster Intelligence found that there were 68,000 hip fracture patients in 2005/6 in the UK, with mortality being 10% at 30 days, 20% at 4 months and 30% at 1 year after admission.

Leicester Royal Infirmary is a busy trauma unit with approximately 700 patients admitted with a fracture neck of femur per year. The Good Hospital guide placed Leicester amongst the six worst hospitals for in-hospital mortality and the worst in the country for patients reaching theatre within 48 h. However, the data were based on the information provided by the hospital itself.

In January 2005, a ‘fracture NOF project group’ chaired by the medical director was set up to assess and improve outcomes in hip fracture patients. The aims of the fracture NOF project were to reduce the length of stay, time to theatre, and mortality in this group of patients. Recommendations suggested by this group were implemented in the year 2006. This study is aimed at assessing the impact of these organisational changes on mortality, time to theatre and length of hospital stay in hip fracture patients.

Subjects and Methods

The fracture neck of femur project

There was an increase in staffing levels including trauma co-ordinators, clinical aides, discharge nurse, theatre and recovery staff, radiographer and evening porters. The trauma co-ordinators provided 7-day cover and their role was to plan and co-ordinate operating lists, attend trauma meetings and post take ward rounds, link closely with the anaesthetic team and maximise theatre efficiency. Prior to 2006, there was no system in place to monitor the time taken for patients to have surgery. The trauma co-ordinators were also responsible for maintaining a record of this information. The clinical aides supported the junior doctors and nursing staff by preparing the patients for theatre and also transporting the patients to theatre. A separate ward was set up for hip fracture patients and a dedicated discharge nurse was appointed to prevent any delays in discharge from hospital.

One of the key suggestions from the #NOF study group was involvement of consultant orthogeriatricians for pre- and postoperative medical management of this group of patients. Since April 2006, two care-of-the-elderly consultants and one registrar have reviewed these patients on a daily basis and have been actively involved in their management.

Before 2006, hip fractures were placed on any of the five trauma lists daily available. This frequently led to cancella-

tions due to time shortage or other injuries requiring urgent surgery replacing them. From 2006, one trauma list every day of the week was dedicated for hip fracture surgery. It was also made mandatory that under no circumstances would listed hip fractures be cancelled.

A senior anaesthetist was listed for the hip surgery list every day, from 2006. Also a named consultant anaesthetist was available each day to discuss complex cases and their pre-operative management. This was in contrast to previous practice when complex cases ended up on junior anaesthetist lists and were cancelled. Also, once the consultant anaesthetist deemed the patient fit for surgery, other staff were not able to cancel it.

As mentioned, there was no data collection for time to theatre before the year 2006. Data were collected by the Trust audit department and then forwarded to Dr Fosters. However, the time noted was from patients' admission to going to theatre. We believe that this data collection was flawed, as average time to theatre of our patients was not as appalling as shown by Dr Fosters.

One of the salient features of the fracture neck of femur project was to start recording data for this group of patients. One of the entries in the data comprised of time elapsed between patient being medically fit and going to theatre. Also, any breaches (more than 48-h waiting time for theatre, once medically fit) and its causes were noted. At the end of 3 months, the trauma co-ordinators, head of service and audit department met to discuss these breaches and ways to improve it.

Long length of stay

Long length of stay is determined as being in the top quartile nationally for a particular diagnosis or procedure group. So, in this case, the upper quartile length of stay for all patients with a primary diagnosis of fractured neck of femur. The exact value of this will change, depending on the year that is being used for the benchmark.

Table 1 Demographics of fracture neck of femur patients admitted between April 2003 and March 2008

Year	No.	Mean age (yrs)	Female (%)	Male (%)	Nursing/residential homes
2003/4	731	81	71	29	24
2004/5	676	81	72	28	21
2005/6	705	81	74	26	24
2006/7	723	81	73	27	19
2007/8	769	81	72	28	19

Figure 1 Length of hospital stay and in-hospital mortality in fracture neck of femur patients admitted between April 2003 and March 2008.

Re-admission

A re-admission is classified as being admitted on an emergency basis to any hospital in England within 28 days of being discharged.

Data collection

Data were obtained from various sources. These included the hospital Information Management and Technology department, the Clinical Audit department and the trauma co-ordinators. Data on mortality were cross-checked with the primary care trust (PCT) database. The study period was April 2003 to March 2008.

Dr Fosters data

Dr Fosters has an expected data value for each variable as in death, length of stay, *etc.* for this group of patients. This is individual to each trust and is calculated by taking factors as sex, age, social deprivation, co-morbidities, *etc.* into account. Also, a relative risk is identified for each variable for the particular trust in accordance with the national average, which for simplicity is taken as 100. These parameters are a good indication of quality of care being provided by the trust, as lowering of risk below national standard would signify positively for the trust and vice versa. We have used both these criteria from Dr Fosters data to highlight, the improvement in our standard of care for #NOF patients.

Data analysis

The described changes were implemented throughout the year 2006. The year 2006/7 was, therefore, excluded from statistical comparison. Comparison of length of stay was made between the years 2005/6 and 2007/8 using the

Mann-Whitney U-test and mortality comparisons were made using the chi-squared test. Time to theatre data were not available before 2006 and hence statistical comparisons were not possible.

Results

Patient demographics are listed in Table 1.

Mortality

The in-hospital mortality was more than 16% in the 3 years before the fracture neck of femur project was implemented (Fig. 1). It dropped from 16.5% in 2005/6 to 10.9% in 2007/8

($P = 0.001$). This was related to a drop in length of stay from 29 days in 2005/6 to 17 days in 2007/8 ($P < 0.001$).

There was a drop in 30-day mortality from 13% in 2005/6 to 10.9% in 2007/8 (Fig. 2) but this drop was not significant ($P = 0.2$). The 4-month mortality fell from 26% to 22% ($P = 0.08$) and the 1-year mortality fell from 37% to 25% ($P < 0.001$).

Time to theatre

Figure 3 and Tables 2 and 3 show the number of patients who went to theatre on each successive day after admission, comparing time periods March 2005 to April 2006 and March 2007 to April 2008. It shows a high percentage (28.7%) of patients was treated conservatively. Of the 495 operated patients, only 39% went to theatre within 48 h of admission. In contrast, only 6.6% patients were treated conservatively; of the remaining 683 patients, 52% went to theatre within 48 h of admission. However, the mean percentage of patients going to theatre within 48 h of being medically fit was over 90% in 2007/8 (Fig. 4). It is evident that while the hospital was in the red as compared to national standards in 2005/6, it turned the corner and came par in 2007/8.

Re-admission

Figure 5 and Table 4 show patient re-admission within 28 days of discharge from hospital. The data show that re-admission rates have been quite uniform over successive years 2003–2008.

Discussion

Hip fractures constitute a major clinical and financial burden to the NHS. About 86,000 hip fractures occur each year in the UK.⁶ Mortality after a hip fracture remains significant,

Table 2 The percentage of patients who went to theatre on each successive day of admission at UHL in 2005/6

LOS (pre-operative)	Admissions	%
All	697	100%
No procedure	202	28.7%
0 days	75	10.8%
1–2 days	121	17.4%
3–4 days	98	14.1%
5–7 days	107	15.4%
8–14 days	69	9.9%
15–28 days	19	2.7%
29–49 days	2	0.3%
50+ days	4	0.6%

Table 3 The percentage of patients who went to theatre on each successive day of admission at UHL in 2007/8

LOS (pre-operative)	Admissions	%
All	734	100%
No procedure	51	6.6%
0 days	32	4.2%
1–2 days	323	43.4%
3–4 days	160	21.6%
5–7 days	99	13.3%
8–14 days	57	7.7%
15–28 days	18	2.4%
29–49 days	4	0.5%
50+ days	2	0.3%

being 11–23% at 6 months and 25–38% at 1 year from injury (7–11). The Orthopaedic Department of University Hospital of Leicester (UHL) faced the same problems as other hospitals in managing the rising number of #NOF patients. The mortality, length of hospital stay and complications rose above the national average and an urgent need to take remedial steps to manage this group of patients better was felt. For this purpose, a #NOF group was constituted in 2005 to review the present set-up, devise ways to improve care and in the final stage implement changes. The suggestions were mainly to re-organise the resources, integrate multidisciplinary care and recruit a minimum of non-medical personnel like trauma co-ordinators, clinical aides, *etc.* The suggested changes were implemented in the financial year beginning April 2006.

Pre-operative care

The fast-track system for #NOF patients has been in place in our hospital for a while. However, from 2006, a dedicated ward was set aside for this group of patients. This streamlined the process of fast tracking the patients to one ward and being looked after by staff trained in caring for these elderly patients. It also aided doctors to institute early pre-operative care and prepare the patient for early surgery if required.

Early surgery

Various studies have reported that early surgery is associated with lower mortality, shorter length of hospitalisation and lower rate of complications. Functional results at 4 months after surgery are better if delay to surgery was 24 h rather than 57 h.^{12–18} The Organization for Economic Co-operation and Development (OECD) has included a 48-h waiting time to surgery in elderly patients with hip fracture in its national quality indicator list.¹⁹ Others, like the British Royal College of Physicians' guidelines, recommend that patients should be operated on within 24 h of admission.²⁰

Delay to surgery is common and when it is due to inadequate facilities or poor organisation rather than medical reasons, the underlying problems should be addressed and solution found by the clinicians and hospital management.

The #NOF group realised this and implemented various changes to improve the number of fracture neck of femur patients going to theatre within 48 h. The important changes, mainly re-organising resources, were instituted with multidisciplinary co-ordination. The implementation of these steps has shown to increase the number of patients having surgery within 48 h. As compared to 17.4% of patients going to theatre within 48 h in 2004, it improved to 43% and 44.1% in 2007 and 2008, respectively. However, this is the data shown by Dr Fosters, which can be termed a

Table 4 Comparison of re-admissions in successive financial years March 2003 to December 2008

Financial year	Admissions	Re-admissions	%
2003/4	751	63	8.5%
2004/5	581	43	7.5%
2005/6	697	52	7.5%
2006/7	664	61	9.2%
2007/8	746	64	8.6%
2008/9	607	74	12.3%

bit inaccurate. The reason being that time-to-theatre is taken from day of patient's admission. It does not take into account that some of these patients are quite ill and have to be medically optimised before being listed for surgery. The data compiled by our own department take time-to-theatre from medical fitness. If patient is medically fit to be listed for theatre on admission, then both these times are the same. Our data show a far superior percentage of patients going to theatre within 48 h of being listed (Fig. 5 and Table 4). The current data show an average performance of 89% of patients operated within 2 days, within the range of performance reported by western countries of 33–95%.²¹

Physicians' input

As far back as 1989, the Royal College of Physicians recommended medical assessment of patients with hip fracture to reduce their mortality and morbidity,²⁰ and this has been reinforced in several subsequent publications.^{22,23} Specialist medical assessment and management of elderly patients with hip fracture before and after surgery, however, remains uncommon in the UK. One of the key suggestions from the #NOF study group was involvement of consultant orthogeriatricians for pre- and postoperative medical management of this group of patients. Since April 2006, two care-of-the-elderly consultants and one registrar see these patients on a daily basis and are actively involved in their management. This has ensured early identification of medically unfit patients and steps taken to make them fit for surgery. Also, postoperative complications are better managed and outcome improved. Tables 2 and 3 show that the number of #NOF patients managed non-operatively in 2005/6 has reduced considerably from 39% to 7% in 2007/8. Also, mortality rates have reduced (Figs 1 and 2).

Length of stay

Bed occupancy for hip fracture in the UK was in excess of 1,199,7261 days, which represents 20% of total orthopaedic bed stays and in women over 45 years accounts for a high-

Figure 5 Comparison of re-admissions in successive financial years March 2003 to December 2008.

er proportion of occupancy of hospital beds than many other common disorders.⁵ Mean length of hospital stay is 24.9 days and the cost to society to treat hip fracture is estimated to be £726 million per annum.²⁴ Early discharge has shown to reduce mortality,²¹ complications²⁵ and costs.²⁶ The working of various personnel involved in the care of these patients as in physiotherapists, occupational therapists, social workers, *etc.* were integrated. Apart from a dedicated ward, these personnel were also specific to the ward; hence, continuity of care was ensured. Moreover, a multidisciplinary meeting involving all care providers is held once weekly to resolve problems associated with discharge and expedite it. A discharge co-ordinator has also been appointed since April 2006 to streamline this process. All the measures have combined to decrease the length of stay progressively (Table 1).

Re-admission

In an effort to expedite discharge there may be a tendency to discharge patients who may not be appropriate to leave hospital. However Figure 5 and Table 4 show that re-admission in our unit has remained uniform over the years. This reflects that even though patients are being discharged earlier, their safety has not been compromised.

Conclusions

We have shown that re-organisation of available resources has a positive impact on reducing mortality and in hospital stay of fracture neck of femur patients.

References

1. Boyce WJ, Vessey MP. Rising incidence of fracture of the proximal femur. *Lancet* 1985; **1**: 50–1.
2. Kannus P, Niemi S, Parkkari J, Palvanen M, Vuori I, Jarvinen M. Hip fractures in Finland between 1970 and 1997 and predictions for the future. *Lancet* 1999; **353**: 802–5.
3. Spector TD, Cooper C, Lewis AF. Trends in admissions for hip fracture in England and Wales, 1968–85. *BMJ* 1990; **300**: 1173–4.
4. Falch JA, Kaastad TS, Bohler G, Espeland J, Sundsvold OJ. Secular increase and geographical differences in hip fracture incidence in Norway. *Bone* 1993; **14**: 643–5.
5. Johnell O, Gullberg B, Allander JA, Kanis JA, the MEDOS Study Group. The apparent incidence of hip fracture in Europe: a study of national register sources. *Osteoporosis Int* 1992; **2**: 298–302.
6. Donaldson LJ, Cook A, Thomson RG. Incidence of fractures in a geographically defined population. *J Epidemiol Community Health* 1990; **44**: 241–5.
7. Center JR, Nguyen TV, Schneider D, Sambrook PN, Eisman JA. Mortality after all major types of osteoporotic fracture in men and women: an observational study. *Lancet* 1999; **353**: 878–82.
8. Keene GS, Parker MJ, Pryor GA. Mortality and morbidity after hip fractures. *BMJ* 1993; **307**: 1248–50.
9. Weatherall M. One year follow up of patients with fracture of the proximal femur. *NZ Med J* 1994; **107**: 308–9.
10. Walker N, Norton R, Vander Hoorn S, Rodgers A, MacMahon S, Clark T *et al*. Mortality after hip fracture: regional variations in New Zealand. *NZ Med J* 1999; **112**: 269–71.
11. Beringer TR, Gilmore DH. Outcome following proximal femoral fracture in the elderly female. *Ulster Med J* 1991; **60**: 28–34.
12. Todd CJ, Freeman CJ, Camilleri-Ferrante C, Palmer CR, Hyder A, Laxton CE *et al*. Differences in mortality after fracture of hip: the East Anglian audit. *BMJ* 1995; **310**: 904–8.
13. Rogers FB, Shackford SR, Keller MS. Early fixation reduces morbidity and mortality in elderly patients with hip fractures from low-impact falls. *J Trauma* 1985; **39**: 261–5.
14. Gdalevich M, Cohen D, Yosef D. Morbidity and mortality after hip fracture: the impact of operative delay. *Arch Orthop Trauma Surg* 2004; **124**: 334.
15. McGuire KJ, Bernstein J, Polsky D. The 2004 Marshall Urist award: delays until surgery after hip fracture increases mortality. *Clin Orthop* 2004; **428**: 294–301.
16. Weller I, Wai EK, Jaglal S, Kreder HJ. The effect of hospital type and surgical delay on mortality after surgery for hip fracture. *J Bone Joint Surg Br* 2005; **87**: 361–6.
17. Zuckerman JD, Skovron ML, Koval KJ, Aharonoff G, Frankel VH. Postoperative complications and mortality associated with operative delay in older patients who have a fracture of the hip. *J Bone Joint Surg Am* 1995; **77**: 1551–6.
18. Davis FM, Woolner DF, Frampton C, Wilkinson A, Grant A, Harrison RT *et al*. Prospective, multi-centre trial of mortality following general or spinal anaesthesia for hip fracture surgery in the elderly. *Br J Anaesth* 1987; **59**: 1080–8.
19. Bottle A, Aylin P. Mortality associated with delay in operation after hip fracture: observational study. *BMJ* 2006; **332**: 947–51.
20. Kelley H, Hurst J. *Health care quality indicators project initial indicators report*. OECD Health Working Paper 2006; No. 22.
21. Royal College of Physicians. Fractured neck of femur. Prevention and management. Summary and recommendations of a report of the Royal College of Physicians. *J R Coll Phys (Lond)* 1989; **23**: 8–12.
22. Flood AB, Ewy W, Scott R, Forrest WH, Brown BW. The relationship between intensity and duration of medical services and outcomes for hospitalised patients. *Med Care* 1979; **17**: 1088–102.
23. Scottish Intercollegiate Guidelines Network. *Prevention and management of hip fracture in older people*. Edinburgh: SIGN, 2002.
24. British Orthopaedic Association. *The care of fragility fracture patients*. London: BOA, 2003.
25. *The economic cost of hip fracture in the UK*. Paper commissioned by Health Promotion England on behalf of the Department of Trade and Industry, 2000.
26. Farnworth MG, Kenny P, Shiell A. The costs and effects of early discharge in the management of fractured hip. *Age Ageing* 1994; **23**: 190–4.
27. Hollingworth W, Todd C, Parker M, Roberts JA, Williams R. Cost analysis of early discharge after hip fracture. *BMJ* 1993; **307**: 903–6.