PAPER

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# International benchmarking of 500 admissions with a fractured hip in Australia using the Standard Audit of Hip Fractures in Europe and the Scottish Intercollegiate Guidelines Network

[1]P Stride, [2]A Houston, [3]D Ratnapala, [4]J Perron

*[1]Consultant Physician, Redcliffe Hospital, [2]Director of Orthopaedic Surgery, Redcliffe Hospital, [3]Intern, Redcliffe Hospital, [4]Intern, Redcliffe Hospital, Queensland, Australia*

**ABSTRACT** The aim of this study was to audit our management of hip fracture and to compare the results with the Scottish Hip Fracture Audits of both 2004 and 2006. We present data utilising a subset of the SAHFE proforma on 500 consecutive admissions to Redcliffe Hospital with a fractured hip, a review of progress at four months post-operatively and a comparison of outcomes in orthopaedic units in Scottish hospitals. We outline how the audit helped us to detect long emergency department door-to-operating theatre times plus a high re-operation rate and subsequently identify the steps required to improve the quality of care and clinical governance of patients sustaining a hip fracture.

**KEYWORDS** Audit, Australia, hip fracture, SAHFE, SIGN, mortality

**LIST OF ABBREVIATIONS** American Society of Anaesthetists (ASA), Physiology and Operative Severity Score for the enumeration of Morbidity and Mortality (POSSUM), Scottish Intercollegiate Guidelines Network (SIGN), Standard Audit of Hip Fractures in Europe (SAHFE)

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*Correspondence to* ***P Stride, Redcliffe Hospital, Locked Bag 1, Anzac Avenue, Redcliffe, QLD 4020, Australia***

*tel.* ***+61 7 3883 7777***

*fax.* ***+61 7 3883 7530***

*e-mail*
***Peter_Stride@health.qld.gov.au***

## INTRODUCTION

Sweden initiated a national register of hip fractures, the Rikshoft, in 1988.[1] This generated international interest, hence the Standardised Audit of Hip Fractures in Europe started in 1993 in Scotland, where most orthopaedic hospitals are currently registered, and subsequently spread all over Europe. The initial stimulus to audit our data was the 1997 Scottish Intercollegiate Guidelines Network guide no. 15,[2] *Prevention and Management of Hip Fracture in Older People* recommending international benchmarking in the management of hip fractures. (SIGN 15 is no longer available online and was updated in 2002 as SIGN 56.) Thus Scotland, with both the audit and guideline, is uniquely positioned to use the synergy between them to exert beneficial pressure on the cost and quality of the hip fracture patient's multifaceted journey of care.

Hospitals in Japan and the US are also participating in SAHFE, but as there was no equivalent audit in Australia, we enrolled Redcliffe Hospital, Queensland, in the Standard Audit of Hip Fractures in Europe in November 2000. We concur with Phillips[3] statement:

> '...there is a lack of prospective, systemic evaluation of practice [in Australia] across hospitals and into the community to facilitate setting of benchmarks, and to improve understanding of practice variations.'

Redcliffe Hospital is an acute care district hospital with 220 beds. The orthopaedic department serves a catchment area of 250,000 people, with an above average population of elderly people. This department consists of 25 beds serviced by visiting and full time orthopaedic surgeons, one consultant physician, one advanced trainee in orthopaedics (specialist registrar) and four resident medical officers, supported by a full ancillary health team. This paper presents our database of results from the first 500 admissions with evaluation of the outcomes and a comparison with the standard management of hip fractures in Scotland.

## METHODS

Data on 500 consecutive admissions with a fractured hip was collected prospectively utilising the SAHFE forms 1–3 as previously described.[4] Standard Audit of Hip Fractures in Europe, Form One collects the acute admission demographic, past health and mobility, fracture type,

| Accommodation | Admission | Discharge | Four months |
|---|---|---|---|
| Home | 52·7% | 22·8% | 35·8% |
| Sheltered home | 3·2% | 1·6% | 1·9% |
| Hostel | 9·2% | 5·6% | 5·5% |
| Nursing Home | 33·1% | 32·1% | 29·6 |
| Rehabilitation | 0·0% | 23·7% | 1·2% |
| Hospital | 1·8% | 5·8% | 4·1% |
| Deceased | 0·0% | 8·4% | 21·5% |
| Lost to follow up* | 0·0 | 0·0 | 0·4 |

**TABLE 1** Pre-fracture and follow up destination. *Subsequent percentages exclude the two patients lost to follow-up.

operation and destination details. Form Two collects follow up data at four months reviewing the patient's hospital readmissions, current residence, mobility and pain level. Patients or carers were contacted usually by telephone interview, occasionally in face-to-face interview. Form Three records re-operations on the fractured hip within the four month follow-up period. Using the SAHFE Forms 4–7, additional data can be collected allowing for example, the analysis of the length of stay in the emergency department, the experience of the surgeon and anaesthetist and the timing of operation. The lack of a research assistant prevented our collection of this data.

Comparative calculations are available on the individual hospital database for some of the recorded information, for example a comparison of pain at follow-up related to sex as shown in Table 3. Participating units can use this program to analyse their own data according to their own case-mix and outcomes. Additional analyses are available through the SAHFE hospital data reception and central control centre in Lund. The results were compared with the Scottish Hip Fracture Audit Reports of 2004 and 2006,[5] which present data from 4,047 cases during 2003 and 4,426 cases during 2005.

### *Statistical Analysis*

Minor variations in the two databases and lack of raw data limited the comparative analysis. For example, Redcliffe Hospital recorded date of admission and date of surgery, while Scotland records door-to-theatre time preventing full statistical analysis of that variable. Quantitative data were analysed where possible using the Mann Whitney U test and qualitative data using the Pearson Chi-square test.

## RESULTS

During the audit period we recorded data on 500 consecutive admissions treated in Redcliffe Hospital for a fractured hip. Four hundred and seventy four patients had a single fracture and 13 patients had bilateral fractures as previously described.[6] Follow-up data on 498 (99·6%) patients was achieved at four months. The success of the follow-up was due to the geographically entrenched population, patients with limited mobility and the time spent by the staff pursuing past patients. Comparisons with Scottish figures are shown in Table 5.

| Walking ability | Admission | Four months |
|---|---|---|
| Alone, outside | 57·6% | 42·9% |
| Accompanied, outside | 4·8% | 18·7% |
| Alone, inside | 21·6% | 5·2% |
| Accompanied, inside | 10·2% | 13·5% |
| Bed/chair-fast | 5·8% | 19·7% |

**TABLE 2** Pre-fracture and follow up mobilities.

### *Demographics*

There were 252 left-sided fractures and 248 right-sided fractures and predictably the majority (75%) of the patients were female. Median age was 80, mean age was 83·1, range 50–103, mean waiting time to surgery was 2·5 days with a median time of one day and mean duration of stay in the orthopaedic ward was 14·6 days with a median of ten days.

### *Fracture sites and surgery*

Two sites predominated, 49·8% of fractures were intertrochanteric, either two or more fragments, while 35·8% were subcapital with displacement. The remaining 14·4% were undisplaced intracapsular, basi-cervical or subtrochanteric fractures. Most patients were treated with a pin and plate (49·5%) or a hemi-arthroplasty (38·8%). Six point nine per cent had cannulated screws, 1·8% had an intramedullary nail and 0·2% had a total hip replacement. The 2·8% treated conservatively were either moribund on arrival or pain-free bed-bound nursing home residents. (See Table 1.)

### *Accommodation*

Accommodation on admission, at discharge and at four months post fracture is shown in Table 1. Fifty-two point seven per cent came from their own home, but only 22·8% returned directly to home, while another 13% returned home after mobilisation in the rehabilitation department. Thus 67·9% of our patients originally living in their own home had returned four months post fracture. The proportion in nursing homes declines slightly between admission and four months. The severity of hip fracture is shown by our death rate of 8·4% during admission, and 21·5% by four months. While the majority of own-home dwellers survive, the death rate of nursing home patients who returned to the same nursing home approached 50% over the following month. (See Table 2.)

### *Mobility*

Mobility decreases following a hip fracture. Details of the

deterioration in walking ability are shown in Table 2. The proportion walking alone out of doors decreased from 57·6% to 42·9%, while the bed-bound population increased from 5·8% to 19·7%.

### *Pain levels*

Pain is a significant problem following a hip fracture causing reduced mobility and a diminished quality of life. Details of levels of pain recorded at the four month follow up in men and women are shown in Table 3.

| Pain level at four months | Males | Females |
|---|---|---|
| No pain | 58·9% | 55·1% |
| Slight, diminishes with activity | 22·4% | 19·9% |
| After activity, resolves with rest | 6·6% | 8·9% |
| Tolerable, limited activity | 4·4% | 8·9% |
| Severe, preventing activity | 1·1% | 1·6% |
| Severe, at rest | 2·2% | 0·3% |
| Unable to answer | 4·4% | 5·3% |

**TABLE 3** Pain level at four months.

### *Discharge destination and deaths*

American Society of Anaesthesthetists grade (see below) prior to surgery was recorded, showing the rate of co-morbidities in the patients to be high, inevitably contributing to the high rates of mortality during admission and at four months.

### *Re-operations*

Thirty patients (6·0%) underwent further surgery related to the original operation, 5 for fracture displacement, 10 for loss of position of osteosynthesis material without fracture, 1 for additional fracture around the implant, 11 for wound infection and 3 for wound haematomas. Operations performed were 4 removals of implant, 6 hemi-arthroplasties, 1 total hip arthroplasty, 6 revisions with internal fixation, 1 excision arthroplasty, 10 drainages of blood or infection and 2 reductions of dislocation. This rate compares unfavourably with the Scottish figure of 3·1%.

## DISCUSSION

Hip fracture is a serious condition with frequent adverse outcomes. Jarman[7] reports that discharge home is less common than following admission with a heart attack or heart failure, median length of hospitalisation may exceed that for a stroke, and aged-matched death rate approaches that of admission with heart failure or myocardial infarction.

The death rate following a femoral fracture is acknowledged to be high, even with the best of care, as this injury occurs predominantly in elderly patients who usually have multiple co-morbidities. Walker[8] for example, identified regional variations of death rate in New Zealand with a maximum one year mortality of 32% in the Christchurch area. Roberts[9] data showed an increasing incidence of hip fracture in UK, with a predominance of women, higher death rates in men, with improvement in mortality between 1960 and 1980, but no further improvement between 1980 and 1998.

Clinical governance and improvement of standards requires careful audit and benchmarking. Europe, with a large population and with European Specialist Societies in most facets of medicine, is much better equipped to ascertain and improve standards than single countries with small populations, hence our enrolment in SAHFE.

Our results are similar to the Scottish data, but with two specific areas where improvement in our management is indicated. The mean 60 hours delay from admission to operation compared unfavourably with the mean of 20 hours in Scotland. The initial report on our first 75 patients[4] alerted the establishment to this delay. We hope the figures will improve with the recent additions of more dedicated emergency theatre time and a full time specialist orthopaedic surgeon.

The re-operation rate in Redcliffe was significantly greater than the figure for Scotland. Patient age and delay to theatre may contribute to this difference; however surgical experience may be a factor. In SHFAR 2004, consultant surgeons perform about a third of operations, and a specialist registrar is present in theatre at more than 80% of operations. By SHFAR 2006, only 6·4% of operations were performed by a senior house officer without at least a Specialist Registrar present in theatre. In Queensland Public Hospitals, nearly all hip repairs are performed by registrars and house officers at varying stages of training, without a more senior surgeon present. This aspect will need further audit of patient age, experience of anaesthetist and surgeon, type of operation, time and duration of surgery, and door-to-theatre time. These examples illustrate the possible synergy between an audit and clinical practice.

Premorbid conditions and age have a significant effect on the death rate. Our patients with a mean age of 83·1 were 3 years older (P=0·002) than the Scottish patients. We also had a greater concentration of patients between the ages of 80–89, Redcliffe 52·1%; Scotland 42·2%. The duration of stay in the acute orthopaedic ward will also have an apparent effect on death rate, as the daily death rate falls with the time elapsed from the fracture. Jarman[7] also reports that transfer to an intermediate care unit after surgery for a broken hip occurs much sooner in the US than the UK; hence the apparent death rate in subsets of patients over 65 in the US was 3·3% with a mean

| Discharge destination | ASA1<br>11 cases | ASA2<br>64 cases | ASA3<br>159 cases | ASA4<br>255 cases | ASA5<br>11 cases |
|---|---|---|---|---|---|
| Home | 55% | 39% | 30% | 12% | 9% |
| Rehabilitation | 36% | 44% | 33% | 14% | 0% |
| Hospital/ Hostel/ NH | 9% | 17% | 31% | 64% | 27% |
| Deceased in hospital | 0% | 0% | 6% | 10% | 64% |
| | 100% | 100% | 100% | 100% | 100% |
| Deceased at 4/12 | 0% | 2% | 8% | 25% | 90% |

**TABLE 4** Discharge destination and deaths.
(NH = nursing home, row 1 – 4 = 100% for each ASA grade)
ASA 1- Normal healthy patient,
ASA 2 - Patient with mild systemic disease with no functional limitations,
ASA 3 - Patient with moderate systemic disease with functional limitations,
ASA 4 - Patient with severe systemic disease that is a constant threat to life,
ASA 5 - Moribund patient who is not expected to survive another 24 hours with or without surgery.

| Information | Redcliffe<br>500 cases | Scotland (2003)<br>4,074 cases | Scotland (2005)<br>4,426 cases |
|---|---|---|---|
| Mean age | 83·1 | 80 (median 82) P = 0·002 | 80 |
| Pre admission at home | 52% | 58% | 67.1% |
| Mean door to surgery time | 60 hours | 20 hours | N/A |
| Mean length of acute stay | 14 days | 16 days P = 0·07 | 36 (now includes rehabilitation) |
| Total hospital stay | No data | 32 days | 36 days |
| Mortality acute | 8·4% (14 days) | 7·8% P = 0·657 | 10·4% (30 days) |
| Return to home 30 days | No data | 50% | N/A |
| Follow up 120 days | 99·6% | 96% | 98·1% |
| Mortality 120 days | 21·4% | 21% P = 0·465 | 23% |
| Re-operation rate | 6·0% | 3·1% P = 0·001 | 2·4% |
| Return to home 120 days | 67·4% | 68% | N/A |
| Mortality 1 year | No data | 30% | No data |

**TABLE 5** Summary of comparisons between Redcliffe and Scotland (2003 and 2005).

length of stay of 6·8 days, whereas in the UK the death rate was 11·9% after 25·5 days. In the Scottish 2004 audit, the 30-day mortality was 7·8%. Young[10] in New Zealand reported a death rate of 12% at 30 days and 32% at one year. Our death rate figure of 8·4% at 14 days is grossly congruent with all these results allowing for different lengths of stay. More precise comparisons would require identical data collection and measurement of comorbidities, using for example, like Young, the POSSUM scoring system. Young's mortality at 30 days was 22·4% in the two highest risk groups combined and 5·4% in the two lowest risk groups combined.

Scottish and Redcliffe patients have almost identical discharge accommodation figures. One hundred and twenty days after the fracture, 68% of the 2004 Scottish patients and 67·9% of Redcliffe patients admitted from their own home, will have returned to their home.

Patient outcomes are improved by the involvement of a physician and a full ancillary care team. UK data collected by Bottle[11] from orthopaedic units by questionnaire between October and December 2003 demonstrated physiotherapist review within 24 hours in 85% of trusts, medical review at some stage of admission in 75%, and a formal medical/geriatric link in 72%. Eleven per cent of patients were managed conservatively with an in-hospital mortality rate three times that of surgically managed patients. Our patients all had physician and physiotherapist review within 48 hours. Two point eight per cent of our patients were managed conservatively. Most of these were ASA category 4 or 5 with a very limited life expectancy and no pain at rest or during nursing care.

The audit results can pinpoint problems within individual hospitals. For example, amongst the Scottish hospitals, Hairmyres Hospital introduced fast-tracking through A&E, reducing time in A&E from 2·5 to 1·6 hours. The introduction of a trauma surgical theatre list reduced mean time to surgery from 62 to 34 hours.

In conclusion, we need to improve on the door-to-theatre time, and reduce the re-operation rate, and to investigate the causes of these problems. Greater use of either the SAHFE or SHFAR tool with the assistance of a research officer is our next target. This should enable us improve the management of the hip fracture patient's journey of care. We also concur with Theis[12] in New Zealand stating that '…it is time to develop a National Hip Fracture Strategy which will guide the future prevention and treatment of hip fractures in this country.'

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