Scottish Needs Assessment Programme

Hip Fracture

SCOTTISH FORUM FOR PUBLIC HEALTH MEDICINE

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Acute Services Network

Hip Fracture

Dr R Muir (Chair)	**Consultant in Public Health Medicine Forth Valley Health Board**
Dr DC Kennie	**Consultant Physician in Geriatric Medicine Stirling Royal Infirmary NHS Trust**
Mr TS Kerr	**Consultant Orthopaedic Surgeon Stirling Royal Infirmary NHS Trust**
Mr A Redpath	**Principal Statistician ISD, Edinburgh**
Dr A Breslin	**Senior Registrar in Public Health Medicine Grampian Health Board**

September 1997

Scottish Forum for Public Health Medicine
69 Oakfield Avenue
Glasgow G12 8QQ
Tel: 0141 330 5607
Fax: 0141 330 3687

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1. The rising incidence of hip fracture is a major problem facing health services. The condition occurs almost exclusively in elderly people and the incidence rises steeply with age. The main underlying causes are osteoporosis and falls, both of which also increase with age.

2. The direct costs of care to the NHS are between £5000 and £6000 per case. Patients with hip fracture occupy around one quarter of all orthopaedic beds and the total annual cost to the NHS in Scotland is around £30 million.

3. Hip fracture is a common condition in the older population; around five and a half thousand cases now occur every year in Scotland. The number of cases in the Scottish population aged 55 and over rose from 4180 in 1982 to 5338 in 1992; i.e. by over 25%. Eighty percent of cases occur in women and the incidence per 1000 women aged 55 years or more rose during the same period from 4.4 to 5.6 per 1000.

4. These increases are due mainly to an increase in the average age of the population and particularly a rise in the numbers of people in the oldest age groups. The age specific incidence of hip fracture appears to have risen quite dramatically during the past 30 to 40 years in developed countries. More recent increases are modest and contribute in only a minor way to rising numbers. The reasons for this rise in age specific incidence are not clear but a significant factor may be reduced levels of exercise.

5. Mortality is high: one in ten cases will die within one month and one third are dead at one year. Most of those who survive experience significant pain, loss of mobility and independence. This results in a major burden for carers and the community services: up to a third of cases admitted from home will require long term or residential care.

6. Hip fracture occurs and presents as an emergency. Surgical and medical care need to start immediately and these cases have a major impact on the orthopaedic and trauma services, on medical and geriatric services and on rehabilitation and therapist care.

7. The numbers of cases occurring will rise by approximately 25% over the next ten years. Of this increase, 95% will be to increasing numbers of older people in the population; the remainder being due to rising age specific incidence. This rise will mean an extra 250 cases per million population per year. The impact will be more severe in some areas due to larger increases in the population aged over 75 in these areas. Given these expected increases, it is essential that the services required should be efficient and well planned.

8. Services are primarily aimed at relieving pain, restoring function and preventing dependency. Hip fracture patients are almost all elderly and have complex needs: management involves many disciplines and requires high levels of surgical, medical, nursing and therapist skill. A major challenge is overall co-ordination of these processes of care.

9. There is evidence that the quality of care for hip fracture varies significantly in different hospitals. Fortunately, much has been learned recently about how to manage hip fracture effectively and a number of key areas are highlighted in this report where high quality services can be specified to improve outcomes and quality of life for patients.

10. Key areas for improvements in care are: aspects of admission; medical and surgical care; rehabilitation and discharge; prevention of pressure sores; avoiding delay in operation; operations being carried out by adequately experienced surgeons and anaesthetists: good orthopaedic-geriatric liaison; multi-disciplinary assessment and management; co-ordination of hospital and community discharge efforts; prospective data collection to inform future service improvements.

11. Prevention of such a common and costly condition should have high priority. The issues, however, are complex. Important elements of prevention are the uptake of exercise and the prevention of smoking. The use of hormone replacement therapy may also be important but this is uncertain as yet. Some preventive initiatives aimed at diet and fall prevention also show potential for reducing the incidence, but require more evaluation.

12. Purchasers and providers have an obligation to ensure the implementation of good practice where it is identified and to ensure that services provide the best possible outcomes and quality of life for patients. There are important opportunities for commissioners/planners and providers to do this for hip fracture care where practice can be improved.

13. The costs of service improvements are unlikely to be major and savings should result from more effective and efficient care. The quality of life of significant numbers of elderly orthopaedic patients and their carers would also be improved.

14. An important consideration is the collection of data on the processes and outcomes of care to permit continuing improvements in the management of the condition. A wide range of outcomes needs to be considered and those important to patients and carers given more attention.

RECOMMENDATIONS

Purchasers should take into account the major impact of hip fracture cases on the emergency, orthopaedic, geriatric and trauma services. They should anticipate an increase in numbers of cases of 25% over the next 10 years.

They should ensure that services for patients with hip fracture are of high quality and well co-ordinated across primary and secondary care by clearly specifying the services required and expected quality standards.

A great deal is now known about the elements of care required to ensure good outcomes and quality of life for hip fracture patients and commissioners/planners should ensure these are included in service specifications and that they are monitored.

4. These key elements are highlighted in this report and they include:

a) A clear specification of services required for hip fracture care.
b) An identified individual responsible for delivery of the service to the specified levels.
c) Agreed written local protocols for care.
d) Prevention of delay in admission and operation.
e) Multi-disciplinary, standardised assessment of cases.
f) Adequately experienced and supervised surgical and anaesthetic staff carrying out the operations
g) Effective orthopaedic-geriatric liaison.
h) Multi-disciplinary rehabilitation.
i) Well co-ordinated discharge arrangements ensuring adequate home support is in place and smooth hand-over to primary care and community services.
j) Participation in the Scottish Hip Fracture Audit or collection of data to a similar standard.

5. A named individual in each hospital or Trust providing care for patients with hip fracture should be responsible for the co-ordination and quality of services for hip fracture patients or for ortho-geriatric care more generally. He or she should report on the service annually regarding service delivery, achievement of clinical and operational quality standards, and potential service developments and improvements.

6. Purchasers should require providers either to participate in the Scottish Hip Fracture Audit or to demonstrate that their collection of data on the processes and outcomes of care is equivalent in terms of informing improvements in the local service and comparing outcomes with other centres.

7. Purchasers should ensure that their programmes of health promotion and prevention take into account the impact and costs of hip fracture. These programmes should emphasise population measures targeting exercise uptake, stopping smoking, and the use of hormone replacement therapy where appropriate.

8. Further research is required in a number of areas including particularly: cost effectiveness studies on prevention, randomised controlled trials of early supported discharge, and work to develop outcomes more relevant to patients and carers.

1. INTRODUCTION

1.1 In Scotland in 1994 5,400 people aged 55 and over fractured a hip (1). The numbers of fractures occurring

is rising. This is due to two principle factors: the average age of the population is rising and the risk of fracture for each age group is increasing over time, at least in the population over 55. Hip fracture occurs mainly in elderly people. Three quarters of patients are over 75 and the average age of cases is around 80 years. The condition is three to four times as common in women as in men (2).

1.2 Hip fracture results in considerable mortality, morbidity and loss of function and independence. It also consumes large quantities of NHS resources, including nearly a quarter of all orthopaedic beds (3). The evidence also suggests it will be difficult to develop effective programmes of prevention. The condition, therefore presents the Health Services with major challenges. As the numbers of cases rises considerable pressure will be exerted on resources and, if the NHS is to cope with this increase, it is essential that best practice be adopted as widely as possible (4).

1.3 The management of hip fracture in elderly people is complex. There are often co-existing medical conditions; many specialties are involved and social and domestic factors may complicate rehabilitation and return home. For this reason the co-ordination of the overall package of treatment is difficult and may not be well managed.

1.4 Many different perspectives on the problem have to be considered - that of the patient, the relatives and carers, the professionals and other provider staff responsible for care, and that of commissioners/planners concerned to ensure patients have access to high quality services. However, the focus of service provision must ultimately be on improving the outcomes of care and the quality of life of patients and carers.

1.5 Hip fracture is a well defined condition about which a great deal is now known. There are major opportunities to ensure that services for patients are of high quality. In the process it is likely that these improvements will have wider benefits for elderly patients with other conditions. This report aims to provide commissioners/planners with information and recommendations to assist in this.

2. NATURE OF THE CONDITION

2.1 Definitions and terminology

A number of terms are used to describe fracture of the hip including, fractured femoral neck, fractured neck of femur, hip fracture. The ICD Code is ICD 820 - “fractured neck of femur” (5). It is distinguished from fracture of the shaft of the femur (ICD code 821). The ICD 10 code is S72.0.

Hip fracture mainly occurs in very elderly people. In this population it is associated with effects of ageing whilst in younger people hip fractures are much less common and usually due to high speed trauma. A cut-off age of 55 years and over was chosen for this report, consistent with a number of previously published studies (6).

2.2 Causes of Hip Fracture

2.2.1 Osteoporosis

Osteoporosis is generally accepted to be the primary underlying pathological process in hip fracture in elderly people (7). Its increasing prevalence with age, together with the increased incidence of falls in this age group are thought to result in the characteristic association of hip fracture with ageing.

Bone density and strength reach a maximum in early adulthood and remain stable for some years (3). Thereafter, bone density and strength decline at a variable rate as age advances. This occurs particularly rapidly after the menopause in women due to loss of protective hormonal effects on bone metabolism so that at any age bone density and strength are lower in women than in men (although there is great variation between individuals). This is likely to explain the difference in incidence of hip fracture between women and men and the rising incidence with age.

The causes of osteoporosis are only partially understood but there is a known association with levels of circulating oestrogen, exercise levels and smoking. There is good evidence that the amounts of exercise taken by individuals is a key factor determining risk of osteoporosis and reduced levels of exercise associated with urbanisation and mechanisation have been proposed as the primary reason for its rising incidence (7). Readers are referred to the SNAP Report on Osteoporosis for detailed discussion of this condition and its prevention (8).

2.2.2 Falls

About one third of the population aged 65 and over will fall at least once a year (9). This rises to more than half of women aged over 85 living at home and a greater proportion of those living in institutions The most serious result of falls is fracture which accounts for 40% of deaths from injury, over half of injury admissions to hospital and two thirds of bed days for injury (10).

A number of potential causes of falls accumulate with increasing age - these include poor eyesight, loss of postural reflexes, unstable blood pressure, medication (commonly antihypertensives, sedatives and diuretics) and impaired blood flow to the brain (11).

2.3 Clinical features

Hip fracture in older people is almost always associated with a fall. These so-called low energy fractures commonly occur without other injuries being present. However, the clinical picture is often complex due to associated factors, many of them age-related. Four out of five hip fracture patients will suffer from conditions common in old age such as hypertension, diabetes, dementia or Parkinson's disease (4).

These conditions may be superimposed on the effects of the fall and time spent lying on the floor after falling with consequent dehydration, hypothermia and malnutrition. Confusion is found in 40 to 50% of cases and up to 20% show clinical features of depression (12). Effects of the fall, dehydration and hypothermia may be mistaken for dementia or stroke. This may complicate history taking and assessment.

Thus, whilst diagnosis of the hip fracture is usually straightforward, accurate patient assessment, vital for effective management, is often complex.

2.4 Type of fracture

Two basic types of fracture occur: intracapsular fracture which occurs close to the femoral head and frequently leads to the blood supply to the femoral head being cut off. The other common type is intertrochanteric fracture which occurs just below the femoral neck, outside the joint capsule. The two types of fracture require different operative methods.

The frequency of these two main types is approximately equal. Patients with extracapsular fracture tend to be slightly older (mean age 80) compared with intracapsular (mean age 78). This may explain the slightly higher mortality rate at three months associated with extracapsular fractures (12).

2.5 Clinical course and management

Patients are commonly found lying after a fall and may have lain unable to rise or move for a considerable time. They are often in pain and confused. The features of apparent leg shortening and external rotation may make the diagnosis easy depending on the type of fracture.

Most cases are admitted to hospital through Accident and Emergency departments where they will, after a variable delay, be assessed and referred for X-ray. Following this they will be admitted to a ward, given medication for pain and possibly have any hypothermia or fluid loss corrected. At some point, usually in the following 24 to 48 hours, they will undergo operation under general or regional anaesthesia.

After recovery from operation and anaesthetic they will be mobilised as rapidly as possible, typically bearing weight within 24 to 72 hours and then enter a programme of rehabilitation aimed at restoring them to their full range of activities of living. This is a vulnerable time for older people: they have reduced reserve and react badly to immobilisation, strange faces and unusual surroundings.

They are put under severe stress by pain, shock and apprehension and may decline rapidly both physically and mentally; much of this decline may be irreversible. Skilled care in the acute phase integrated with active, well planned rehabilitation can do much to prevent this.

It is known that programmes of rehabilitation vary widely from hospital to hospital depending on the way services

are organised and run. This probably has an important role in producing the difference in outcome between units (4). The duration of the rehabilitation and the subsequent destination on discharge vary: most will go home but many will go to institutional care. Which outcome is achieved will depend on the patient's physical and mental state prior to injury and on the care given in the acute episode. The proportion going home varies significantly between hospitals, partly reflecting case-mix but also reflecting difference in care (4,12).

2.6 Outcomes

2.6.1 Mortality

Around 7% of cases die during the acute admission. At 30 days overall mortality is around 10%, (13) and at four months this increases to about 25%. Approximately one third of cases overall were dead at one year in the population reported on in the Scottish Hip Fracture Audit in 1995 (12).

Mortality is around three times higher in those admitted from institutional care compared with patients admitted from their own home. This is a very elderly population in which mortality is inherently high. The population who suffer hip fracture inevitably contains a proportion of the very frail for whom this will be one of a number of possible causes precipitating a terminal decline.

2.6.2 Scottish Clinical Outcome Indicators

Outcome indicators for fractured neck of the femur have been published by the Clinical Outcomes Working Group of the Clinical Resource and Audit Group (CRAG) in their fourth report published in December 1995 (13). These were derived from SMR1 data for the period July 1991 - June 1994 inclusive and standardised indirectly for age, sex, deprivation and a number of other morbid conditions. Survival after 30 days of admission, as a percentage of all admissions for fractured neck of femur, varied from 88.7% to 96.2%. The figure for all Scotland was 91.6%. Four Trusts were significantly above the Scottish average figure and none were significantly below.

Discharge home after emergency admission of fractured neck of femur varied from 57.6% to 74.4%. The Scottish figure was 63.9%. Only two Trusts were significantly above the Scottish figure.

No conclusions should be drawn from the comparisons about the quality or the efficacy of the treatment provided. However, whilst some of the differences will be due to differences such as case-mix, others will be attributable to remedial deficiencies in service provision or therapeutic regimes.

2.7 Morbidity

Much of the importance of hip fracture lies in the resulting loss of function and independence. Services should be designed to minimise the impact of this on patients and carers.

2.7.1 Going Home

The proportion of patients admitted from home who are discharged directly to home appears to vary between hospitals from approximately 40% to 85% depending on the source of the data (4,12). The proportion depends partly on case-mix but is an important potential indicator of outcome, e.g. a figure of 60% could be set as a target. Between a quarter and a third of patients admitted from home will require admission to long term and residential care.

2.7.2 Pain

Between 30% and 40% of patients state they have 'a lot of pain' on weight bearing during the acute hospital stay. This reduces to 10 to 20% at four months (12). Some studies report higher incidence, e.g. 55% at six months (15).

2.7.3 Mobility and Independence

Four months after fracture between 40% and 45% of patients have the same measured walking ability as before fracture although only 10% to 15% assess their walking as being as good as this (12). This level of preserved mobility is at the expense of increased use of walking aids.

2.7.4 Outcomes and Quality of Life

Hip fracture thus has a significant lasting impact on the quality of life of most of those whom it affects. This impact is a major one in terms of pain, loss of mobility and independence in around half of all sufferers. Many individual aspects of the care process will have an impact on outcome. As yet it is not fully understood to what extent each of these bits of the jigsaw of care influences outcome although, thanks to recent research, we now know much more than we did. The overall co-ordination of the total package of care is also an important factor and it has been suggested that this is the most important determinant of care (15).

3. EPIDEMIOLOGY AND COSTS

3.1 In Scotland in 1994 approximately 5,400 hip fracture cases in those aged 55 and over and over were treated in Scottish hospitals. This is about 1000 fractures per million total population. Approximately four out of five of these were women.

3.2 Patterns of disease

A great deal is now known about hip fracture and the problem has been studied in many populations. The incidence rises sharply with age and this rise has been shown in many studies to be approximately exponential, typically doubling in each successive 5 year age group (16). There is a marked sex difference in incidence in Western populations with women having higher rates. The ratio of female to male incidence is generally between 3 and 4 to 1 (16, 17).

3.3 Geographical and Racial Variation

Incidence rates from different countries within Europe appear to vary substantially (18) with the highest incidences found in Northern Europe and the lowest in the Mediterranean area (19). Highest rates are found in white populations and lower rates are found in Asian and developing countries. Rural populations have a lower incidence than urban populations. Institutionalised elderly people also have higher rates (14).

3.4 Scotland in comparison with other countries

Scottish rates in males and females over 55 years for the period 1981 to 1991 are shown compared with rates from a number of international studies (20) in Table 1.

Table 1
Age adjusted rates of hip fracture per 100,000 from a series of studies*

Geographical area Years of survey	Age adjusted rates/100,000		
	Women	**Men**	**Total**
Norway 1983 -84	1293	551	968
Stockholm, Sweden 1972-81	622	291	477
New Zealand (Whites) 1973 -76	620	151	414
Texas, USA (Whites) 1980	530	205	384
Scotland 1981-91	**452**	**162**	**324**
Yorkshire, UK 1973-77	275	96	196
California, USA (Blacks) 1983-84	219	144	185

*Standardised to the USA standard 1985 population 50 years and over.

This puts Scottish rates in the middle of a fairly wide international range. Rates in Scotland appear to be significantly higher than those in England but this may be due to better recording in Scotland. Comparing disease rates in different countries is notoriously difficult due to differences in definition, in accuracy of population data and ascertainment of cases.

3.5 Variations within Scotland

The numbers and age-standardised rates for hip fracture in Scotland in males and females aged 55 years and

over for the years 1981 to 1994 are shown for each five year age group in Tables A1 and A2 (Appendix 2). It should be noted that the figure for 1981 is inflated because of the method of data linkage and is not directly comparable with the data for the other years. The female rate is around three times the male rate for this age range and there is a dramatic increase in incidence with age.

The incidence of hip fracture by Health Board in Scotland is shown in Figure A1 (Appendix 2). This data is age standardised and linked. A number of boards appear to have rates significantly different from the Scottish mean. In particular Lothian rates are higher for both males and females. Lanarkshire and the Western isles have rates which are low for males and females.

3.6 Changing incidence over time

The majority of studies which have looked at changes over time in hip fracture point to a rising age-specific incidence of the condition in the latter half of this century (7). There as been much speculation as to why the incidence of this condition should be increasing. There is good evidence that the amounts of exercise taken by individuals is a major factor in determining risk and increasing urbanisation and mechanisation have reduced exercise levels in society. This has been proposed as the primary reason for rising incidence.

Although it has been suggested that a period of increasing incidence could be slowing down or coming to an end, possibly due to a cohort effect, this is speculative (21,22).

The increases seen over time in a number of studies have been dramatic, e.g. a doubling in age-specific incidence in women over 75 in Nottingham between 1971 and 1981 (23), a 50% increase in age specific rates in Sweden from 1965 to 1982 (24), a 15 to 20% increase in age-specific rates in males and females in the Netherlands between 1972 and 1987 (22).

The rising age specific incidence is in addition to the rising numbers of people in the older age groups for both men and women. In 1991 in the UK one in six people was aged over 65. By 2001 this will rise to around one in five. Within this there are more dramatic increases in the populations over 75 and even more so in those aged over 85; the so-called ‘old’ and those most at risk of hip fracture. Some Health Board areas will be more affected by this population change than others due to different population structures. See Table A3 (Appendix 2).

3.7 Rising rates in Scotland

The age-standardised incidence of hip fracture in Scottish residents aged 55 and over for the period 1981 to 1994 is shown in Table A2 (Appendix 2). This shows a small rise in incidence over the period for both males and females. Regression analysis shows the rise in rate to have been 2.03 per 100,000 population per annum for males and 4.57 per 100,000 per year for females.

The number of cases in each five-year age group is smaller, making it more difficult to detect trends at this level but the rise in incidence appears more pronounced in the older age groups.

3.8 Projecting future rates and numbers

Using regression analysis of age-standardised rates for 1981 to 1994 together with population projections, future numbers of cases can be predicted if it is assumed current trends will continue (Table 2).

Table 2
Projected numbers of hip fracture cases in Scotland in those aged 55 and over

	1994	**2000**	**2005**	**2010**
Male	1114	1345	1544	1788
Female	4289	4908	5296	5755
Total	5403	6253	6840	7543
Increase from 1994		15.7%	25.9% (*4%)**	39.6% *(8.3%)**

** The percentage change due solely to the increase in incidence is shown in brackets beside the overall percentage increase. The increase is seen to be almost entirely due to the increased numbers of older people in the population.*

The annual numbers of fractures from 1982 to 1994 together with these projections are shown graphically in Figure A2 (Appendix 2).

There is inevitably some uncertainty about these projections due to a number of factors including the difficulty of accurately forecasting population sizes and structures and the confidence intervals associated with the linear regression. Whether rates continue to rise as they have done in the past will, in addition, depend on unpredictable changes in underlying causes. However, they should be regarded as reasonable estimates of future trends.

The impact at an individual Health Board level will vary: some Boards will experience larger increases than others. The increases in the population aged 75 and over by Health Board is shown in Appendix 2 in Table A3.

3.9 Forecasting future resource use

The forecasting of future incidence and resource use relies on a number of unknown factors and assumptions. Most studies which have attempted this have been based on projections of historic trends in incidence and length of stay together with population projections as discussed in section 3.8.

Jensen, in Denmark, used data from a retrospective study of hospital records, taking into account trends in type of treatment and possible surgical complication rates and predicted a doubling in the number of cases over the 17 years from 1980 to 1997 (25). Owing to falling length of stay he forecast that this increase would be accommodated within current bed resources. Lord used age-specific fracture rates derived from hospital discharge data together with projections of length of stay and population and forecast an 83% increase in bed-use between 1986 and 2011 in an Australian population (26).

A prospective review of costs associated with hospitalisation for hip fracture has provided a more recent example from current NHS practice (15). This suggests that the numbers of patients admitted to hospital is likely to rise by 22% by the year 2011. The increase in resource use is likely to be higher than this, around 25%. This study further predicts an additional 41% increase in resource use by the year 2031.

These projections are based on the assumption that rates will stay at the present level. An important additional factor will be mortality rates. If these fall more than expected the rises in the numbers of very elderly people in the population may be greater than forecast. Also, the data in the study are from an area with well developed ‘Hospital at Home’ facilities which may encourage lower length of stay and reduced resource use in hospital. These support facilities are not available in most parts of the United Kingdom.

3.10 Length of stay

Use of hospital resources is closely related to length of hospital stay. Although mean length of stay is a relatively crude measure of outcome it is widely understood as an indicator of resource use. Length of stay will depend not only on the availability of facilities such as home nursing and domiciliary physiotherapy but also on factors such as technical aspects of surgery. Jensen, in a study of 1600 cases found that hospitalisation time was considerably influenced by the type of surgery and the frequency of technical failures (25). Holmberg studied the consumption of hospital resources in hip fracture patients in Stockholm and showed that reduced bed-days per case were associated with the use of ‘specialist’ surgeons and with particular surgical fixation techniques (27). Lower levels of operative complications and lower costs were associated with surgical specialisation and cases with complications consumed three times the hospital bed days of uncomplicated cases.

Length of hospital stay for hip fracture cases has fallen substantially and steadily in Scotland in the period 1982 to 1994. The total number of bed days appears to have fallen despite the increase in the numbers of cases. Differences in the way beds are used and classified makes interpretation of exactly how this has been achieved difficult.

It is likely that the impact of the rising numbers of cases has been masked by the simultaneous fall in length of stay. It is also probable that a proportion of the rising cost of hip fracture has been absorbed by shifting costs to primary care and the community, e.g. by earlier discharge of more dependent cases, although quantifying this would be difficult.

Continuing to reduce length of stay becomes progressively more difficult to sustain over time, partly because

reductions are achieved by earlier discharge of fitter patients leaving a more dependent and rehabilitation-resistant case-load but also because the average age of hip fracture cases is rising and length of stay increases with age (4).

Length of stay varies between hospitals. Figures quoted for orthopaedic ward stay are typically eight to fifteen days (4,12) This will vary depending on arrangements for rehabilitation and home support. Total acute sector (so-called pre-convalescent) length of stay is probably around 30 days on average but there is great variation between cases.

Considerable effort has been made in a number of centres to reduce hospital stay and the existence of schemes if 'Early Supported Discharge ' or 'Hospital at Home may affect local performance. This is discussed in Chapter 4. Case-mix is an important factor and interpretation of crude length of stay figures should be undertaken only with a knowledge of such local factors.

3.11 Costs

Direct costs of hip fracture include those for assessment, in-patient management, and rehabilitation. In 1995 costs for managing a hip fracture quoted on an ECR basis by six Scottish Trusts ranged from £3,200 to £5,300. While these costs vary substantially they are similar to those in an assessment of the cost-benefit of treatment in 1992 which included the operation, rehabilitation, follow-up clinic visits and any further related hospital activity within one year of admission (28). The average cost per patient was £3,300. A more recent prospective NHS-based study of in-patient costs has put the average cost of in-patient treatment at £5076 at 1991-92 prices (15).

The cost per quality adjusted life year (QALY) was £992. In comparison the cost per QALY of a cardiac bypass operation was £1,300 and a total hip replacement was £960 per QALY.

In 1987 the cost of hip fractures to the NHS was estimated to be £165 million (29). More recent estimates put the total direct cost to the secondary sector in England alone at £288 million (15). On a crude population basis this would suggest a figure of around £30m for Scotland. This approximates reasonably to the cost of 6000 hip fractures at around £5000 each.

3.12 Implications

Under current patterns of care the more dramatic projections of rising numbers of cases would require large numbers of extra beds, skilled hospital personnel and other resources. Even more modest rises will put significant pressure on services. It is probably unrealistic to attempt to quantify future resource requirements in any precise way: the rate of rise in incidence remains uncertain as the epidemiology is incompletely understood and operative techniques and rehabilitation programmes are constantly developing.

Given the disturbing implications of this for resource use there must be a strong case for investment in measures aimed at primary prevention and this is discussed later in Chapter 4.

It is also important that research and audit continue to improve our knowledge of how best to manage this condition and that best practice should be disseminated and adopted widely. Both Commissioners/Planners and Providers have a major responsibility to ensure this occurs and participation in well-organised audit of hip fracture management is an important way to ensure this happens.

3.13 Data quality

The quality of the data on which this information is based is important. There has been scepticism amongst clinicians regarding the use of SMR 1 data and this has been a long-standing problem.

One examination of a sample of 400 cases of hip fracture identified from ward registers in Edinburgh Royal Infirmary covering the years 1984 to 1990 showed that SMR 1 data at that time underestimated the number of cases by 6.9% (95% c.i. 1.9 to 11.9%) (30).

ISD Scotland's Quality Assessment and Accreditation (QAA) Team regularly check a 1% sample of SMR 1 records against hospital case notes to verify the quality of the SMR 1 data. In 1992, 95% of records which were or should have been coded to ICD9 820 - (fractured neck of femur) as the main condition - were coded correctly

on SMR 1. In 1994 the figure was 90%. The reason for this fall is unknown. It is important to bear in mind the limitations of routinely collected data although it is likely that the SMR data used here is of relatively high quality compared with that in many of the data sets used to derive information on hip fracture in other studies. This reinforces the importance of well managed prospective data collection.

4. MANAGEMENT OF HIP FRACTURE

4.1 The complex nature of the problem

Patients with hip fracture require a range of services covering admission, assessment, surgical and medical care, rehabilitation, long term support and management. At each stage problems may arise to compromise the eventual outcome. The Audit Commission report 'United They Stand' looked in particular at these kinds of problem and is an important source of informed advice on the processes of care for those seeking to improve them (4).

4.2 Admission

Most cases of hip fracture are admitted to hospital through Accident & Emergency Departments where they have to compete for attention with large numbers of urgent and semi-urgent cases. Patients may wait several hours for full assessment and treatment. The Royal College of Physicians have recommended that hip fracture patients should not spend more than one hour in A & E (29).

Delays at this stage can worsen pain, confusion and dehydration and initiate pressure sores (4). Most cases wait more than one hour: particular causes include waiting for X-rays to be taken or processed and waiting for an orthopaedic surgeon to sanction or arrange admission. Hip fracture patients should be regarded as a priority for early assessment and admission and processes designed to minimise delays.

4.3 Assessment

Most patients with hip fracture are elderly and have complex needs. Ideally, this assessment should be multi-disciplinary and involve orthopaedic surgeon, geriatrician, nursing, physiotherapy, and occupational therapy**.**

Incomplete or inadequate assessment can lead to delays in operation, misdiagnosis, delays in recovery and discharge. A major improvement to admission procedures could result from the use of standard documentation (common to nursing, medical and surgical) where this is not already in use. This should include prompts for key information such as:

- pressure sore risk
- pain assessment
- pre-fracture mobility
- cognitive function
- nutrition assessment
- relevant social factors

In addition, patients and carers require to be given adequate information about the diagnosis and the likely course and duration of treatment.

4.4 Treatment in the acute phase

These cases present a complex mixture of medical, surgical and social problems. Treatment needs to be carried out quickly to prevent mental and physical deterioration. Coordinating the medical and surgical treatment therefore presents major challenges and requires a team approach with someone having overall responsibility for making sure the processes of care are integrated.

4.5 Surgery

The overwhelming majority of cases (97%) go forward for surgery despite the risk in patients of this age. The main aims of surgery are to provide pain relief and to give the patient a better chance of rapid rehabilitation.

Each case requiring operation will, on average, occupy an operating theatre and its staff for approximately 1½

hours. A District General Hospital covering 250,000 population will therefore require to set aside two or three operating sessions a week solely for fractured necks of femur.

There are basically two types of operation. In the first the fracture is reduced and held in place by either metal pins or a screw and plate. The second type of operation involves replacing the femoral head with a metal prosthesis. This is called hemiarthroplasty.

There is a large variety of implants available at widely differing costs. At present there is very little evidence that the more expensive types have any great practical advantages over the less expensive ones, particularly in elderly patients. There may be some theoretical advantage in younger patients of the bi-articular type of prosthesis although this has yet to be shown in clinical practice**.**

4.6 Quality of surgical care

The Royal College of Physicians Guidelines recommend that these operations for hip fracture should be carried out by 'experienced doctors'. The grade of surgeon carrying out the operation varies widely between hospitals. The ideal is consultant-led operating lists (see also para 5.4).

Patients should be operated on as soon as possible, ideally within 24 hours. The ability to operate within 24 hours depends on the availability of daily trauma lists. This is a long standing recommendation of the British Orthopaedic Association. Trauma lists should be available during the day, both on weekdays and on weekends and ideally, operations should not be carried out as emergencies at night.

Cancellation of operations, particularly repeated cancellations, are not uncommon and can lead to dehydration and malnutrition. They are also a cause of significant wastage of beds. Excessive periods of withholding food and water before a surgery are common and undesirable. Research has shown that a four hour period is usually sufficient (4).

4.7 Orthopaedic-Geriatric Liaison

Hip fracture patients have major rehabilitative needs and often have concomitant physical and mental problems which lie outwith the primary remit of the orthopaedic surgeon in charge of the case. For this reason it is desirable that clinical staff specialised in the care of elderly patients are involved in admission, pre-operative assessment and management of the patient following surgery. A number of models of care now operate throughout the United Kingdom:

4.7.1 *Care as Orthopaedic Inpatients*

There is increasing evidence that this model of care may result in longer hospital stay, poorer functional outcome, increased mortality and in fewer patients being discharged back to independent living in the community.

4.7.2 *Early Supported Discharge*:

This model of care is also known as a 'rapid transit system' or 'hospital at home scheme'. Such schemes involve close links with the hospital orthopaedic team, good discharge planning, increased community support and community rehabilitation. A number of such schemes have reported reduced lengths of hospital stay (31, 32, 33). However, only non-randomised studies have been reported and the strategy is suitable only for selected patients (34). Although this aftercare strategy seems acceptable to many carers and its adverse impact on them seems small, again, only non-randomised studies have been reported.

4.7.3 *Shared In-patient care with Physicians in Geriatric Medicine (Orthogeriatric Care)*

Although collaborative care between geriatrician and orthopaedic surgeon is an accepted part of clinical practice in many areas of the United Kingdom, it is by no means universal. A 1985 survey found only 15% of departments of geriatric medicine participating in this model of aftercare (35). There is also considerable variation in the process by which this collaboration is undertaken (36, 37), e.g.:

As a Consultancy Service:

There are a limited number of reports of descriptive non-randomised studies showing benefit but this aftercare strategy has lacked close scrutiny.

As Specialist In-patient Rehabilitation:

When a designated unit is set aside for this purpose it is known as a geriatric orthopaedic rehabilitation unit (GORU). Most specialist rehabilitation is however carried out in 'geriatric' assessment or rehabilitation beds or in 'second line' surgical beds. The results are indistinguishable between these different geographical locations.

There are now numerous non-randomised trials on orthogeriatric rehabilitation, almost all of which have shown benefit. There is also an increasing number of reports of randomised controlled trials (38, 39, 40, 41). Further analysis of the evidence is being conducted by a working group of the Musculoskeletal Injuries Working Group of the Cochrane Collaboration (42).

There is good evidence, at present, of benefit from such collaborative orthogeriatric care in terms of reduced lengths of hospital stay, reduced mortality and a reduced need for long term institutional care. Such a strategy has been shown to have no specific or long term adverse impact on carer stress (38, 43). There is less clear evidence on the key elements for such success. Experience suggests the following to be important:

a functionally orientated approach to the practice of care by the nursing staff.

the consultant geriatrician acting as clinical care manager for the patient and exercising clinical judgement in discharging frail patients back to their own homes in the community with additional support.

the intensity of therapy input, particularly physiotherapy, though the floor and ceiling levels of intensity within which optimal progress is made towards recovery remains undefined.

4.7.4 *As Nursing Home Care*

In the United Kingdom there is an increasing use of nursing homes for the aftercare of hip fracture patients. In the USA this shortened hospital stay but increased the proportion of patients remaining in nursing homes one year after hospitalisation from 9% to 33% (44). Care should therefore be exercised in implementing this aftercare strategy particularly as randomised trials of nursing home care in Britain for other elderly patient groups have shown it to be less effective in achieving discharge than traditional longstay hospital wards (45). The input of primary medical care to British nursing homes is also extremely variable (46).

An essential element in ensuring adequate quality of care is that clear agreements exist setting out the arrangements in place and establishing the lines of communication and areas of responsibility. Ideally, one person should be in charge of the overall co-ordination of care by orthopaedic and geriatric specialists (see also para 5.5).

4.8 Resource Implications

Several studies of specialist in-patient rehabilitation have suggested its potential for cost savings because of reduced lengths of hospital stay. Two formal cost-benefit analyses of orthogeriatric in-patient care have been undertaken. One study failing to show benefit was seriously flawed (47). Another more recent study suggested that specialist rehabilitation would release resources equivalent to approximately 17% of costs for treatment (48). Other studies of early supported discharge have indicated that such schemes produce good results at minimal cost (49, 50) (see also para 5.10).

4.9 Rehabilitation and Discharge Arrangements

Patients with hip fracture are admitted as emergencies and this makes planning and co-ordinating rehabilitation and discharge more difficult. Effective rehabilitation and discharge has to start with sound assessment procedures on admission. Standardised assessment procedures and documentation helps to ensure consistency and to improve communication between professionals.

Standardised assessment tools are available and can assist in the monitoring and auditing of outcomes of care. These should cover:

pressure sore risk

abbreviated mental test score

standardised measure of physical functioning

pain assessment

nutritional risk

4.10 Pain Control and Early Mobilisation

Pain control is often sub-optimal. However, a variety of assessment tools now exist. Care plans should pay particular attention to the monitoring of analgesia.

Mobilisation should be carried out as early as possible, ideally the day after surgery. This requires adequate input from physiotherapists and occupational therapists. Early mobilisation reduces the risk of complications and helps prevent unnecessary dependancy developing. It also prevents the secondary effects of immobility which include pressure sores, osteoporosis, incontinence, urinary tract infection, loss of balance, thrombosis and pneumonia.

A good ward environment is important to encourage patients to move around. Attention should be paid to appropriate beds, chairs and toilets, non-slip floors, handrails, lighting, signposting, and the provision of aids (4).

The provision of clothing, the structure of the day and the ward environment should be such as to promote autonomy and to allow patients to maintain control and independence.

Post operative care should be carried out by a multi-disciplinary team; lines of communication and responsibility should be clear. The ideal is weekly ward meetings to discuss strategic issues and individual care plans including, for example, the setting of goals for rehabilitation. Someone, for example, a named health professional, should have overall responsibility for co-ordinating and managing the process of post operative care and rehabilitation for each patient.

Recovery and rehabilitation programmes should be tailored to the individual patient. Different patients will recover at different speeds and it is essential that the system can accommodate this.

4.11 Discharge

Most patients will be discharged to home. Important elements necessary for effective early discharge include:

skilled multi-disciplinary assessment including home circumstances and support

liaison including, for example, shared-care protocols between hospital rehabilitation and care at home and pre-discharge home visits

appropriate on-going support in the early days at home

provision of therapist care at home

For all patients being discharged it is good practice to ensure: early identification of those who will require increased support following discharge, early specification of a likely target discharge date (4), good co-ordination and organisation of the support needed, involvement of the patient and carers in planning discharge.

Discharge planning is often poorly recorded in patient records and structured discharge planning documentation would almost certainly be a major step forward in most units. Hospital discharge policies should be written down, available and used. Formal discharge planning meetings are the ideal and training for nurses and social workers in the use of discharge plans should be provided.

Improvement in these aspects of care would benefit a wide range of patients including those suffering from conditions other than hip fracture. Some formal arrangement for planning and monitoring discharge is essential. Discharge liaison nurses can assist in providing frameworks for staff to work with and in co-ordinating training.

4.12 Prevention

The principal causal factors in hip fracture in the elderly are osteoporosis and falls. Strategies for prevention have been reviewed (3). In addition, a separate SNAP report has reviewed prevention of osteoporosis and readers are referred to this (8).

Osteoporosis

The most effective way of reducing the risk of hip fracture would be by increasing the uptake by the population of regular exercise (3): this could reduce risk by half. However, increasing exercise uptake generally is a major task and the issues are complex (15).

Stopping smoking is also important and efforts to achieve this should be reinforced by the knowledge of this additional benefit. Reducing smoking before the menopause may reduce hip fracture risk by one quarter in women.

The effect of hormone replacement therapy in reducing hip fracture is less clear (3, 15). There is a strong association with ever using HRT and having less risk but the protective effect of this treatment is lost relatively soon after stopping treatment. Since most women take HRT around the age of 50 and then for only a few years the real effect on hip fracture may be small. More prospective research on this is required.

The use of screening for osteoporosis using bone densitometry to detect those at high risk of osteoporotic fracture is controversial. There is currently no evidence that this is a cost effective method of reducing risk or improving treatment.

Low levels of Vitamin D are associated with increased bone loss. Recent trial evidence suggests that dietary supplementation with calcium and Vitamin D can reduce the rate of hip fracture in some groups of susceptible elderly people. However, the information available appears insufficient at present to act as a basis for a policy of dietary supplementation for use in prevention.

Falls

There is some evidence from randomised controlled trials that exercise including balance training such as ‘Tai Chi’ can reduce the risk of falls in elderly people possibly by between 10% and 25% compared with controls (11).

Home visits and surveillance aimed at reducing environmental and personal risk factors can also reduce falls. The degree of risk reduction in one study involving 2000 people was 21% but other studies have not replicated this and it is unclear which aspects of the interventions used were responsible.

A trial of hip protector pads worn by elderly people in a residential setting showed a reduction of risk of more than half. However, more results from well designed studies will be required before this can be considered as a routine measure. Further work is ongoing to assess acceptability in other settings.

4.13 Data collection and Audit

A great deal has now been published about hip fracture. Many of the studies have used routine hospital data as a source. There are weaknesses in using this kind of data including problems with ascertainment and lack of good data on case-mix. In order to extend our knowledge of the condition and the most effective ways to manage it we need to undertake prospective collection of data designed specifically to deal with these problems.

There are many advantages to this approach. For example, the use of a common data set permits comparisons of performance between units; outcomes can be compared in subgroups stratified by age, sex and type of fracture; and the effects of changes in surgical and medical management over time can be monitored.

4.14 Hip Fracture Audit

The Scottish Hip Fracture Audit was begun in 1993. Based on a Swedish multi-centre study, it was begun in Scotland in the Royal Infirmary, Edinburgh. A number of other orthopaedic units in Scotland have now joined or are planning to. It is based on dedicated audit co-ordinators in participating hospitals collecting data in accordance with protocols. The audit is centrally administered and is funded by the NHSiS, CRAG and local Audit Committees.

The aim of the audit is to document hip fracture care in Scotland by means of a standard core data set including case-mix, surgical procedures and complications, mobility, dependency, residential status, and mortality; to improve services; to compare outcomes stratified by age, sex, type of fracture and so on to monitor the effects of changing management of the condition.

There is a strong argument for providers participating in the Scottish Hip Fracture Audit or, failing this, being able to demonstrate that their data collection is of a high quality and capable of permitting comparison with other hospitals in terms of outcome and of informing the process of improving the standards of care and outcomes over time.

4.15 Measuring outcomes

There is a wide range of parties interested in hip fracture whose outcomes need to be considered (15). These include the primary care team; the hospital team; the patient and carers and health care commissioners/planners. Emphasis in the past has been on mortality rates; this is a particularly poor indicator of outcome in a condition such as hip fracture as a significant number of these fractures occur in extremely frail elderly people. There is a need to consider multiple measures of outcome covering; impairment; disability and handicap as well as post operative complications; readmission and revision rates. This will need to be taken into account in future research into this condition.

5. QUALITY ISSUES

5.1 In a complex process such as the management of hip fracture in the elderly there will be many points at which the quality of outcome can be affected. However when planning or specifying services it is important to identify the critical factors influencing quality as complex and lengthy specifications are unlikely to be implemented or effectively monitored.

The following is an attempt to list the critical determinants of a good service i.e. the requirements for a service specification. Ideally these should be achievable and measurable for audit or monitoring purposes and they should lead to improved outcome or quality of life for the patients or carers.

5.2 Admission

There is a need to prevent delay in admission particularly in Accident and Emergency departments: this could be achieved by agreeing that hip fracture (or even all elderly non-ambulant patients) should have a priority status for assessment and investigation in Accident and Emergency Departments.

5.3 Assessment

This should be: multi-disciplinary; standardised and complete using documentation common to surgical, medical, nursing and therapy staff.

Protocols to identify those who will require extra support or who will be suitable for early fast-track discharge should be drawn up.

Specific written and agreed policies or protocols should be in place for:

pressure sore risk assessment and prevention

pain control

prevention of DVT.

These protocols should be based on SIGN guidelines where these are available, e.g. the SIGN Guideline on prevention of thrombo-embolism.

5.4 Medical and surgical management

It is important to avoid operative delay or cancellations - this means having adequate provision of trauma theatres as advised by the British Orthopaedic Association. The numbers of cases cancelled after preparation for theatre would be a suitable subject for quality monitoring or audit.

Adequately skilled and supervised staff should carry out surgery and anaesthesia. In practice this means that no operating should be carried out by unsupervised SHOs and that any staff carrying out surgery unsupervised should have an agreed defined level of experience and expertise. This should be made explicit in the specification of the service and needs discussion between commissioner/planner and provider: there are important implications for training and for quality of outcomes which should be carefully considered.

5.5 Orthopaedic-geriatric liaison

This requires, at the minimum, having agreed policies on patient management setting out who is responsible at each stage and how specialist advice on care of the elderly can be effectively integrated into their orthopaedic surgical care.

5.6 Case management

A named person in charge of planning care and reviewing progress of each case should be the required standard. This can be any member of the team caring for the patient but their roles and responsibilities in this respect need to be made clear and properly delegated.

5.7 Rehabilitation

Multidisciplinary rehabilitation and discharge planning with regular team meetings (medical/geriatric, social work, Professions Allied to medicine (PAMS), nursing/liaison nurse) are needed to ensure good management of this part of the process of care.

Clear joint goals need to be set for rehabilitation (with patient and carer involvement). A written agreed policy on early mobilisation, ward environment, patient clothing and independence, and information for patient and carers should be developed. Adequate PAMS staffing is necessary to ensure rehabilitation plans are implemented.

5.8 Discharge

Minimum requirements are:

Early specification of target date for discharge

A written discharge policy (available on the ward and used) to ensure adequate home support and smooth hand over to community staff

A named person in charge of co-ordinating hand-over and adequacy of community support

5.9 General

A separate service specification for hip fracture or orthopaedic-geriatric care with a named individual responsible for the service. This is a powerful way of focusing on the key quality issues and their implementation.

Participation in the Scottish Hip Fracture Audit or collection of data to a similar standard.

5.10 Cost implications

The costs of implementing these measures will vary from unit to unit. Some of them have implications for staffing, e.g. provision of adequate physiotherapy or occupational therapy; others for staff time, e.g. team meetings or preparation of protocols and policies. Allocating costs of staff time to specific elements of acute services is notoriously difficult.

The time and cost in drugs and equipment of effective prevention of, for example, venous thrombosis, could be significant but should result in important cost savings to hospitals, primary care and patients and families.

It is not possible to give meaningful estimates of the time and resources required for many of these activities in a given hospital. Much of it is already in place in good units and is part of good practice in any acute hospital setting. Again, the savings in terms of reduced bed requirements, reduced complication rates, re-admission rates and more effective use of staff time are likely to be substantial.

The costs of well conducted audit may be significant. It is estimated that the cost in a typical District General Hospital of participation in the Scottish Hip fracture audit is around £15,000 per annum (12). Such a hospital might expect to deal with 250 to 300 cases annually. Since each case costs around £5000 this would increase costs per case by around 1%. Commissioners/planners, providers and patients could expect to benefit considerably from this investment both in the short and longer term.

5.11 Implementing change

There are a number of ways in which changes in practice can be brought about. These include clinical guidelines, audit and education programmes, and service specifications. Commissioners/planners and providers have an obligation to implement good practice when it is identified and an important opportunity exists to do this through the development of specifications for a service for hip fracture patients.

A specification should ideally set out the aims of the service, the target population, the service to be provided, the agreed standards to be met, agreed outcomes to be achieved, and data collection and audit and arrangements for monitoring the service delivery.

Such a specification should set standards which are achievable and which can be measured and monitored in a way which facilitates the development of a high quality service. This service quality needs to be owned and developed by the provider.

5.12 Further Research

The following areas require further research:

Prevention

Cost effectiveness studies addressing the issues of prevention, particularly exercise uptake, diet, hormone replacement therapy and environmental modification.

Discharge

A randomised controlled trial of early supported discharge for hip fracture patients identifying its:

effect on length of hospital stay

cost effectiveness

applicability to various patient groups

acceptability to and impact on carers

Outcomes

The development and validation of a disease-specific questionnaire on outcomes for hip fracture beyond the

items already identified by CRAG.

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