Scottish Intercollegiate Guidelines Network

56 Prevention and Management of Hip Fracture in Older People

A national clinical guideline

January 2002

KEY TO EVIDENCE STATEMENTS AND GRADES OF RECOMMENDATIONS

LEVELS OF EVIDENCE

1^{++}	High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias
1^{+}	Well-conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias
1^{-}	Meta-analyses, systematic reviews, or RCTs with a high risk of bias
2^{++}	High quality systematic reviews of case control or cohort studies High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal
2^{+}	Well-conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal
2^{-}	Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
3	Non-analytic studies, e.g. case reports, case series
4	Expert opinion

GRADES OF RECOMMENDATION

A	At least one meta-analysis, systematic review, or RCT rated as 1^{++}, and directly applicable to the target population*; or* A body of evidence consisting principally of studies rated as 1^{+}, directly applicable to the target population, and demonstrating overall consistency of results
B	A body of evidence including studies rated as 2^{++}, directly applicable to the target population, and demonstrating overall consistency of results*; or* Extrapolated evidence from studies rated as 1^{++} or 1^{+}
C	A body of evidence including studies rated as 2^{+}, directly applicable to the target population and demonstrating overall consistency of results*; or* Extrapolated evidence from studies rated as 2^{++}
D	Evidence level 3 or 4*; or* Extrapolated evidence from studies rated as 2^{+}

GOOD PRACTICE POINTS

☑	Recommended best practice based on the clinical experience of the guideline development group

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1 Introduction

1.1 THE NEED FOR A GUIDELINE

Hip fracture is a common serious injury that occurs mainly in older people. For many previously fit patients it means loss of prior full mobility; for some frailer patients the permanent loss of the ability to live at home. And for the frailest of all it may bring pain, confusion and disruption to complicate an already distressing last illness. Mortality after hip fracture is high: around 30% at one year. Despite significant improvements in both surgery and rehabilitation in recent decades, hip fracture remains, for patients and their carers, a much-feared injury.

For health service and social work professionals hip fracture is uniquely challenging. First, because it occurs in older people and is commonest in those with previous frailty and dependency, and with pre-existing medical problems. Secondly, because a simple fall, most commonly at home, marks the beginning of a complex journey of care. This takes patients through the accident and emergency (A&E) department, to an orthopaedic ward, to an operating theatre, to a ward again and then – depending on the circumstances of the patient and nature of the services available – back home either directly or via more extended in-patient rehabilitation, or to an alternative placement within the private or voluntary sector, or local authority or NHS care.

Many disciplines, specialties and agencies are therefore involved, and a patient undergoing even fairly straightforward management for hip fracture may meet in the course of one admission as many as 50 different professionals: ambulance staff, general practitioners, hospital doctors, nurses, occupational therapists, physiotherapists, social workers and many others. So hip fracture can be viewed as a tracer condition in systems of care for older patients, testing hospital and community health services and social work provision, and also – very importantly – testing how these different services are coordinated to provide acute care, rehabilitation and continuing support for a large and vulnerable group of patients. Hip fracture, as a common and costly injury with a complex journey of care and outcomes that vary demonstrably across Scotland,[1] is thus an important but challenging topic for a clinical guideline.

1.2 INCIDENCE OF HIP FRACTURE

Hip fracture is becoming commoner. Between 1982 and 1998 (the last year for which complete data is available) the number of hip fractures sustained annually in Scotland by people over 55 years rose from just over 4,000 to 5,700, with 80% occurring in women. It is estimated that the number of people alive in Scotland in 1998 who had experienced a hip fracture was around 27,000. The rise in the number of cases of hip fracture is not simply a reflection of the growing numbers of older people in Scotland. In older people the age-standardised risk is also rising: between 1982 and 1998 in those over the age of 55 it rose from 165 to 205 per 100,000 in men, and from 500 to 593 per 100,000 in women.

1.3 THE COST OF CARE

The care of hip fracture is costly. Although average length of stay – the main determinant of hospital costs – has fallen over recent decades, this has not compensated for increasing incidence and the tendency towards older and more complex cases. Costs of hip fracture vary with case-mix, and downstream costs of community support and institutional care for those who need it must be added to those of hospital care. An average figure of £5,000 for hospital care, and an average of the same again for subsequent costs, is widely accepted, with hospital costs in Scotland probably amounting to around £30 million a year, and total costs around £60 million.

1.4 REVIEWING THE FIRST SIGN HIP FRACTURE GUIDELINE

In 1997 the first Scottish guideline on hip fracture, *Management of Elderly People with Fractured Hip* (SIGN guideline no.15)[2] was published. In keeping with SIGN's commitment to update its evidence-based guidelines in the light of emerging evidence, a guideline review group was convened in 1999 and completed its work in 2001. Over the period 1997 to 2001 a number of important relevant series and meta-analyses have been published and have considerably enriched the available evidence on both prevention and management. The Scottish Hip Fracture Audit (SHFA), which began in 1993 and in 1999 was documenting around 80% of cases nationwide, has accumulated a database of more than 18,000 episodes of care, with details of case-mix, surgical intervention, hospital stay and outcome at four months. This has proved a valuable resource for the guideline review group.

The SIGN guideline process itself has also developed further. In particular, the approach to assessing evidence and grading recommendations has been refined. The guideline review group, unlike its predecessor, also included a patient representative, whose views were clear and helpful, and whose mere presence served to remind all others concerned that the chief goal of a clinical guideline is to improve the quality of care and the quality of the patient's experience throughout the journey of care.

1.5 STATEMENT OF INTENT

This guideline is not intended to be construed or to serve as a standard of patient care. Standards of care are determined on the basis of all clinical data available for an individual case and are subject to change as scientific knowledge and technology advance and patterns of care evolve. The ultimate judgement regarding a particular clinical procedure or treatment plan must be made in light of the clinical data presented by the patient and the diagnostic and treatment options available. However, it is advised that significant departures from the national guideline or any local guidelines derived from it should be fully documented in the patient's case notes at the time the relevant decision is taken.

1.6 REVIEW AND UPDATING

This guideline was issued in January 2002 and will be considered for further review in 2005, or sooner if new evidence becomes available. Any updates to the guideline will be available on the SIGN website: **www.sign.ac.uk**.

1.7 AUDIT AND GUIDELINES

The Scottish Hip Fracture Audit is based on 'Rikshoft', the Swedish multicentre hip fracture study. It began in 1993 in the Royal Infirmary of Edinburgh and Borders General Hospital and expanded, with CRAG and local funding, to a maximum of 18 participating centres, capturing around 80% of all hip fractures in Scotland, in 1999. Although funding uncertainties have affected coverage, 14 centres continue in the Audit, and around 65% of cases nationally are currently documented. It aims to document hip fracture care and outcomes; improve services by providing feedback data; facilitate comparisons between units; monitor effects of changes in surgical and rehabilitation policies; and allow national and international comparison of hip fracture care.

The Audit covers case-mix, surgical and rehabilitation care, and outcomes, with documentation on admission and discharge from acute care, at four months following admission and on readmission to orthopaedic care with a hip-related presentation. Case-mix data includes age and sex of patient, previous mobility, living circumstances and type of fracture. Care is documented in terms of time in A&E Department, time to surgery, type of anaesthetic, nature of surgical treatment, time in acute ward, destination from acute ward (home, rehabilitation ward, return to care home, etc.). Outcome data includes mobility status and living circumstances at four months, and mortality. Follow up at four months averages 98%.

A total of more than 18,000 cases has now been documented. A unitary national database of 12,000 cases has undergone preliminary analysis, and has provided detailed information to support the preparation of this guideline. National reports have benchmarked hip fracture care across Scotland. Regular local reports to participating units have prompted and monitored changes in clinical practice, and allowed evaluation of service developments. Improvements in hip fracture care in various participating centres documented by SHFA include fast-tracking through A&E departments, reduced fasting times, improved pressure area care and enhanced rehabilitation and discharge arrangements.[1]

Scotland is unique in having established both a national guideline for hip fracture care and a national hip fracture audit, and the potential for synergy between the two has been recognised since the publication of SIGN guideline no.15 in 1997. An evidence-based guideline identifies good practice – what **ought** to happen – in hip fracture care. A robust national audit documents the realities of care – what **is** happening. Guidelines and audit working together allow comparisons, in detail and across the journey of care, of the care recommended with the care delivered and can hence exert continuing upward pressures on the quality of care.

In 2000 the Clinical Standards Board for Scotland (CSBS), recognising the importance of hip fracture as the most common serious injury in older patients, the complexity of the care involved, and the combined value of the SIGN guideline in setting standards and the Scottish Hip Fracture Audit in providing data, adopted hip fracture as a tracer condition in its work on standards for older people in acute care. These standards, recently developed and still being finalised, will form the basis of a nationwide series of hospital visits to be carried out in 2002, with a view to the publication of a CSBS national report on Older People in Acute Care early in 2003.

Hip fracture care is therefore emerging as a case study in clinical governance in Scotland, with this SIGN guideline providing nationally accepted evidence-based standards; the Scottish Hip Fracture Audit documenting care; and a programme of quality assurance visits under the auspices of CSBS providing national accountability. All three initiatives seek to improve the quality of hip fracture care, but are much more likely to do so by working together. It may be some years before conclusive evidence of the effectiveness or otherwise of this combined approach emerges.

2 Prevention of hip fracture

2.1 RISK FACTORS FOR HIP FRACTURE

Risk factors for hip fracture can be neatly, but perhaps simplistically, separated into those which relate to the increased prevalence of falls in the elderly and those which relate more specifically to changes in bone mass. However, there are some factors, such as smoking and immobility, which may have direct effects on bone mass while also increasing the risk of falls.

An American study of osteoporotic fractures defined 16 risk factors which, when present in middle-aged women, led to an increased incidence of fracture during a follow-up period of three years.[3] Of these 16 factors, the four most prevalent and which define the largest number of at risk women are shown in Table 1.

A more recent population-based cohort study from the Netherlands with a follow-up period of 2.8 years[4] identified a history of immobility as another significant factor. Low body weight was also a specific risk factor, but this study did not find that current smokers had an increased risk. However, the balance of evidence from other cohort studies does suggest that current smoking at least doubles the risk and it may be up to 10 years after cessation of smoking before the excess risks disappear.[5] 2+

Table 1: Risk factors for fracture

KEY RISK FACTORS
Previous low trauma fracture after the age of 50 years
Maternal history of hip fracture
Current smoking
Low body weight (BMI <18.5)

2.2 RISK FACTORS FOR FALLS

The tendency to fall increases with age. Risk factors for falling tend to increase in prevalence with age, leading to more frequent falls. Evidence from cohort studies strongly suggests that the direction of the fall (to the side rather than forward) is critical in determining hip fracture and is also an age-related effect. Poor visual acuity, use of hypnotics, neurological disease and slow gait speed have also been shown to be significant risk factors.[6-8] 2+

Risk factors for falls are of most significance if they are (1) easily identifiable and if they are (2) potentially reversible. Potentially reversible risk factors (*see Table 2)* are an obvious target for intervention, provided that the preventative approach is cost-effective. Identifiable risk factors which cannot be reversed might be used to target protective devices.

Table 2: Risk factors for falls

IDENTIFIABLE RISK FACTORS *(potentially reversible)*
Muscle weakness
Abnormality of gait or balance
Poor eyesight
Drug therapy – hypnotics/sedatives/diuretics/antihypertensives
Neurological disease e.g. Parkinson's disease, stroke
Foot problems/arthritis
Layout of home environment (e.g. loose or slippery floor covering)

2.2.1 BONE-RELATED FACTORS

Assessment of bone mass is the most studied and probably the most powerful bone-related predictor of future hip fracture. Several prospective cohort studies have shown that a reduction in bone density, measured at the hip or heel, of one standard deviation, is associated with at least a doubling in risk of hip fracture.[9] This has been confirmed in two recent meta-analyses.[10,11] 1+

However, bone mineral density (BMD) is not the only measurable characteristic of bone that predicts hip fracture. Examination of the Study of Osteoporotic Fractures (SOF) prospective database has demonstrated an excess risk, independent of BMD and age, of an increase in the length of the femoral neck.[12] However, femoral length is set at an early age. The EPIDOS (Epidémiologie de l'Ostéoporose Study) prospective cohort study from France has demonstrated that a one standard deviation reduction in quantitative bone ultrasound parameters, measured at the heel, is also associated with a doubling of fracture risk,[13] an effect which was partly independent of BMD. Similar findings have been demonstrated from the SOF database.[14] Finally, an elevated rate of bone turnover, as assessed by measurement of bone resorption and formation markers, has also been shown to predict future hip fracture independently of BMD in the EPIDOS[15,16] and SOF studies.[17] At present it is not possible to quantify fracture risk using a validated scale based on the presence of these markers, but the evidence for this may continue to develop. 2++

Bone-related clinical risk factors may also be independent predictors of hip fracture and may be identifiable without recourse to clinical measurement.[3,4] These include: 2+

- maternal history of hip fracture
- a previous low trauma fracture after the age of 50
- low body weight (i.e. BMI <18.5) is one of the strongest risk factors.[18]

A **Assess the risk of hip fracture in older people using the identified risk indicators and base any intervention on this risk assessment (patient and environment).**

2.3 NON-DRUG INTERVENTIONS TO PREVENT FALLS AND FRACTURE

2.3.1 EXERCISE AND ASSOCIATED INTERVENTIONS

A number of randomised controlled trials (RCTs) have studied the use of exercise programmes in the prevention of hip fracture and two high quality meta-analyses of these studies have been carried out.[8,19] In most of the trials, exercise was combined with other interventions such as home assessment, dietary change, use of hip protectors, education, cognitive intervention or medication change. It is not clear which of these interventions, or which subset, is effective; however, exercise programmes alone have not been shown to be effective.[19]

There is insufficient evidence to support the use of individual interventions such as exercise or balance training in fall or fracture prevention. However, interventions which target multiple, identified risk factors in individuals can be effective in reducing falls, as can behavioural interventions targeting environmental hazards plus other risk factors. Home-based programmes to improve strength and balance can reduce significantly the number of falls and injuries experienced by women in community settings aged 80 years and older.[20] 1+

A **Older people should have their risk of falls and fracture assessed.**

Those at increased risk should be offered multiple interventions* aimed at reducing the identified individual and environmental risks.

** E.g. exercise programmes (focusing on strength, flexibility and which are weight-bearing), balance training, and modification of identified hazards.*

2.3.2 HIP PROTECTORS

A recent systematic review[21] of seven RCTs has found that hip protectors worn by older people in institutional settings who are at high risk of hip fracture appear to reduce the risk of fracture by 50-66%. A recent study in care homes in Japan confirms this strong protective effect.[22] 1+

Compliance with wearing hip protectors in older people living in care homes is likely to be only 25-30%, mainly due to problems with fit and skin irritation.[23]

B **Hip protectors are recommended in men and women at high risk of hip fracture, particularly older people in care homes, although problems with compliance should be recognised.**

2.4 DRUG THERAPIES

The risk of hip fracture may be reduced by a number of dietary and pharmacological agents that decrease bone turnover and reduce fracture incidence. Calcium (alone or with vitamin D), hormone replacement therapy (HRT), bisphosphonates, calcitonin, fluoride and thiazides all have effects on bone mass, and some of these drugs have been promoted for use in the primary and secondary prevention of osteoporosis. Evidence is still emerging regarding the role of selective oestrogen receptor modulators (SERMs), and they have not been addressed in this guideline.

The focus in this guideline is on those treatments where data exists on hip fracture as an endpoint and, when this is absent, where there is good data on bone density at the hip. Cost-effectiveness has been taken into account in deriving recommendations on treatment, which are summarised in section 2.5.

Additional information about the cost-effectiveness of interventions to prevent falls and hip fractures is available on the SIGN website: **www.sign.ac.uk**.

2.4.1 CALCIUM

No RCTs were found that looked at the effect of calcium supplementation alone on hip fracture as an endpoint. One RCT[24] showed no benefit of calcium supplementation on bone loss during the first five years postmenopause, but supplementation produced a significant increase in BMD at the hip in the late menopause. Calcium supplementation appeared most effective in those with lowest calcium intakes. A second RCT,[25] using high dose calcium supplements in late menopausal women, produced significant retention of BMD at all hip sites. This was confirmed by a four year RCT which also demonstrated an associated reduction in the total fracture rate.[26] 1+

A Department of Health report on nutrition and bone health[27] concluded that there was insufficient evidence to recommend an increase in calcium intake in the elderly from the recommended daily allowance (RDA) of 700 mg/day, although expert opinion admitted this might be inadequate. The report concluded there was evidence that calcium intake below 400 mg/day might not be compatible with good bone health. 4

2.4.2 CALCIUM PLUS VITAMIN D

Vitamin D acts to enhance calcium absorption and also corrects the secondary hyperparathyroidism found in deficiency states, which are common in the elderly due to lack of sun exposure and reduced dietary intake of vitamin D.

Calcium plus vitamin D has been shown to reduce significantly the incidence of all fractures, including hip, in both elderly women with a high risk of hip fracture living in institutions[28] and in independently living men and women over 65 years of age.[29] This has been confirmed in a systematic review,[30] although it was unclear whether vitamin D alone offered protection. Vitamin D also appeared to reduce death rates in treatment groups, suggesting age-related actions other than on bone. 1+

Calcium plus vitamin D is cheap and safe at prescribed dosages and could be a cost-effective intervention in groups such as institutionalised elderly people and those with poor diets. This is an evolving area and further trials will inform practice in the future.

2.4.3 HORMONE REPLACEMENT THERAPY

A prospective controlled study[31] concluded that postmenopausal women with the lowest total oestrogen levels (and highest sex hormone binding globulin levels) were most at risk of a hip fracture.

The median age for hip fracture in the UK is 79 years, more than 25 years post menopause, yet fewer than 20% of women continue HRT for more than 10 years, even in the most committed groups. Long term compliance is poor because women take HRT for climacteric symptoms and not bone loss. Continuous combined preparations now overcome cyclical bleeding but there is a recognised risk of breast and endometrial carcinoma (the latter only with unopposed oestrogen use) with treatment longer than 10 years.[32] 2++

There are no RCTs on the effect of HRT on hip fracture. A systematic review[33] of all types of fracture, concluded that there was fair evidence that HRT reduced the incidence of fracture while treatment was continued, and good evidence that bone mass was preserved during treatment.

There is consistent observational evidence from a meta analysis of case controlled and cohort studies[34] that oestrogen reduces the risk of hip fracture in post menopausal women by approximately 25% and that risk decreased with duration of treatment. A prospective cohort study[35] of HRT in women older than 65 years showed the greatest reduction in hip fracture rates in those over 75 years of age. A large population-based case-control study by the Swedish Hip Fracture Group[36] showed that the hip fracture rate reduced by 6% per year with use of HRT, with combined oestrogen/progestogen products being more effective. Progestins also allowed a lower dose of oestrogen to be equally effective. HRT started even nine years or more postmenopause gave some reduction of hip fracture risk, and most of this acquired protection was lost within five years of stopping therapy.

2.4.4 BISPHOSPHONATES

Bisphosphonates such as alendronate, risedronate and etidronate act by inhibiting the dynamic resorption of bone by osteoclasts, reducing the rate of bone turnover and preserving bone mass. There are RCTs on the use of the alendronate in both primary and secondary prevention.[37,38] These trials, on women with and without pre-existing vertebral fractures, showed a statistically significant reduction in hip fractures over three years of treatment but contained only small numbers of fractures in a highly selected group of women. Both trials showed statistically significant increases in bone density at hip sites with duration of treatment. 1-

In a large phase III RCT of risedronate, designed specifically to prevent hip fracture, the bisphosponate reduced hip fracture rates by 40% in women aged 70-79 years, with low bone density at the femoral neck. However, it was no more effective than calcium and vitamin D alone in women aged 80 years or more.[39] This is consistent with the non-vertebral fracture rate of alendronate which is also only seen in those with low femoral neck bone density.[38]

A retrospective population-based cohort study[40] of the General Practice Research Database on the effect of cyclical etidronate showed a significant reduction in hip fracture rate, greatest in those over the age of 76 years. Control and treatment groups were not well matched, but bias would have favoured a reduced effect of treatment.

2.5 COST-EFFECTIVE TARGETING OF INTERVENTIONS

Modification of environmental risk factors, use of HRT and treatment with calcium and vitamin D targeted at those with relevant risk factors all may result in reductions in hip fracture rates. The costs associated with these interventions are lower in the longer term compared to the cost of no treatment to reduce risk and the cost of managing a later hip fracture. However, some sustained treatments (e.g. HRT) may be less clinically desirable and should be assessed for each patient and related to lifestyle issues. 2+

The quality of the cost-effectiveness evidence for some interventions is relatively poor (e.g. modification of environmental risk factors, HRT and vitamin D).[41-48]

The most cost-effective intervention is calcium and vitamin D. The more costly bisphosphonates start to become cost-effective when their use is targeted to high risk individuals *(see sections 2.1 and 2.2)*.[49-51] 1+

Targeting therapy to high risk individuals – by using either BMD measurement or an assessment of clinical risk factors for bone related risk factors during routine visits – greatly improves the cost-effectiveness of hip fracture prevention. Targeting those with low bone mineral density gives a cost per hip fracture prevented of approximately £11,000 for bisphosphonates (excluding cost savings from avoiding treatment). The cost per hip fracture prevented and the total cost to the health service are even more favourable for calcium and vitamin D, and hip protectors. 2+

BMD measurement appears to be a less cost-effective method of targeting therapy with calcium and vitamin D than assessing clinical risk factors. However, it may be the only realistic way to target the use of bisphosphonates to reduce hip fractures.[38]

A number of factors are recognised as indicators of increased risk of hip fracture in older people (*see sections 2.1 and 2.2)*. At present it is not possible to quantify risk using a validated scale based on the presence of these markers, but it would seem reasonable to assume that higher risk is associated with the presence of more markers.

B **Assessment of recognised risk factors for low bone density is the most cost-effective method of targeting interventions that act on low bone density. Mass screening for low BMD is less cost-effective and is not recommended.**

B **All patients who are assessed as being at risk of hip fracture should be treated with calcium and vitamin D.**

A **All patients who are assessed as being at high risk of hip fracture should be treated with:**

- **hip protectors,** when patients are living in a care home setting and are assessed as being compliant

or

- **the bisphosphonates, alendronate or risedronate,** when risk is assessed by measuring BMD.

☑ Where access to BMD measurement is impractical, bisphosphonates may be considered in patients with strong evidence of pre-existing osteoporosis *(see Table 1)*.

There is no evidence at present that these drugs are effective in preventing hip fracture in patients over the age of 80 years.

3 Pre-hospital management

3.1 COMMUNICATION ON ADMISSION

Patients with a fractured hip require early admission to hospital. As much clinically relevant information as possible about the patient should be recorded on admission. For optimal management the essential information fields in the SIGN referral document[52] should be recorded. 4

D **When a patient is admitted all of the essential information fields in the SIGN referral document should be recorded, in particular:**
- **history and examination findings**
- **concurrent medical condition and relevant past medical history**
- **current drug therapy**
- **premorbid functional state, particularly mobility**
- **premorbid cognitive function**
- **social circumstances.**

☑ Any history of previous falls should also be recorded.

3.2 TRANSPORT TO HOSPITAL

The literature search carried out for this guideline found no evidence to inform practice with regard to ambulance transport. However, good clinical practice suggests the following are important considerations in patients with fractured hip:

☑ Transfer to hospital from the site of the injury should be undertaken as quickly as possible.

☑ The training of all ambulance personnel should include the recognition of the possibility of a fractured hip in an elderly person, often signified by:
- history of fall
- presence of hip pain
- shortening and external rotation of the lower limb.

☑ If necessary, pain relief should be given as quickly as possible using intravenous opiate analgesia, carefully titrated and supervised for effect, starting with a low dose.

If this is not possible (e.g. due to lack of appropriate supervision) then analgesia using entonox should be considered.

☑ If a patient faces a long journey or an irreducible delay before transfer, consideration should be given to the use of an indwelling urinary catheter.

☑ Attention should be paid to pressure area care *(see section 4.2)*.

4 Management in Accident & Emergency

The guideline review group found no evidence directly relating to the emergency management of patients with hip fracture. The recommendations contained in this section are therefore mainly based on the 1989 report from the Royal College of Physicians of London.[53]

4.1 ASSESSMENT IN A&E

Assessment in A&E should include all relevant medical, nursing and social factors as well as the orthopaedic injury.[53,54] | 4

D **Early assessment, in A&E or on the ward, should include a formal recording of:**
- **pressure sore risk**
- **hydration and nutrition**
- **fluid balance**
- **pain**
- **core body temperature using a low reading thermometer**
- **continence**
- **co-existing medical problems**
- **mental state**
- **previous mobility**
- **previous functional ability**
- **social circumstances.**

☑ Patients suspected of having a fractured hip should be assessed by medical staff as soon as possible, preferably within one hour.

4.2 IMMEDIATE MANAGEMENT

Steps should be taken to prevent the development of pressure sores. Patients at high risk of developing pressure sores can be identified using assessment tools,[55] although the evidence for the accuracy of pressure sore risk scales is confusing, and the scales themselves may not be an improvement on clinical judgement.[56] Use of foam based low-pressure mattress, rather than a standard hospital mattress, has been shown to reduce the occurrence of pressure sores.[57,58] | 2^{++}

B **Patients judged to be at very high risk of pressure sores should ideally be nursed on a large-cell, alternating-pressure air mattress or similar pressure-decreasing surface.**

The Royal College of Physicians of London report[53] on fractured neck of femur has produced a number of recommendations which should be applied to all patients in A&E: | 4

D **Patients admitted to A&E with a suspected hip fracture should be managed as follows:**
- **use soft surfaces to protect the heel and sacrum from pressure damage**
- **keep the patient warm**
- **administer adequate pain relief to allow for regular, comfortable change of patient position**
- **instigate early radiology**
- **measure and correct any fluid and electrolyte abnormalities.**

4.3 FAST TRACKING

Whilst transfer to the ward within one hour has been recommended in some guidelines,[53] the guideline review group found no evidence to suggest that fast tracking improves patient outcome. However, evidence on pressure care suggests that fast tracking is a good standard of clinical care.[59] The Clinical Standards Board for Scotland draft standards for older people in acute care require people with confirmed or suspected hip fracture to begin transfer within two hours of arrival in A&E. 3

D **Patients should be transferred to the ward within two hours of their arrival in A&E.**

4.4 DIAGNOSIS

The vast majority of hip fractures are easily identified on plain radiographs, but a normal x-ray does not necessarily exclude a fractured hip. Where there is doubt regarding the diagnosis, for example, a radiologically normal hip in a symptomatic patient, and where the radiographs have been reviewed by a radiologist, alternative imaging should be performed. Repeating the plain radiographs (perhaps with additional views) 24-48 hours after admission, a radioisotope bone scan any time from 12 hours after injury onwards, or magnetic resonance (MR) imaging are useful additional investigations. Where available, a limited MR sequence allows definitive diagnosis and immediate formulation of a management plan. Such a policy has been shown to require few additional images.[60-63] 3

D **MR imaging is the investigation of choice where there is doubt regarding the diagnosis. If MR is not available or not feasible, a radioisotope bone scan or repeat plain radiographs (after a delay of 24-48 hours) should be performed.**

4.5 PAIN RELIEF

Pain relief should be tailored to the individual patient. Adequate and appropriate analgesia is probably best achieved by titration of intravenous opiates. In selected cases local nerve block may be appropriate.[64] Analgesia must be administered early, in anticipation of painful procedures, such as the movement of the patient for radiological investigation. If delay occurs, repeat administration of analgesia may be required. 3

D **Adequate and appropriate pain relief should be administered before the patient is transferred from a trolley to the x-ray table.**

☑ If necessary, pain relief should be given as quickly as possible using intravenous opiate analgesia, titrated for effect. If this is not possible (e.g. due to lack of appropriate supervision) then analgesia using entonox should be considered.

5 Preoperative care

5.1 TIMING OF SURGERY

5.1.1 PREOPERATIVE ASSESSMENT

Patients should be fully evaluated before surgery. Any short, unavoidable, delay can be used to gain improvement in clinical condition, particularly restoration of circulatory volume, and to improve chronic medical conditions.[65] Short delays prior to surgery may be justified for the correction of such conditions as hypo- and hyperkalaemia, poorly controlled cardiac failure or diabetes, significant anaemia, and for the investigation of cardiac murmurs. However, it is important not to chase unrealistic medical goals with resulting delay. For example, it is not considered appropriate to delay surgery because of infective pulmonary conditions, as real improvement is unlikely in the presence of continued immobility and pain. 4

Bone quality should be assessed, especially the possible existence of osteoporosis, osteomalacia or secondary malignant deposits.

5.1.2 EFFECT OF DELAY ON PATIENT OUTCOMES

As well as causing distress to the patient, delay in operative fixation is associated with increased morbidity and mortality, and with reduced chance of successful internal fixation and rehabilitation.[66,67] A delay of more than 24 hours between admission and operative fixation of fracture has been shown to be associated with increased mortality.[66] Better functional results at three months have been shown when the mean delay to surgery was 29 hours compared to 57 hours.[67] Early surgery (within 24 hours) reduces the risk of deep vein thrombosis (DVT)[68] and of fatal pulmonary embolism (PE) after hip fracture.[69] Delay in surgery may also lead to an increased incidence of pressure damage.[70] Surgery should be performed as soon as the medical condition of the patient allows, provided that appropriate staffing and facilities are available.[70-72] However, it has also been demonstrated that surgical treatment conducted as a night-time emergency increases mortality.[65,73] 2+

C **Patients should be operated on as soon as possible (within 24 hours), during standard daytime working hours, including weekends, if their medical condition allows.**

Delay to surgery is common,[74] and when it is due to inadequate facilities or poor organisation rather than any medical reason, the underlying problems should be addressed, and solutions identified by the clinicians and hospital management.

5.2 PREOPERATIVE TRACTION

A Cochrane review has examined the use of traction (both skin and skeletal) applied to the injured leg from the time of admission until surgery.[75] This time-honoured practice is intended to relieve pain and make subsequent surgery easier. Data from the six trials included in the latest update to the review was limited, for instance in the recording of long term complications such as the rates of avascular necrosis of the femoral head or fracture healing. However there was no evidence of any benefit in pain relief or fracture reduction from the routine use of preoperative traction in hip fracture patients. The small numbers and limitations of the studies cannot exclude possible advantages of traction for specific fracture types. 1+

Similarly, further larger studies would be needed to assess more clearly the risks of complications from traction, such as pressure sores.

A **The routine use of traction** (either skin or skeletal) **does not appear to have any benefit and is not recommended prior to surgery for a hip fracture.**

☑ Foam gutter splints can be used to alleviate heel pressure.

5.3 PROPHYLAXIS AGAINST INFECTION

Patients with hip fractures are also at risk of infections of the chest, urinary tract, and wound.[76] Although bacteriuria is common on admission in patients with a hip fracture, it is very rare for the same organism to be associated with a postoperative wound infection.[77]

A systematic review of randomised trials[78] indicates that the administration of antibiotic prophylaxis in patients undergoing surgery for a hip fracture is associated with a reduced incidence of superficial and deep wound infection, urinary tract infection and respiratory infection. 1+

The antibiotic should be given as a single dose intravenously at anaesthetic induction.[78] However, if surgery takes longer than two hours or there is blood loss greater than two litres (which are both unlikely during hip surgery but possible in complex cases), a second dose may be administered during the operation.[79]

A **All patients undergoing hip fracture surgery should receive antibiotic prophylaxis.**

☑ Bacteriuria should not be a reason to postpone surgery for hip fracture.

5.3.1 METHICILLIN RESISTANT *STAPHYLOCOCCUS AUREUS*

Methicillin Resistant *Staphylococcus Aureus* (MRSA) infection poses substantial problems for hip fracture patients. Patients may be admitted with MRSA colonisation or infection. Local hospital guidelines should be written for the detection, management, decolonisation and treatment of MRSA.[80]

☑ Infected or colonised patients should be isolated by following hospital infection control guidelines in consultation with the infection control team.

☑ Active infection should be treated in consultation with Infection Specialists.

☑ Decolonisation should not be attempted before all wounds are healed and any urinary catheter removed.

5.4 ANTITHROMBOTIC PROPHYLAXIS

Antithrombotic prophylaxis is discussed in the SIGN guideline on prophylaxis of venous thromboembolism.[81] The following is extracted from this document.

Hip fracture surgery carries high risks of asymptomatic deep vein thrombosis (DVT) (45%), symptomatic DVT (1-11%), symptomatic pulmonary embolism (PE) (3-13%) and fatal PE (1-7%) in the absence of venous thromboembolism (VTE) prophylaxis.[82] The pilot SIGN guideline on thromboprophylaxis,[83] considering published evidence up to early 1994, identified traumatic (e.g. hip fracture) orthopaedic surgery as "high risk" in the absence of prophylaxis. However, the recent literature has challenged the view that fatal PE is common. A recent review has highlighted the declining incidence of fatal PE in major orthopaedic surgery, due to increasing use of spinal or epidural anaesthesia *(see section 6.2)*, early mobilisation, and use of mechanical prophylaxis.[84]

5.4.1 MECHANICAL PROPHYLAXIS

A meta-analysis of four randomised controlled trials involving 422 patients of mechanical methods (two trials of intermittent pneumatic compression (IPC) and two of foot pumps; no trials of graduated elastic compression stockings (GECS) were identified) observed that the incidence of asymptomatic DVT was reduced from 19% to 6% (NNT = 7.2).[85] There was insufficient data to establish the effects of these devices on symptomatic VTE or mortality. In the PEP trial,[86] use of GECS (by 30% of patients, non-randomised) was not associated with reduction in symptomatic VTE. 1+

A **Mechanical prophylaxis (IPC or foot pumps) should be considered to reduce the risk of asymptomatic DVT after hip fracture. There is no evidence for efficacy of GECS in hip fracture patients.**

5.4.2 ANTIPLATELET DRUGS (ASPIRIN)

A meta-analysis of randomised controlled trials (mainly the PEP study of aspirin[86]) in patients undergoing surgery for hip fracture observed that aspirin reduced the risk of asymptomatic DVT (42% to 36%), symptomatic DVT (1.5% to 1.0%), all PE (1.6% to 0.8%) and fatal PE (0.8% to 0.4%), with no effect on total mortality. The excess risk of bleeding was small (one additional transfused bleed per 1,000 patients who were not receiving concomitant heparin prophylaxis).[86] 1++

A **All patients with hip fracture should receive aspirin (150 mg orally, started on admission and continued for 35 days) unless contraindicated.**

5.4.3 HEPARINS

A meta-analysis of unfractionated heparin (UFH) and low molecular weight heparin (LMWH) in hip fracture surgery showed that heparins reduced the risk of asymptomatic DVT from 39 to 24% (NNT = 6.5). Unlike elective hip arthroplasty, no studies of recurrent asymptomatic DVT (venography at 4-5 weeks) or prolonged prophylaxis were identified. There was insufficient data to establish the effects of heparins on symptomatic VTE, mortality, or bleeding.[85] 1++

In a multivariate analysis of predictors of death in a multicentre regional audit, mortality was lower among patients receiving pharmacological prophylaxis for VTE.[76] However, use of heparin prophylaxis (18% UFH, 26% LMWH, non-randomised) was not associated with reduction in symptomatic VTE in the PEP trial.[86] The additional benefit of UFH or LMWH compared to routine early mobilisation, mechanical prophylaxis and aspirin is therefore unclear.[82] 1++ 3

A **Heparin should be reserved for selected patients at high risk of VTE after hip fracture due to:**
- **multiple risk factors***
- **contraindications to routine mechanical prophylaxis and/or aspirin.**

5.4.4 ORAL ANTICOAGULANTS AND DEXTRANS

These methods also reduce the risk of VTE after surgery,[87] but are not widely used in the UK[88] due to logistic problems, and risks of bleeding (oral anticoagulants) and anaphylaxis (dextrans).

5.5 FLUID AND ELECTROLYTE BALANCE

Fluid and electrolyte balance problems are common in the course of hip fracture management in the elderly. Awareness of these risks is part of preoperative assessment. At particular risk are older, frailer patients, especially those in whom identification of hip fracture and hence admission has been delayed.[89] 4

D **Patients should have clinical and laboratory assessment of possible hypovolaemia and electrolyte balance, and deficiencies appropriately and promptly corrected.**

5.6 SUPPLEMENTARY OXYGEN

It has been reported that persistent hypoxia may be present in all hip fracture patients from the time of admission until up to five days postoperatively.[90,91] 1+ 3

C **Oxygen saturation should be checked on admission. Supplementary oxygen should be administered to all patients with hypoxaemia.**

* ***More than one of the following:*** *age > 80 years, obesity (BMI > 30 kg/m^2), varicose veins, previous VTE, thombophilias, heart failure, recent MI or stroke, severe infection, inflammatory bowel disease, nephrotic syndrome, polycythaemia, paraproteinaemia, Bechet's disease, paroxysmal nocturnal haemoglobinuria, hormone replacement therapy, tamoxifen, paralysis, malignancy.*

6 Anaesthetic management

6.1 ANAESTHETIC EXPERIENCE

Patient outcomes are better when perioperative management is undertaken by experienced anaesthetic personnel.[65,92] An Audit Commission report has shown wide variations in practice in the anaesthetic management of hip fracture patients.[54] In some hospitals, all patients with fractured hip are anaesthetised by an experienced anaesthetist (registrar or above), whereas in others almost half are anaesthetised by an unsupervised senior house officer. The SHFA has shown similar, but less pronounced, variations.[1] 3

D **Anaesthesia should be carried out, or closely supervised, by an anaesthetist with sufficient experience of anaesthesia in elderly patients.**

6.2 GENERAL VS. REGIONAL (SPINAL/EPIDURAL) ANAESTHESIA

The impact of anaesthetic technique on various aspects of outcome of surgery for fractured hip has been assessed in a meta-analysis,[93] in systematic reviews[58,94] and other studies.[66,95,96,97]

6.2.1 MORTALITY

A meta-analysis of 13 studies, mainly RCTs, showed a reduction in mortality at one month in patients treated with regional (spinal or epidural) anaesthesia, compared with those receiving general anaesthesia (summary odds ratio for mortality 0.67, 95% CI 0.46-0.98).[93] However, evaluation of this meta-analysis found that some of the studies had used the same patient population, and that one of the studies was not an RCT.[58] When this data is excluded, there is still a reduction in mortality at one month in the regional anaesthesia group (7.5% vs. 9.2%), with a relative risk for mortality of 0.68 (95% CI 0.46-0.96) in favour of regional anaesthesia, which was recommended as the anaesthetic technique of choice. A Cochrane review[94] found that patients receiving regional anaesthesia had a reduced mortality at one month compared with patients receiving general anaesthesia (6.8% vs. 9.4%) with a relative risk of 0.72 (95% CI 0.51-1.00). Neither of these studies detected any statistically significant difference in mortality after one month. 1+

The difference in 30 day mortality is of borderline statistical significance and many of the studies included in these reviews are more than 10 years old. Techniques of general anaesthesia have changed in this time and many anaesthetists now supplement general anaesthesia with nerve blocks.[98] Further study comparing modern general and regional anaesthesia with or without supplementary nerve blocks is required.

However, further weight has been given to the benefits of regional anaesthesia by a systematic review of 141 RCTs involving over 9,500 patients undergoing all types of major surgery, including hip fracture surgery, which found a 30% reduction in 30 day mortality in the patients receiving regional anaesthesia.[99] 1++

6.2.2 MORBIDITY

Aspects of outcome other than mortality have been studied less extensively:

Deep vein thrombosis (DVT)

Several studies have shown a reduction in asymptomatic DVT following spinal anaesthesia, as diagnosed by venography or labelled fibrinogen,[93,100] and this has been reflected by a lower incidence of thromboembolic complications in some studies. Pooled data[94] show a reduction in asymptomatic DVT from 47% to 30% in patients in the regional anaesthesia groups (relative risk 0.64, 95% CI 0.46-0.86). 1++

Pulmonary thromboembolism (PTE)

There is a non-significant reduction (0.64% vs. 2.0%, relative risk 0.48, 95% CI 0.18-1.28) in the incidence of fatal PTE in patients undergoing regional anaesthesia.[94] 1++

Hypoxaemia

Hypoxaemia is worse in the first six hours after surgery under general anaesthesia compared with spinal anaesthesia. Thereafter there is no difference between patients treated with either type of anaesthesia.[93] 2+

Hypotension

The Cochrane review found a non-significant increase in the incidence of hypotension following regional compared with general anaesthesia (34% vs. 26%).[94] In a study of patients with known ischaemic heart disease, hypotension was more common in patients who had received single shot spinal or general anaesthesia, compared to those who had received an incremental spinal technique using an intrathecal catheter.[101] Hypotension was associated with evidence of myocardial ischaemia in such patients. 1+

Acute confusional state

A correlation has been demonstrated between acute confusional state and intraoperative hypotension, perioperative hypoxaemia, the use of anticholinergic agents and a history of depression.[102] The development of an acute confusional state does not appear to be associated with any particular anaesthetic technique. Conversely (although it did not examine patients with a fractured hip), one study[103] found that in elderly patients undergoing general anaesthesia, increasing age, duration of anaesthesia, postoperative infection, a second operation, and respiratory complications, were risk factors for early postoperative cognitive dysfunction, but that hypoxaemia and hypotension were not. 2+

Other indicators of morbidity

There appears to be no statistically significant difference in the incidence of postoperative respiratory morbidity, perioperative blood loss, myocardial infarction, congestive cardiac failure, renal failure and cerebrovascular accident following different types of anaesthesia.[94] 1++

Ambulation

There is evidence to suggest that the time to ambulation may be quicker (three days vs. five days, $p < 0.05$) in patients anaesthetised using regional anaesthesia.[104] 1+

In summary, in patients who have undergone regional anaesthesia there is a reduction in mortality at one month, and there appear to be other benefits from regional rather than general anaesthesia, including a significant reduction in the incidence of deep venous thrombosis.

B **Regional anaesthesia is recommended for patients undergoing hip fracture repair, providing there are no specific indications for general anaesthesia or contraindications to regional anaesthesia.**

6.2.3 HEPARINS

The use of regional anaesthesia in patients who have received unfractionated low dose heparin (LDH) and low molecular weight heparin (LMWH) is controversial because of the risk of development of a vertebral canal haematoma.[81] Anti-Xa activity after LMWH peaks 3-4 hours after injection and falls to 50% only after 12 hours.[105] 4

☑ Administration of spinal or epidural anaesthesia should be delayed until 10-12 hours after the administration of low molecular weight heparin.

6.2.4 ASPIRIN

There is little or no evidence that aspirin increases the risk of vertebral canal haematoma in patients receiving spinal or epidural anaesthesia,[106] although interactions with other agents such as heparins or warfarins may occur.[107] 4

6.3 PERIPHERAL NERVE BLOCKS

Discussion of the multiplicity of nerve blocks available to supplement anaesthesia and provide analgesia into the postoperative period is outside the scope of this guideline.

One systematic review found that nerve blocks reduce the quantity of opioid analgesics required in the postoperative period.[64] Unfortunately, the studies included in the review each examined different outcome measures other than opioid usage and no significant benefits were demonstrable from reduced opioid use. 1++

6.4 FLUID BALANCE

Invasive intravascular monitoring is not usually carried out in patients undergoing hip fracture surgery, despite the fact that patients are frequently dehydrated prior to surgery whilst at the same time unable to cope with large volumes of parenteral fluid. A small study of patients undergoing general anaesthesia found the use of an oesophageal Doppler monitor to optimise the intravascular volume status of patients was associated with a more rapid recovery postoperatively and reduced length of stay.[108]

7 Surgical management

Large, well-controlled RCTs comparing different surgical treatments are rare. There are many small studies, often with significant limitations, making it difficult to formulate clear recommendations. Many aspects of surgical management are currently being reviewed by the Cochrane Collaboration. Additional information will also be available from a multicentre prospective randomised controlled trial (the STARS project - *Scottish Trial of Arthroplasty or Reduction and fixation in Subcapital hip fractures*) which is due to report in 2002 on completion of two years follow up.

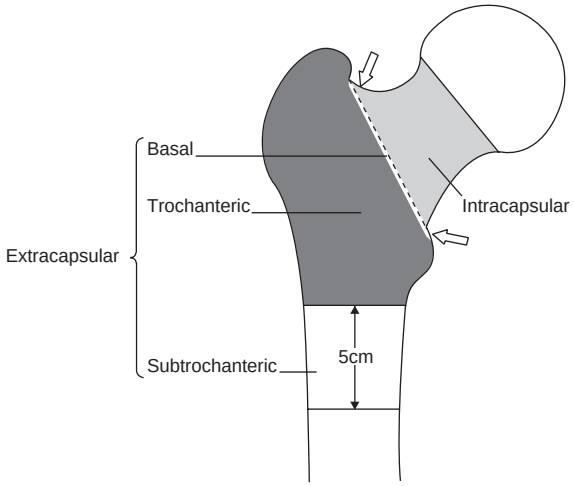
7.1 SURGICAL EXPERIENCE

Evidence suggests that the best results are obtained when hip fracture operations are undertaken by an experienced surgeon.[53,92] The Scottish Hip Fracture Audit has shown considerable variation in the grade of surgeon performing hip fracture surgery.[74] Although there is no association between the grade of surgeon and mortality, the duration of surgery and incidence of postoperative complications are reduced and outcomes improved with an experienced surgeon.[66,70]

7.2 TYPES OF FRACTURE

Hip fractures are classified as *intracapsular* or e*xtracapsular* depending on the site of the fracture in relation to the insertion of the capsule of the hip joint (indicated with an arrow in Figure 1) onto the proximal femur.

Figure 1: Classification of fractures of the proximal femur (hip fractures)



Intracapsular fractures include subcapital and transcervical fractures, and are best subdivided into undisplaced or displaced. Older classifications, such as Garden grades I-IV, offer no further diagnostic, therapeutic or prognostic information.

Extracapsular fractures include per-, inter- and sub-trochanteric, and are best subdivided by their degree of comminution. Basal cervical fracture lines tend to be approximately at the level of the insertion of the joint capsule, and they behave as extracapsular fractures (and should be regarded as such for prognostic and therapeutic considerations).

7.3 TREATMENT OF INTRACAPSULAR FRACTURES

The treatment of intracapsular hip fractures has stimulated vigorous debate for decades, but with remarkably little good evidence to support clearly one option over another.

7.3.1 UNDISPLACED INTRACAPSULAR FRACTURES

The limited evidence available suggests that there is little difference in outcome between operation and conservative treatment of undisplaced fractures.[109,110] However, surgical treatment allows early mobilisation of the patient and reduces the risk of untreated undisplaced fractures becoming displaced at a later date. Undisplaced intracapsular fractures that are treated surgically should be treated by internal fixation.[58,111] 3

A meta-analysis of 25 RCTs including 4,925 patients did not demonstrate evidence of the superiority of one device over another, or any benefit from the presence of a side-plate in the treatment of displaced or undisplaced intracapsular fractures.[111] The meta-analysis did suggest that multiple screws (up to three) were more reliable than pins. 1+

There is some suggestion from a small prospective audit that the very elderly (aged over 80 years) may be better served by prosthetic replacement,[112] because of the higher risk of failure of fixation. 3

D **Most undisplaced intracapsular hip fractures that are treated surgically should have internal fixation, except in the very elderly, when hemiarthroplasty may be considered.**

7.3.2 DISPLACED INTRACAPSULAR FRACTURES

There is no single surgical procedure which has been shown to give the best outcome in all groups of patients with this injury.[113] Two randomised trials indicate that both internal fixation and arthroplasty produce similar final outcomes, but internal fixation has a marginally lower mortality at the expense of an increased re-operation rate:[114,115] some studies have reported that following open reduction and internal fixation the reoperation rate is up to 30%.[116,117]

The results of hemiarthroplasty are initially better, but if the patient survives more than three to five years, then function deteriorates. The results from total hip replacement may be better than those for hemiarthroplasty after three years, but a higher incidence of early dislocation is reported.[118-121] Results of secondary THR following failure of fixation are better than the results of hemiarthroplasty after a number of years from the initial injury.[122] Therefore many factors other than the type of fracture must to be considered when deciding surgical approach and choice of implant. These include age, previous physical mobility, previous mental agility, condition of the bone and joint (e.g. presence of arthritis). [111] 2++

B **Assessment prior to surgery must consider the patient's:**

- **age**
- **mobility**
- **mental state**
- **pre-existing bone and joint pathology.**

The Scottish Hip Fracture Audit demonstrated the widespread nature of current clinical practice, with primary reduction and internal fixation of displaced intracapsular hip fractures in younger patients ("biologically" aged less than 65-70 years), and arthroplasty in older patients to reduce healing complications.[1]

The complications from internal fixation are dependent upon the quality of the reduction.[122-126] A meta-analysis of 106 papers showed a re-operation rate of 20-36% after internal fixation compared with 6-18% after hemiarthroplasty.[113] Other studies have suggested reoperation is more common in older patients.[119,127] A rigorous analysis of the Scottish Hip Fracture Audit unitary database of over 12,000 hip fractures has shown a reoperation rate of 17% after internal fixation, compared to 5% after hemiarthroplasty in over 3,300 displaced intracapsular fractures (all age groups).[1] There is a marked difference in management of this type of fracture between Scandinavia, where internal fixation is the preferred treatment, and the UK. It is therefore difficult to generalise from the results of Scandinavian studies to the target population of this guideline.

Surgical techniques for internal fixation

A recent Cochrane review considered surgical techniques for the internal fixation of intracapsular fractures.[128] Techniques included the impaction of the fracture during surgery, compressing the fracture, and performing an open or closed reduction of a displaced fracture. The review concluded that there was insufficient evidence to determine the relative effectiveness of any of these techniques. As outlined in the surgical treatment of undisplaced intracapsular fractures, a meta-analysis did not demonstrate evidence of the superiority of one device over another, or any benefit from the presence of a side-plate.[111]

B

- **Younger, active, fit patients should be considered for internal fixation.**
- **Active patients with an anticipated survival of more than a few years should be considered for internal fixation, total hip replacement or hemiarthroplasty, depending on the patient factors outlined above.**
- **Patients with an anticipated survival of less than three years and patients whose activity level is low should be considered for hemiarthroplasty.**
- **Bed or chair bound patients may be treated conservatively.**

7.3.3 TYPES OF HEMIARTHROPLASTY

Hemiarthroplasties may be either unipolar (e.g. Thomson and Austin Moore) or bipolar (e.g. Hastings). Either type may be uncemented or cemented into the femur.

Cemented vs. uncemented stems

The use of bone cement has been associated with intra-operative morbidity. This can be reduced by intramedullary lavage and modern cementing techniques.[129,130] Uncemented stems are associated with more thigh pain and poorer overall function.[131-133] 2+

C **Cement should be used when undertaking hemiarthroplasty, unless there are cardiorespiratory complications.**

Unipolar vs. bipolar hemiarthroplasty

Radiological studies have suggested that, in many patients, bipolar prostheses move almost entirely at the outer articulation,[134] and therefore simply act as expensive unipolar prostheses. The main theoretical benefit of a bipolar prosthesis is a reduction in the amount of acetabular wear, minimising pain, joint destruction and mobility problems. Such problems appear to be directly related to the patient's activity levels (degree of mobility and independence of living) and the time since operation.[135] There does not appear to be any good evidence to show any significant advantage from using bipolar hemiarthroplasty in favour of unipolar hemiarthroplasty.[133,136,137] 2++

B **Bipolar hemiarthroplasty should not be performed in preference to unipolar hemiarthroplasty, as there is limited evidence of any clinical benefit.**

Surgical approach for hemiarthroplasty

The common surgical approaches for hemiarthroplasty for intracapsular hip fractures are anterolateral or posterior. Dislocation[138,139] and thrombosis are more common with the posterior approach, but increased operative time, blood loss and infection are more common with the anterior approach.[140,141] 2+

C **The anterolateral approach is recommended for hemiarthroplasty surgery.**

7.3.4 THE ROLE OF TOTAL HIP REPLACEMENT

Cohort studies provide conflicting results on the outcome of total hip replacement (THR) as the primary treatment for a hip fracture.[118,121] Dislocation rates of between 10-20% can be expected,[142] but generally, prognosis is good. After three years THRs appear to be doing better than hemiarthroplasties[118,133,143] 3

Further information on the outcome of THR as a primary treatment for displaced intracapsular hip fractures in "fit" patients will be available from the STARS trial.

THR as a secondary procedure after failed internal fixation performs better than hemiarthroplasty.[122] The results of THR after failed hemiarthroplasty are similar to the results after revision for primary THR, although there is a higher complication rate.[144]

D **In patients with pre-existing joint disease, medium/high activity levels and a reasonable life expectancy, THR may be appropriate as the primary treatment.**

7.4 TREATMENT OF EXTRACAPSULAR FRACTURES

The standard treatment of extracapsular fractures is operative. The alternative, conservative treatment with prolonged bed rest, is not practised in this country. In elderly patients conservative treatment has been associated with a high incidence of morbidity and mortality, prolonged length of stay and high costs per quality adjusted life year (QALY).[110] A systematic review[75] has not identified any major differences in outcome between these two approaches, but operative treatment appeared to be associated with less deformity, a reduced length of hospital stay and improved rehabilitation.

B **Extracapsular hip fractures should all be treated surgically unless there are medical contraindications.**

The operative treatment of extracapsular fractures is almost always by reduction and internal fixation. This may be accomplished by using implants that are either extramedullary (*e.g.* sliding screw and plate) or intramedullary (*e.g.* Gamma nail).

7.4.1 EXTRAMEDULLARY *VS.* INTRAMEDULLARY FIXATION/ IMPLANTS

Extramedullary fixation by a sliding hip screw appears to give a lower complication rate than a fixed nail plate or intramedullary devices such as the Gamma nail, the IMHS, or condylocephalic implants such as the Ender nail.[145] Further studies are required to determine if the Gamma nail, or its modifications, have advantages for fractures such as subtrochanteric fractures and trochanteric fractures with a reversed obliquity fracture line.[146] These implants, and the indications for their use, continue to evolve.

7.4.2 OSTEOTOMY

It has been proposed that the fixation of unstable extracapsular hip fractures can be improved by an osteotomy to change the displacement and angle of the proximal femur. However, a recent systematic review[128] found inadequate evidence of any benefits from the routine use of osteotomy in conjunction with fixation by a sliding hip screw for an unstable trochanteric hip fracture.[147,148]

☑ Osteotomy is rarely indicated, but may be relevant if used in conjunction with a fixed nail plate.

7.4.3 COMPRESSION

There is only limited amount and poor quality evidence to support the application of compression across the fracture site of a trochanteric fracture during sliding hip screw fixation.[128,149]

7.5 BLOOD TRANSFUSION

A retrospective study of 8,787 hip fracture patients, aged ≥60 years, found that perioperative transfusion had no effect on mortality in patients with haemoglobin levels ≥80 g/l. However, several smaller studies have suggested that patients with known cardiac disease may benefit from transfusion at higher haemoglobin levels.[151-153] For further information see the SIGN guideline on perioperative blood transfusion.[154]

8 Early postoperative management

8.1 PAIN RELIEF

Many drugs used for pain relief and methods of administration are available and it is not possible in the context of this guideline to discuss specific techniques. The provision of good pain relief for postoperative patients is generally associated with reduced cardiovascular, respiratory and gastrointestinal morbidity. Good analgesia is thought to enhance early mobilisation and may be associated with early discharge from hospital.

Studies have shown a reduction in postoperative opioid requirements when peripheral nerve blocks were used but have not shown any clinical benefits as a result of this reduction.[64] 1++

The analgesic requirements of patients with fractured hip and the adequacy of current analgesic practice have not been fully evaluated. Adequate assessment of analgesia and pain in the confused elderly patient remains a major challenge.

The Royal College of Surgeons of London recommends regular assessment and formal charting of pain scores as this can help in the management of pain.[155] 4

D **Regular assessment and formal charting of pain scores should be adopted as routine practice in postoperative care.**

☑ Pain management in elderly patients should be supervised by practitioners with appropriate specialised experience.

8.2 OXYGEN

One RCT and an observational study have shown that hypoxaemia can persist until the fifth postoperative day.[90,91] 1+ 2+

Continuous ECG monitoring has shown that episodes of myocardial ischaemia occur in postoperative patients with known ischaemic heart disease in the early hours of the morning and are most common on the second postoperative day.[101] Hypoxaemia can be detected by using pulse oximetry regularly to check oxygen saturation levels. Not surprisingly, it has been shown that monitoring oxygen saturation using pulse oximetry reduces the incidence of hypoxaemia.[156] Providing supplementary oxygen increases the mean oxygen saturation, but does not completely prevent episodic desaturation/hypoxaemia in the postoperative period.[157] 2+

B **Oxygen saturation should be monitored routinely to reduce the incidence of hypoxaemia and continued for as long as the tendency to hypoxaemia exists.**

C **Supplementary oxygen is recommended for at least six hours after general or spinal/epidural anaesthesia, at night for 48 hours postoperatively and for as long as hypoxaemia persists as determined by pulse oximetry.**

8.3 FLUID AND ELECTROLYTE BALANCE

Electrolyte imbalances, particularly hyponatraemia and hypokalaemia, are common in the postoperative period[158] and reflect the limited renal reserve of these patients. 1+

The situation may be made worse by diuretics and inappropriate composition of maintenance intravenous fluids. Fluid management in elderly patients is often poor[53] and elderly women appear particularly at risk of developing hyponatraemia in the perioperative period.[89] 4

B **Fluid and electrolyte management in elderly patients should be monitored regularly.**

D **Fluid and electrolyte management should begin in A&E** *(see section 4)*.

8.4 EARLY MOBILISATION

Early mobilisation may prevent complications such as pressure damage and deep vein thrombosis.[58,159] Early mobilisation in combination with pre- and postoperative physiotherapy may be of value in reducing pulmonary complications.[160]

☑ If the patient's overall medical condition allows, mobilisation and multidisciplinary rehabilitation should begin within 24 hours postoperatively.

☑ Weight bearing on the injured leg should be allowed.

8.5 CONSTIPATION

Prevention of constipation should be considered in the early management of hip fracture patients. Use of opioid analgesics, even in low doses, dehydration, decreased fibre in the diet and lack of mobility can all lead to constipation. The following options should be considered in constipated patients:[161]

- laxatives
  (as recommended in the British National Formulary for drug-induced constipation)
- increase fluid intake
- increase fibre in diet
- increase mobility.

☑ Prevention of constipation should be considered.

8.6 URINARY CATHETERISATION

The guideline development group found no good quality evidence on urinary catheterisation in hip fracture patients.

In general catheterisation should be avoided, except in the following specific circumstances:

- in the presence of urinary incontinence
- on a long journey
- where there is concern about urinary retention
- when monitoring renal/cardiac function.

In patients with a catheter, good management includes:

- maintaining adequate fluid balance
- ensuring adequate pain relief.

☑ Urinary catheters should be avoided except in specific circumstances.

☑ When patients are catheterised in the postoperative period, prophylactic antibiotics should be administered to cover the insertion of the catheter.

9 Rehabilitation and discharge

Considering the importance of good rehabilitation in the overall quality and cost-effectiveness of hip fracture care, the relevant evidence base is somewhat disappointing. Factors such as complexity of case-mix, service context, details of service organisation and multidisciplinary inputs, and even health care reimbursement systems, can add greatly to the problems normally associated with the organisation of large-scale clinical trials involving older patients. However, a number of systematic reviews have reported in recent years.[162-164]

9.1 EARLY ASSESSMENT

Early assessment by medical and nursing staff, physiotherapist and occupational therapist to formulate appropriate preliminary rehabilitation plans has been shown to facilitate rehabilitation and discharge.[165,166] 2+

Premorbid mental state, mobility and function are the most reliable predictors of the success of rehabilitation, and can be used as screening tools to assess a patient's early rehabilitation needs and potential.[167-170] 2++

B **Within 48 hours of admission, a corroborated history should be obtained, which should include:**

- **premorbid function and mobility**
- **available social support**
- **current relevant clinical conditions**
- **mental state.**

Patients from home, who are relatively alert and fit, are most likely to benefit from supported discharge schemes. Patients previously precarious at home may require longer periods of inpatient rehabilitation to maximise their chances of return home. Cognitive status has a bearing on functional abilities, length of stay and outcome.[167-171] 2++

B **Patients with co-morbidity, poor functional ability and low mental test scores prior to admission should undergo rehabilitation in a Geriatric Orthopaedic Rehabilitation Unit (GORU).**

Maintaining balance during daily activities is a useful predictor of subsequent hospitalisation, care home placement and mortality.[172]

9.2 REHABILITATION

9.2.1 NUTRITION AND REHABILITATION

Elderly patients with hip fractures are often malnourished on admission and their nutritional status will not necessarily improve in hospital. Dietary surveys in the postoperative period have recorded inadequate dietary intake. Poor nutrition can lead to mental apathy, muscle wasting and weakness, impaired cardiac function and lowered immunity to infection.[162]

Oral multinutrient feeds provide protein, energy, some vitamins and minerals and may reduce complications whilst in hospital, although they have no effect on mortality. The presence of protein in an oral feed may reduce the number of days spent in rehabilitation. Nasogastric feeding may be of benefit to very malnourished patients and may reduce their length of stay in hospital.[164] 1++

The studies were unclear regarding how long supplementation should continue; the duration varying from study to study. In practice, the duration of supplementation will depend on assessment of the needs of each individual patient, in consultation with a dietitian.

A **Supplementing the diet of hip fracture patients in rehabilitation with high energy protein preparations containing minerals and vitamins should be considered.**

☑ Patients' food intake should be monitored regularly, to ensure sufficient dietary intake.

9.2.2 MULTIDISCIPLINARY REHABILITATION

Multidisciplinary team working is generally considered to be effective in the delivery of hip fracture rehabilitation. The professions, grades and interrelationships of members of the "multidisciplinary team" vary between studies and, because these characteristics are rarely described in detail, the effectiveness of different approaches to team working is not yet well understood.[165,166,173-175] Rehabilitation should be commenced early to promote independent mobility and function. The initial emphasis should be on walking and activities of daily living (ADL) e.g. transferring, washing, dressing, toileting. Balance and gait are essential components of mobility and are useful predictors in the assessment of functional independence.[167, 172] 2++

9.2.3 MEDICAL MANAGEMENT AND REHABILITATION

Collaboration between orthopaedic surgeons, physicians in geriatric medicine and other members of the multidisciplinary team should be sought to assist in medical management and rehabilitation. The benefits of shared postoperative management by orthopaedic surgeons and geriatricians include trends towards earlier functional independence, reduced length of stay, improved management of medical conditions and decreased future need for institutional care, including nursing home care.[173-179] 2++

B **Multidisciplinary team working facilitates the rehabilitation process.**

9.3 DISCHARGE

9.3.1 SUPPORTED DISCHARGE

Supported discharge and early supported discharge (ESD) schemes comprise an identified team of staff (schemes vary but the teams tend to include designated medical, nursing, physiotherapy, occupational therapy and social work personnel) whose role is to assess patients on admission, to identify those suitable for supported discharge, to facilitate early mobilisation and rehabilitation and arrange appropriate support on discharge and follow up.[166,174, 180,182] Most schemes have an identified discharge coordinator or liaison nurse.

Patients who are mentally alert, medically well and mobile postoperatively are most likely to benefit from a supported discharge scheme,[167,170,174,180] and should be identified by multidisciplinary team assessment. Such patients who have been admitted from home can be discharged directly back home, without compromising the patient's recovery. Supported discharge schemes have also been shown to improve patients' abilities to carry out activities of daily living[170,174,180] and increase the overall proportion of patients discharged home.[174]

Supported discharge and hospital at home schemes reduce length of acute stay and appear to free resources without transferring unacceptable costs to community health and social services.[165,166,170,174,180,182] These costings do not include informal support from carers. 2++

Local circumstances will dictate the nature of local arrangements between hospital and community health and social services.[175]

B **Supported discharge schemes should be used to facilitate the safe discharge of elderly hip fracture patients and reduce acute hospital stay.**

9.3.2 GERIATRIC ORTHOPAEDIC REHABILITATION UNITS

Geriatric orthopaedic rehabilitation units (GORUs) are multidisciplinary inpatient facilities catering for the frailer, more dependent patient and were originally associated with larger orthopaedic units. Medical care and rehabilitation are supervised by a geriatrician, often with the help of a specialist GP. Orthopaedic cover from a visiting surgeon should be available.

Geriatric service interventions after hip fractures are complex and it is not easy to quantify conclusively the effectiveness of each different type of co-ordinated inpatient rehabilitation.[162,163] The observed trends favour GORU over conventional management, with a reduction in deaths and an increase in functional improvement.[162] GORUs can increase the efficiency of acute bed use by taking on potentially long stay patients, for example, patients needing prolonged rehabilitation prior to discharge or patients who are unable to return home and are awaiting an alternative placement. 1+

There is no evidence that length of stay is reduced in a GORU compared to a conventional unit.[163] In both cases, excessive lengths of stay are primarily related to non-medical problems such as care needs and social support, as well as cognitive impairment.[168] As GORUs tend to increase the chance of a patient returning to their own home, they may be cost-effective in reducing the costs of residential care.[162]

9.3.3 PATIENTS ADMITTED FROM INSTITUTIONAL CARE WITH FRACTURED HIP

Data from the Scottish Hip Fracture Audit[74] reveals that in the past five years over one third of female hip fracture patients were admitted from institutional care. One fifth of admissions were from care homes. Of these, one third die within four months of admission compared to only 14% of patients admitted from home. Short length of stay can be predicted in medically fit patients who are from care homes because of the supportive care available. A longer length of stay can be predicted in patients from institutions which do not provide nursing care. Although many can be returned to their original placement with the benefit of familiar care, outcomes are poor, with one-year mortality well over 50%.

9.4 DISCHARGE MANAGEMENT

Multidisciplinary discharge management, involving community and hospital nurses, hospital doctors and general practitioners, physiotherapists, occupational therapists, social workers and family[166,170,174,175,180] has been shown to improve planning and implementation of discharging patients. For example, prior to discharge, the patient may have a continued fear of falling, leading to loss of confidence and increased dependency. Supported discharge schemes with liaison nurse follow up can monitor patient progress at home and help to alleviate some of these fears.[165,171,180]

☑
- The patient should be central to discharge planning, and, where realistic, their needs and wishes taken into consideration. The views of a carer are also important.
- Liaison between hospital and community (including social work department) facilitates the discharge process.
- Occupational therapy home assessments assist in preparing patients for discharge.
- Patient, carer, GP, and other community services should be given as much notice as possible of the date of discharge.
- Discharge should not take place until arrangements for postdischarge support are in place and the patient is fit for discharge.
- Written information on medication, mobility, expected progress, pain control and sources of help and advice should be available to patient and carer.
- GPs have an important role to play in postdischarge rehabilitation and should receive early and comprehensive information on hospital stay, services arranged and future follow up arrangements. Complicated discharges that may have considerable impact on the primary care team should be discussed in advance with the GP.
- Consideration should be given to the prevention of falls with particular attention being paid to potential household hazards, footwear, provision of adaptive equipment/ walking aids and alarm systems.

10 Implementation and audit

10.1 LOCAL IMPLEMENTATION

In general terms, implementation of national clinical guidelines is the responsibility of each NHS Trust and is an essential part of clinical governance. It is acknowledged that every Trust cannot implement every guideline immediately on publication, but mechanisms should be in place to ensure that the care provided is reviewed against the guideline recommendations and the reasons for any differences assessed and, where appropriate, addressed. These discussions should involve both clinical staff and management. Local arrangements may then be made to implement the national guideline in individual hospitals, units and practices, and to monitor compliance. This may be done by a variety of means including patient-specific reminders, continuing education and training, and clinical audit. Integrated Care Pathways may be a useful means by which to implement the guideline at the "bedside".

10.2 KEY POINTS FOR AUDIT

Hip fracture audit should include details of case-mix, processes of care and outcome. The Scottish Hip Fracture Audit (SHFA)[1] core data sets, identical to those of the Standardised Audit of Hip Fracture in Europe (SAHFE),[183] were developed over a number of years by an international multidisciplinary group and represent a robust and practical approach to hip fracture audit that is now widely used in many countries. Forms covering core data sets, admission to acute care, discharge/transfer from acute care, four-month follow up and hip-related readmission to acute care are shown on the following pages.

In addition to the core data set, many participating units collect data on matters of local clinical and research interest, such as:

1. Time spent in A&E department
2. Medical co-morbidity
3. Abbreviated mental test score
4. Pre-fracture mobility
5. Delay to operation
6. Duration of preoperative fasting
7. Grade of surgeon and anaesthetist
8. Type of anaesthetic
9. Thrombo- and antibiotic prophylaxis
10. Pressure sore
11. Wound infection.

10.3 SYNERGY OF AUDIT AND GUIDELINES IN HIP FRACTURE CARE

As noted in section 1.7, Scotland has both a national guideline for hip fracture care and national hip fracture audit on a substantial scale. This offers unique opportunities to use audit and the guideline together to document care, compare the care delivered with that recommended, and then match care more closely to recommendations by clinical and organisational initiatives undertaken and evaluated locally. This approach, applicable to the whole journey of care, has delivered measurable local improvements in specific aspects of care and the organisation of care, and continues to offer examples of evaluated initiatives that other services can learn from.

NOTES FOR SAHFE FORMS 1-3

10.4 RECOMMENDATIONS FOR FURTHER RESEARCH

Patient care	– routine and systematic feedback of patient satisfaction
Prevention	– cost-effective targeting of interventions for prevention – identifying indicators of high risk sensitivity and specificity of indicators of high risk – role of calcium and vitamin D in the secondary prevention of hip fracture
Anaesthetic management	– appropriate pre- and postoperative management of fluid balance – preadmission dehydration – marginal kidney function repeated fasting – general anaesthesia ± supplementary nerve blocks vs spinal/ epidural anaesthesia ± supplementary nerve blocks
Surgical management	– intramedullary devices for the fixation of specific types of extracapsular hip fractures – choice of arthroplasty (and cement) for hip fractures (including total hip replacement) – use of Trauma Lists and Orthopaedic Theatres (laminar flow) – impact of surgical experience – pre and postoperative medical care, including fluid balance, should the patients be stabilised pre and post surgery on HDU, should cardiac output be measured, etc.
Rehabilitation and discharge	– informal costs in Early Supported Discharge and hospital-at-home – impact on local authorities and general practices – long term dependency needs of disabled patients – services in remote and rural areas – comparisons of different rehabilitation methods
General	– nutritional supplementation – use of integrated care pathways

11 Key messages for patients

These notes are provided for possible use by clinicians in discussing investigations and treatment options with patients who have fractured their hip. They are not intended for direct distribution to patients, but might be incorporated into locally-developed patient information materials.

Prevention

- Patients should be encouraged to be active - a history of immobility is a significant risk factor for fracture.
- Identify any factors that might reduce the risk of the patient falling if they were addressed in advance. For example:
  - at home - e.g. loose rugs, trailing flexes etc.
  - has the patient's eyesight and/or hearing been tested/checked recently?
  - would the use of walking aids be beneficial, or could their current use be optimised?
  - are there other appliances that could be prescribed for home use?
- All patients who have been assessed as being at risk of hip fracture should be prescribed calcium and vitamin D. It should be explained to the patient that taking these tablets will help to reduce the risk of fracturing the hip if they should fall.
- Patients who are asked to use hip protectors should be encouraged to stick with them. Although they may be uncomfortable to wear, studies have shown that they really do reduce the risk of fracture.

Early mobilisation

- The importance of early mobilisation following a hip fracture operation should be emphasised:
  - let patients know in advance that they will be encouraged to move within 24 hours of their operation
  - acknowledge that starting to walk again is a challenge and will be uncomfortable.

Pain control

- Pain control is important to promote mobilisation and patients should be encouraged to take pain medication as offered, so that they are comfortable in bed **and** when exercising with the physiotherapist.

Rehabilitation and discharge

- From the beginning, patients should be encouraged to think ahead, not just about getting back on their feet, but also about getting home.
- Patients should be made aware, that for this reason, ward staff, in particular physiotherapists and occupational therapists may need information about their home and social circumstances in order to make any necessary arrangements for additional support or equipment needed on discharge from hospital.

Further information

Further information for patients is available from other sources. For example, the booklet *Coping with Hip Fracture* produced by the National Osteoporosis Society is free to patients and carers. It explains what to expect during time in hospital; how to look after oneself during convalescence and how exercise, diet and changes in the home can play a central role in recovery. Available from the National Osteoporosis Society, PO Box 10, Radstock, Bath BA3 3YB. Tel: 01761 471 771, **www.nos.org.uk**, e-mail info@nos.org.uk.

12 Development of the guideline

12.1 INTRODUCTION

SIGN is a collaborative network of clinicians, other health care professionals, and patient organisations, funded by the Clinical Resource and Audit Group (CRAG) of the Scottish Executive Health Department. SIGN guidelines are developed by multidisciplinary groups using a standard methodology based on a systematic review of the evidence. Further details about SIGN and the guideline development methodology are contained in *SIGN 50: A guideline developer's handbook*, available at **www.sign.ac.uk.**

12.2 THE GUIDELINE DEVELOPMENT GROUP

Dr Colin Currie	*Senior Lecturer, Geriatric Medicine Unit, Royal Infirmary of Edinburgh*
Professor James Hutchison *(Joint Chairmen)*	*Regius Professor of Surgery and Sir Harry Platt Professor of Orthopaedic Surgery, University of Aberdeen; and Honorary Consultant Orthopaedic Surgeon, Aberdeen Royal Infirmary*
Mrs Winifred Boyd	*Patient Representative, Edinburgh*
Mrs Joyce Brown	*Service Manager, Western Infirmary, Glasgow*
Professor Charles Court-Brown	*Consultant Orthopaedic Surgeon, Royal Infirmary of Edinburgh*
Dr Kerr Fraser	*General Practitioner, Edinburgh*
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Professor David Reid	*Consultant Rheumatologist, Foresterhill Hospital, Aberdeen*
Dr Richard Scorgie	*Consultant Physician, Woodend Hospital, Aberdeen*
Dr Sue Shepherd	*Specialist Registrar in Public Health, Lothian Health*
Mr James Stevenson	*Consultant in Accident & Emergency, Crosshouse Hospital, Kilmarnock*
Ms Lisa Stewart	*Senior Occupational Therapist, Royal Infirmary of Edinburgh*
Mr Ian Stother	*Consultant Orthopaedic Surgeon, Glasgow Royal Infirmary*
Mr Luke Vale	*Health Economist, Health Economics Research Unit, University of Aberdeen*

The membership of the guideline development group was confirmed following consultation with the member organisations of SIGN. Declarations of interests were made by all members of the guideline development group. Further details are available from the SIGN Executive. Guideline development and literature review expertise, support, and facilitation were provided by the SIGN Executive

12.3 SYSTEMATIC LITERATURE REVIEW

The evidence base for this guideline was synthesised in accordance with SIGN methodology. A systematic review of the literature was carried out using an explicit search strategy devised by the SIGN Information Officer in collaboration with members of the guideline development group. Searches were restricted to systematic reviews, meta-analyses, and randomised controlled trials. Material relating to people aged under 45 years and fractures caused by other diseases (e.g. cancer) were specifically excluded. Internet searches were carried out on the Web sites of the Canadian Practice Guidelines Infobase, the New Zealand Guidelines Programme, the UK Health Technology Assessment programme, and the US National Guidelines Clearinghouse. Searches were also carried out on the search engines Northern Light and OMNI, and all suitable links followed up. Database searches were carried out on Cochrane Library, ASSIA, CINAHL,

Embase, Healthstar, Medline, PsychInfo, and Sociological Abstracts from 1985-1999. Separate searches were carried out for subroups of the main development group looking at acute care, physiotherapy, postoperative care, and prevention of falls. The Medline version of the main search strategies can be found on the SIGN web site, in the section covering supplementary guideline material.The main searches were supplemented by material identified by individual members of the development group. All selected papers were evaluated using standard methodological checklists before conclusions were considered as evidence.

12.4 CONSULTATION AND PEER REVIEW

12.4.1 NATIONAL OPEN MEETING

A national open meeting is the main consultative phase of SIGN guideline development, at which the guideline development group presents their draft recommendations for the first time. The national open meeting for this guideline was held in conjunction with the Hipfest meetings in 1999 and 2001. The draft guideline was also available on the SIGN web site for a limited period at this stage to allow those unable to attend the meeting to contribute to the development of the guideline.

12.4.2 SPECIALIST REVIEW

The guideline was also reviewed in draft form by a panel of independent expert referees, who were asked to comment primarily on the comprehensiveness and accuracy of interpretation of the evidence base supporting the recommendations in the guideline. SIGN is very grateful to all of these experts for their contribution to this guideline.

Dr Fraser Anderson	*Consultant Geriatrician, Southampton General Hospital*
Miss Rose Byrne	*Operations Manager, Princess Margaret Rose Orthopaedic Hospital*
Ms Annie Cornforth	*Superintendent Physiotherapist, Middlesex Hospital, London*
Dr John Crispin	*General Practitioner, Whinpark Medical Centre, Edinburgh*
Mr Peter Davis	*Research Nurse, Orthopaedics, Queens Medical Centre, Nottingham*
Dr Willie Gilchrist	*Consultant Geriatrician, Gartnavel General, Glasgow*
Professor Bill Gillespie	*Consultant Orthopaedic Surgeon, Dunedin, New Zealand*
Professor Marion McMurdo	*Consultant Geriatrician, Ninewells Hospital, Dundee*
Dr Stuart Mercer	*General Practitioner, Edinburgh*
Miss Madeleine Mooney	*Chair, Occupational Therapy in Trauma and Orthopaedics, Liverpool*
Mr Raymond Newman	*Consultant Orthopaedic Surgeon, Harrogate District Hospital*
Mr Martyn Parker	*Orthopaedic Research Fellow, Peterborough District Hospital*
Dr Rhona Patey	*Consultant Anaesthetist, Aberdeen*
Dr Nigel Raby	*Consultant Radiologist, Western Infirmary, Glasgow*
Professor Alison Tierney	*Professor of Nursing Research, University of Edinburgh*
Dr David Torgerson	*Senior Research Fellow, Centre for Health Economics, University of York*
Dr Alex Watson	*General Practitioner, Dundee*

12.4.3 SIGN EDITORIAL GROUP

As a final quality control check, the guideline was reviewed by an Editorial Group comprising the relevant specialty representatives on SIGN Council:

Dr Doreen Campbell	*CRAG Secretariat, Scottish Executive Department of Health*
Mrs Patricia Dawson	*Royal College of Nursing*
Dr John Gillies	*Royal College of General Practitioners*
Dr Grahame Howard	*Acting Chairman of SIGN, Co-Editor*
Ms Juliet Miller	*Director of SIGN, Co-Editor*
Mr Douglas Harper	*Royal College of Surgeons of Edinburgh*
Dr Cameron Howie	*Royal College of Anaesthetists*
Dr Margaret Roberts	*Royal College of Physicians and Surgeons of Glasgow*
Ms Ruth Stark	*British Association of Social Workers*
Professor Joanna Wardlaw	*Royal College of Radiologists*

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Abbreviations

A&E	Accident and Emergency
BMD	Bone mineral density
BMI	Body mass index
DVT	Deep vein thrombosis
ECG	Electrocardiogram
EPIDOS	Epidemiologie de L'Osteoporose Study
ESD	Early supported discharge
GECS	Graduated elastic compression stockings
GORU	Geriatric orthopaedic rehabilitation unit
GP	General practitioner
HRT	Hormone replacement therapy
IPC	Intermittent pneumatic compression
LDH	Low dose heparin
LMWH	Low molecular weight heparin
MR	Magnetic resonance
MRSA	Methicillin resistant *staphylococcus aureus*
NHS	National health service
PE	Pulmonary embolism
PEP	Pulmonary Embolism Prevention
QALY	Quality adjusted life year
RCT	Randomised controlled trial
RDA	Recommended daily allowance
SAHFE	Standardised Audit of Hip Fracture in Europe
SERMs	Selective oestrogen receptor modulators
SHFA	Scottish Hip Fracture Audit
SIGN	Scottish Intercollegiate Guidelines Network
SOF	Study of Osteoporotic Fractures
STARS	Scottish Trial of Arthroplasty or Reduction and Fixation in Subcapital Hip Fractures
THR	Total hip replacement
UFH	Unfractionated heparin
UK	United Kingdom
VTE	Venous thromboembolism

HIP FRACTURE SURGERY

INTRACAPSULAR FRACTURES

UNDISPLACED INTRACAPSULAR FRACTURES

B Most undisplaced intracapsular fractures that are treated surgically should have **internal fixation**, except in the very elderly, when hemiarthroplasty may be considered

DISPLACED INTRACAPSULAR FRACTURES

B Assessment prior to surgery must consider the patient's:
- age
- mobility
- mental state
- pre-existing bone and joint pathology

B
- Younger, active, fit patients: consider **internal fixation**
- Active patients with an anticipated survival of more than a few years should be considered for **internal fixation, total hip replacement** or **hemiarthroplasty**
- Patients with an anticipated survival of < 3 years and patients whose activity level is low: consider **hemiarthroplasty**
- Bed- or chair-bound patients: **treat conservatively**

HEMIARTHROPLASTY

C **Cement** should be used when undertaking hemiarthroplasty unless there are cardiorespiratory complications

B Bipolar hemiarthroplasty should not be performed in preference to unipolar hemiarthroplasty

C The **anterolateral approach** is recommended for hemiarthroplasty surgery

TOTAL HIP REPLACEMENT

D In patients with pre-existing joint disease, medium/high activity levels and a reasonable life expectancy, **total hip replacement** may be appropriate as the primary treatment

EXTRACAPSULAR FRACTURES

B Extracapsular hip fractures should all be treated surgically unless there are medical contraindications

☑ Osteotomy is rarely indicated, but may be relevant if used in conjunction with a fixed nail plate

TIMING OF SURGERY

A **Patients should be operated on as soon as possible** (within 24 hours) during standard daytime working hours, including weekends, if their medical condition allows

ANAESTHETIC MANAGEMENT

D Anaesthesia should be carried out, or closely supervised, by an anaesthetist with sufficient experience of anaesthesia in elderly patients

B **Regional anaesthesia** may be considered for patients undergoing hip fracture repair, particularly those at risk of VTE

☑ Administration of spinal or epidural anaesthesia should be delayed until 10-12 hours after the administration of low molecular weight heparin

EARLY POSTOPERATIVE MANAGEMENT

D **Regular assessment** and formal charting of **pain scores** should be adopted as routine practice in postoperative care

B **Monitor oxygen saturation** routinely to reduce incidence of hypoxaemia, continue for as long as hypoxaemia persists

C **Supplementary oxygen** is recommended for at least six hours after general or spinal / epidural anaesthesia, at night for 48 hours postoperatively and for as long as hypoxaemia persists as determined by pulse oximetry

B **Monitor fluid and electrolyte management** in elderly patients

☑
- If the patient's overall medical condition allows, **mobilisation** and **multidisciplinary rehabilitation** should begin within 24 hours postoperatively
- **Weight bearing** on the injured leg should be allowed

☑
- **Prevention of constipation** should be considered
- **Urinary catheters** should be avoided except in specific circumstances
- When patients are catheterised in the postoperative period, **prophylactic antibiotics** should be administered to cover insertion of the catheter

REHABILITATION AND DISCHARGE

ASSESSMENT

B Within 48 hours of admission, **a corroborated history** should be obtained, which should include:
- premorbid function and mobility
- available social support
- current relevant clinical conditions
- mental state

A Patients with co-morbidity, poor functional ability and low mental test scores prior to admission should undergo rehabilitation in a **Geriatric Orthopaedic Rehabilitation Unit**

REHABILITATION

A Consider **diet supplementation** with high energy protein preparations containing minerals and vitamins

B **Multidisciplinary team working** facilitates the rehabilitation process

DISCHARGE MANAGEMENT

B **Supported discharge schemes** should be used to facilitate the safe discharge of elderly hip fracture patients and reduce acute hospital stay

☑
- The patient should be central to discharge planning
  The views of carers are also important
- Liaison between hospital and community (including social work) facilitates the discharge process
- The patient, carer, GP and other community services should be given as much notice as possible of the date of discharge
- Discharge should not take place until arrangements for postdischarge support are in place and the patient is fit for discharge
- Written information on medication, mobility, expected progress, pain control and sources of help and advice should be available to patient and carer
- GPs have an important role in postdischarge rehabilitation and should receive early, comprehensive information on hospital stay, services arranged and follow up arrangements
- Consider prevention of falls, especially potential household hazards, footwear, provision of adaptive equipment/walking aids and alarm systems

PREVENTING HIP FRACTURE: RISK FACTORS FOR FRACTURES AND FALLS

Key risk factors for fracture *(bone related):*

- previous low trauma fracture after the age of 50
- maternal history of hip fracture
- current smoking
- low body weight

Assessment of bone mass is probably the most powerful bone-related predictor of future hip fracture

Identifiable risk factors for falls

- muscle weakness
- abnormality of gait or balance
- poor eyesight
- drug therapy
  – hypnotics / sedatives / diuretics / antihypertensives
- neurological disease e.g. Parkinson's disease, stroke
- foot problems/ arthritis
- layout of home environment (e.g. loose or slippery floorcovering)

A
- **Assess the risk of hip fracture** and **falls** in older people using identified risk indicators *(patient and environment)* and base any intervention on this risk assessment
- Those at increased risk should be offered **multiple interventions*** aimed at reducing the identified individual and environmental risks

** e.g. exercise programme (focusing on strength, flexibility and which are weight bearing), balance training, and modification of identified hazards.*

B **Hip protectors** are recommended in men and women at high risk of hip fracture, particularly older people in care homes, although problems with compliance should be recognised

COST-EFFECTIVE TARGETING OF PREVENTIVE INTERVENTIONS

B Assessment of recognised risk factors for low **bone mineral density (BMD)** is the most cost-effective method of targeting interventions that act on low bone density. Mass screening for low BMD is less cost-effective and is not recommended

All patients who are assessed as being at risk of hip fracture should be treated with calcium and vitamin D

A All patients who are assessed as being at high risk of hip fracture should be treated with:

- **hip protectors,** if the patients are living in a care home setting and are assessed as being compliant
- the **bisphosphonates** alendronate or risedronate when risk is assessed by measuring BMD

☑ Where access to BMD measurement is impractical, bisphophonates may be considered in patients with strong evidence of pre-existing osteoporosis

Many disciplines, specialties and agencies are involved in managing patients with a hip fracture
Coordinated provision of acute care, rehabilitation and continuing support is essential

TRANSPORT TO HOSPITAL

☑
- Transport to hospital from the site of the injury should be undertaken as quickly as possible
- Training of all ambulance personnel should include recognition of possible fractured hip in an elderly person, often signified by:
  – history of fall
  – presence of hip pain
  – shortening and external rotation of the lower limb
- If necessary, pain relief should be given as quickly as possible using intravenous opiate analgesia, carefully titrated and supervised for effect, starting with a low dose
  If this is not possible consider analgesia using entonox
- If the patient faces a long journey or delay before transfer, consider use of an indwelling catheter
- Attention should be paid to pressure area care

MANAGEMENT IN A&E

☑ Patients suspected of having a fractured hip should be assessed by medical staff as soon as possible, preferably within one hour

D **Early assessment**, in A&E or on the ward should include a formal recording of:

- pressure sore risk
- hydration and nutrition
- fluid balance
- pain
- core body temperature using a low reading thermometer
- continence
- co-existing medical problems
- mental state
- previous mobility
- previous functional ability
- social circumstances

D
- Use **soft surfaces** to protect heel and sacrum from pressure damage
- Keep the patient **warm**
- Administer adequate **pain relief** to allow regular, comfortable change of position
- Instigate **early radiology**
- Measure and correct any **fluid and electrolyte abnormalities**

B If very high risk of **pressure sores**, use a large-cell, alternating-pressure air mattress or similar pressure-decreasing surface

D **Transfer patient to ward within two hours of arrival in A&E**

DIAGNOSIS

The vast majority of hip fractures are easily identified on plain radiographs, but a normal x-ray does not necessarily exclude a fractured hip

D
- **Magnetic resonance imaging (MRI)** is the investigation of choice where there is doubt regarding the diagnosis, e.g. a radiologically normal hip in a symptomatic patient.
- If MRI is not available or not feasible, perform a **radioisotope bone scan** or **repeat plain radiographs** (after a delay of 24-48 hours), perhaps with additional views
- Adminster adequate and appropriate **pain relief** before the patient is transferred from a trolley to the x-ray table

PREOPERATIVE CARE

A The routine use of **traction** *(either skin or skeletal)* does not appear to have any benefit and is **not recommended**

A All patients undergoing hip fracture surgery should receive **antibiotic prophylaxis**

☑ Bacteriuria should **not** be a reason to postpone surgery

A Consider **prophlyaxis against venous thromboembolism (VTE)**
- **Mechanical prophylaxis** to reduce risk of asymptomatic VTE (intermittent pneumatic compression or foot pumps)
- **Aspirin** for all patients (150 mg orally for 35 days)
- **Heparin** reserved for selected patients at high risk of VTE due to multiple risk factors or contraindications to mechanical prophlyaxis and/or aspirin

D Assess possible **hypovolaemia** and **electrolyte balance**, and correct deficiencies

C Check **oxygen saturation** on admission and administer supplementary oxygen to all patients with hypoxaemia

KEY

A B C D **Indicates grade of recommendation**

☑ **Indicates good practice point**