



Management of hip fracture in older people

A national clinical guideline



June 2009

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, eg case reports, case series
- 4 Expert opinion

GRADES OF RECOMMENDATION

Note: The grade of recommendation relates to the strength of the evidence on which the recommendation is based. It does not reflect the clinical importance of the 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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Scottish Intercollegiate Guidelines Network

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A national clinical guideline



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purpose of implementation in NHSScotland

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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. For the frailest of all it may bring pain, confusion and disruption to complicate an already distressing illness. Overall, one-year mortality after hip fracture is high, at around 30%, though only one third of that is directly attributable to the fracture.¹ 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. Firstly, because it occurs in older people and is commonest in those with previous frailty and dependency, and with pre-existing medical problems. Secondly, because an accidental fall, most commonly at home, marks the beginning of a complex journey of care. This takes patients through the emergency 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 inpatient 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 many different professionals in the course of one admission. 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 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,² is thus an important but challenging topic for a clinical guideline.

1.1.1 UPDATING THE EVIDENCE

In 1997 the first Scottish guideline on hip fracture, SIGN 15: Management of elderly people with fractured hip, was published.³ In keeping with SIGN's commitment to keep its guidelines up to date, this was superseded in 2002 by SIGN 56: Prevention and management of hip fracture in older people. SIGN 56, a completely new guideline, was well received, and, in conjunction with the Scottish Hip Fracture Audit, raised the profile of hip fracture care in Scotland by exploiting the synergy of guidelines and audit in the improvement of care.⁴ The availability of the SIGN guideline and a comprehensive national audit led to the selection of hip fracture as a tracer condition for NHS Quality Improvement Scotland (NHS QIS) work on Older People in Acute Care, with a National Report in 2002 showing that the standards for hip fracture care were only variably met. Most significantly, these cumulative developments supported the implementation of a Scottish government target to provide surgery within 48 hours for medically fit patients – a target achieved in 2008 in over 95% of cases.

In 2007 a guideline review group was convened to review the emerging evidence on hip fracture care and undertake a selective update of SIGN 56. Secondary prevention of hip fracture, though covered in SIGN 56, was not addressed in the review because the assessment and treatment of osteoporosis has been the subject of a separate guideline,⁵ and, because little evidence of significance could be identified on the value of falls prevention measures in the specific post-hip fracture context. General guidance on secondary prevention of fragility fractures is available in the 2007 Blue Book on the care of patients with fragility fracture.⁶

Where no new evidence was identified to support an update, text and recommendations are reproduced verbatim from SIGN 56. The original supporting evidence was not re-appraised by the current guideline development group.

1.1.2 THE COST OF CARE

The care of hip fracture patients is costly.⁷ In 2003 the average hospital cost for a patient over 60 years of age undergoing surgery for a hip fracture was retrospectively estimated at £12,163.⁷ As there are over 6,000 hip fracture patients each year in Scotland and the vast majority are treated surgically (96.3%),² the estimated annual hospital cost for NHS Scotland is around £73 million. The ongoing substantial total cost of hip fracture care should take into account subsequent related health and social care costs required after discharge from hospital and costs met by the families of the patients.

1.2 REMIT OF THE GUIDELINE

1.2.1 OVERALL OBJECTIVES

The aim of this guideline is to ensure that older people with a hip fracture receive optimal management. This guideline covers pre-hospital care, management in the emergency department, pre- and postoperative care, discharge planning and rehabilitation. Prevention of hip fracture and the management of osteoporosis are covered elsewhere.⁵

Guidance on preventing falls in older people is available from the National Institute for Health and Clinical Excellence (NICE).⁸

1.2.2 TARGET USERS

This guideline will be of interest to anyone who has responsibility for the care of patients with a hip fracture, including ambulance staff, carers, general practitioners, hospital doctors, nurses, anaesthetists, orthopaedic surgeons, occupational therapists, patients, physiotherapists, dietitians and social workers.

1.2.3 SUMMARY OF UPDATES TO THE GUIDELINE BY SECTION

2	Key recommendations	New
3	Pre-hospital management	Unchanged
4	Emergency department management	Minor update
5	Preoperative care	Completely revised
6	Anaesthetic management	Completely revised
7	Surgical management	Minor update
8	Early postoperative management	Updated
9	Rehabilitation and discharge	Updated
10	Provision of information	New

1.3 STATEMENT OF INTENT

This guideline is not intended to be construed or to serve as a standard of 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. Adherence to guideline recommendations will not ensure a successful outcome in every case, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care aimed at the same results. The ultimate judgement must be made by the appropriate healthcare professional(s) responsible for clinical decisions regarding a particular clinical procedure or treatment plan. This judgement should only be arrived at following discussion of the options with the patient, covering the diagnostic and treatment choices available. It is advised, however, 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.

1.3.1 PRESCRIBING OF LICENSED MEDICINES OUTWITH THEIR MARKETING AUTHORISATION

Recommendations within this guideline are based on the best clinical evidence. Some recommendations may be for medicines prescribed outwith the marketing authorisation (product licence). This is known as “off label” use. It is not unusual for medicines to be prescribed outwith their product licence and this can be necessary for a variety of reasons.

Generally the unlicensed use of medicines becomes necessary if the clinical need cannot be met by licensed medicines; such use should be supported by appropriate evidence and experience.⁹

Medicines may be prescribed outwith their product licence in the following circumstances:

- for an indication not specified within the marketing authorisation
- for administration via a different route
- for administration of a different dose.

‘Prescribing medicines outside the recommendations of their marketing authorisation alters (and probably increases) the prescribers’ professional responsibility and potential liability. The prescriber should be able to justify and feel competent in using such medicines.’⁹

Any practitioner following a SIGN recommendation and prescribing a licensed medicine outwith the product licence needs to be aware that they are responsible for this decision, and in the event of adverse outcomes, may be required to justify the actions that they have taken.

Prior to prescribing, the licensing status of a medication should be checked in the current version of the British National Formulary (BNF).

1.3.2 ADDITIONAL ADVICE TO NHSSCOTLAND FROM NHS QUALITY IMPROVEMENT SCOTLAND AND THE SCOTTISH MEDICINES CONSORTIUM

NHS QIS processes multiple technology appraisals (MTAs) for NHSScotland that have been produced by the National Institute for Health and Clinical Excellence (NICE) in England and Wales.

The Scottish Medicines Consortium (SMC) provides advice to NHS Boards and their Area Drug and Therapeutics Committees about the status of all newly licensed medicines and any major new indications for established products.

SMC advice and NHS QIS validated NICE MTAs relevant to this guideline are summarised in the section on implementation.

2 Key recommendations

The following recommendations were highlighted by the guideline development group as the key clinical recommendations that should be prioritised for implementation. The grade of recommendation relates to the strength of the supporting evidence on which the evidence is based. It does not reflect the clinical importance of the recommendation.

2.1 TRANSPORT TO HOSPITAL

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

2.2 ASSESSMENT IN THE EMERGENCY DEPARTMENT

- D** Early assessment, in the ED 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
 - coexisting medical problems
 - mental state
 - previous mobility
 - previous functional ability
 - social circumstances and whether the patient has a carer.
- Medical staff should assess patients suspected of having a fractured hip as soon as possible, preferably within one hour of arrival in the ED.

2.3 PHYSICIAN OR ORTHOGERIATRICIAN INPUT

- D** All patients presenting with a fragility fracture should be managed on an orthopaedic ward with routine access to acute orthogeriatric medical support.

2.4 TIMING OF SURGERY

- C** Services and resources should be organised to:
 - maximise the proportion of medically fit patients receiving surgery as soon as possible, within safe operating hours (*including weekends*), after presenting to hospital with hip fracture
 - reduce the duration of pain and dependency
 - reduce hospital length of stay.

2.5 ANAESTHETIC EXPERIENCE

- D** Anaesthesia should be carried out, or closely supervised, by an anaesthetist experienced in anaesthesia in older people.

2.6 EARLY MOBILISATION

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

2.7 REHABILITATION

- B** A multidisciplinary team should be used to facilitate the rehabilitation process.

2.8 DISCHARGE

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

2.9 DISCHARGE MANAGEMENT

- The patient should be central to discharge planning, and their needs and appropriate wishes taken into consideration. The views of a carer are also important.

3 Pre-hospital management

3.1 TRANSPORT TO HOSPITAL

No evidence was identified 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 older 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 (*eg 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*).

3.2 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 should be recorded.¹⁰

- 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**
 - **pre-morbid functional state, particularly mobility**
 - **pre-morbid cognitive function**
 - **social circumstances and whether the patient has a carer.**
- History of previous falls should be recorded.

4 Emergency department management

The recommendations contained in this section are mainly based on the 1989 report from the Royal College of Physicians of London.¹¹

4.1 ASSESSMENT IN THE EMERGENCY DEPARTMENT

Assessment in the emergency department (ED) should include all relevant medical, nursing and social factors as well as the orthopaedic injury.^{11,12}

4

D Early assessment, in the ED 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
- coexisting medical problems
- mental state
- previous mobility
- previous functional ability
- social circumstances and whether the patient has a carer.

Medical staff should assess patients suspected of having a fractured hip as soon as possible, preferably within one hour of arrival in the ED.

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,¹³ 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.¹⁴ Use of a foam based low-pressure mattress, rather than a standard hospital mattress, has been shown to reduce the occurrence of pressure sores.^{15,16}

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 on fractured neck of femur has produced a number of recommendations which should be applied to all patients in emergency departments.¹¹

4

D Patients admitted to the ED 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,¹¹ the guideline review group (2002) found no evidence to suggest that fast tracking improves patient outcome. However, evidence on pressure care suggests that fast tracking provides a good standard of clinical care.¹⁷ The NHS QIS standards for older people in acute care require people with confirmed or suspected hip fracture to begin transfer within two hours of arrival in the emergency department.¹⁸

3
4

The Scottish Hip Fracture Audit (SHFA) found that during a nine month period in 2006 around 24% of patients with a broken hip were transferred through the ED within two hours. Fifty eight per cent were transferred within two to four hours while almost 18% had a stay in the ED of over four hours.²

D Patients should be transferred to the ward within two hours of their arrival in the emergency department.

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.¹⁹⁻²²

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 best achieved by titration of intravenous opiates. In selected cases local nerve block may be appropriate.²³ 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.

2+

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 (*eg due to lack of appropriate supervision*) then analgesia using entonox should be considered.

5 Preoperative care

5.1 PHYSICIAN OR ORTHOGERIATRICIAN INPUT

People who sustain hip fractures are often frail, may have comorbid conditions and be medically precarious. These patients, who are often treated in trauma units, may benefit from the skills of a geriatrician.

Little evidence was identified on the effect on inpatient mortality in hip fracture patients of early physician or orthogeriatrician input during acute admission. The existing evidence was inconsistent. The nature of early physician or orthogeriatrician input was not clearly defined, and the relationship with other relevant inputs, for example, from surgical staff, was not described.

A randomised controlled trial (RCT) of a model of care involving a role similar to an orthogeriatrician showed a significant reduction in inpatient mortality and a trend to reduction in twelve-month mortality.²⁴ A cohort study of a 'hospitalist' model of care using physician assistants showed no significant difference in inpatient mortality and did not record twelve month mortality.²⁵ Both studies reported a reduction in length of stay following the intervention, but neither clearly demonstrated that this was attributable to the intervention. In the cohort study, there was a reduction of 2.2 days in the mean length of stay and a reduction of 13 hours in the mean time to surgery. No account was taken of potential changes in other factors, which may have also affected the length of stay. In the RCT only the length of stay in the surgical ward was recorded and a higher number of patients were transferred to rehabilitation wards in the intervention group (74.2% versus 59.6%, $p=0.006$). There was no significant difference in time to theatre.

1-
2+

The British Orthopaedic Association guideline on the care of patients with a fragility fracture suggests that a high standard of medical management of older people with hip fracture is best achieved by the employment of a consultant or staff grade physician to work full time on the fracture ward, providing daily medical care and advice in the perioperative management of older patients with hip fracture.⁶

4

D All patients presenting with a fragility fracture should be managed on an orthopaedic ward with routine access to acute orthogeriatric medical support.

5.2 TIMING OF SURGERY

5.2.1 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 attention to chronic medical conditions.²⁶ Short delays prior to surgery may be justified for the correction of such conditions as hypo- and hyperkalaemia, poorly controlled cardiac failure or diabetes or significant anaemia. For the investigation of cardiac murmurs see section 5.2.4.

4

A single-cohort study found that the odds ratio (OR) of postoperative complications in the presence of significant preoperative abnormality ranged from 3.02 to 4.65 ($p < 0.005$), whereas in the presence of minor preoperative abnormalities the odds ratio ranged from 0.76 to 1.2 (non-significant, NS).²⁷

2-

Chasing unrealistic medical goals should not lead to delay. For example, it may not be appropriate to delay surgery because of infective pulmonary conditions, as real improvement is unlikely in the presence of continued immobility and pain.²⁸

5.2.2 REVERSAL OF WARFARIN ANTICOAGULATION

A body of evidence indicates that low-dose vitamin K (1-2.5 mg) administered either intravenously (IV) or orally, partially reverses the anticoagulant effect of warfarin over a 24 hour period. The studies have been carried out in patients who are over anticoagulated and present with international normalised ratio (INR) values above their therapeutic range. However, the same effect on the intensity of anticoagulation would be expected in patients within therapeutic range.²⁹ The onset of reversal is quicker and change in INR value greater in the first four hours when IV vitamin K is administered compared with a similar dose of oral vitamin K.³⁰

1++
3

B Withholding warfarin combined with administration of oral or intravenous vitamin K is recommended if reversal of the anticoagulant effects of warfarin to permit earlier surgery is deemed appropriate.

The indications for transfusing fresh-frozen plasma (FFP) are very limited. When transfused it can have significant adverse effects including transmission of infection, allergic reactions, anaphylaxis, transfusion-related acute lung injury, and haemolysis. Guidelines for the use of fresh-frozen plasma, and cryoprecipitate are available.³¹

4

FFP should not be used where there is no contraindication to the use of vitamin K.

D Where it is deemed appropriate to use it, FFP should be used in accordance with national guidelines from the British Committee for Standards in Haematology.

Local policies for reversal of anticoagulation particularly in relation to valvular heart disease and recurrent VTE should be agreed.

A report from the SHFA showed that 95% of patients with an INR > 1.6 had their surgery postponed.²⁸ 3.4% of all hip fracture patients had their surgery postponed because of coagulation problems (INR > 1.6), and 2.5% had their surgery delayed by more than 48 hours.²⁸ If all patients requiring coagulation correction for INR > 1.6 could be corrected and taken to theatre within one day, nearly 400 bed-days would be saved across NHSScotland annually.

5.2.3 ANTIPLATELET THERAPY

An increasing number of patients are receiving antiplatelet drugs for the prevention of stroke, myocardial infarction, and thrombosis after coronary stent insertion. Patients receive drugs such as aspirin, dipyridamole and clopidogrel alone or in combination. There is concern in these patients about an increased risk of surgical bleeding and also the development of spinal haematoma after spinal or epidural anaesthesia.³²⁻³⁴ The management of these patients is described in SIGN 96: Management of stable angina³⁵ and in an evidence based review from the American College of Chest Physicians (ACCP).³⁶

To reduce the risks of surgical bleeding the ACCP guideline recommends stopping antiplatelet drugs for a minimum of five days before elective surgery. When patients require emergency surgery the recommendation is not to delay and to transfuse platelets only in the event of excessive surgical bleeding.³⁶

4

Spinal or epidural anaesthesia is generally not recommended in patients taking dual antiplatelet therapy.^{32,33,37} Treatment with aspirin or dipyridamole alone does not contraindicate spinal or epidural anaesthesia.^{32,33,37}

The 2003 guidelines published by the American Society of Regional Anesthesia recommended that clopidogrel should be stopped seven days before performing neuraxial anaesthesia. This was based largely on manufacturer's advice.³⁷ There are case reports of spinal haematoma occurring in patients taking clopidogrel, even though the patients had stopped taking the drug more than seven days before anaesthesia was performed.^{38,39}

Surgery should not be delayed in hip fracture patients taking antiplatelet therapy.

General anaesthesia is recommended for patients taking dual antiplatelet therapy. Neither spinal nor epidural anaesthesia are recommended.

5.2.4 PREOPERATIVE CARDIAC INVESTIGATION

Systolic murmurs are common in the elderly. The incidence of aortic stenosis is approximately 3% in those aged over 75 years.⁴⁰ The presence of a murmur often leads to a request for echocardiography which may delay surgery. In many cases the murmur has been previously investigated and repeating the echocardiogram is not necessary unless there is a significant change in the patient's clinical condition.

In an SHFA report on fitness for theatre statistics, 621 out of 5,447 patients were found to have a cardiac murmur.²⁸ Echocardiography was planned for 127 of these patients after the first assessment and around one half of these patients had surgery the same day, following an echocardiogram and avoiding further delay. There was widespread variation in the use of echocardiography throughout Scotland (0-15%). This may relate to the availability of either cardiology support or the results of previous echocardiograms. If it is possible to identify clinically the type and severity of the murmur then an echocardiogram may not be required.⁴¹ This may be difficult for the non-specialist.

- Echocardiography should be performed if aortic stenosis is suspected, to allow confirmation of diagnosis, risk stratification and any future cardiac management.

Echocardiogram results are unlikely to significantly alter perioperative management. Concerns about potential uncontrolled hypotension with spinal or epidural anaesthesia can be avoided when patients are looked after by experienced anaesthetists who undertake general anaesthesia and invasive arterial pressure monitoring. Postoperative management in a high dependency unit (HDU) after a period of observation in the recovery room may be appropriate for selected patients.

- The need for echocardiography, based on clinical history, physical examination and ECG findings should not delay surgery unduly.
- Rapid access to an echocardiography service is recommended for appropriate patients to avoid unnecessary delay to surgery.

A retrospective cohort study of 235 patients assessed the medical and economic impact of preoperative cardiac testing in the treatment of patients with hip fracture.⁴² In patients with hip fracture and acute cardiac changes (new ECG changes, arrhythmias, or congestive cardiac failure), preoperative cardiac investigation made no difference to surgical management. Cardiac testing introduced an average delay of three days to surgery. In 50% of patients with hip fracture with known cardiac disease new medical recommendations were made following clinical investigation. Patients identified clinically as high risk had the highest incidence of perioperative cardiac complications. Clinical suspicion of cardiac perioperative risk by diagnosis of acute cardiac changes preoperatively was as reliable as cardiac testing. Patients identified clinically as "at-risk" had the highest incidence of perioperative cardiac complications.

2+

Guidelines from the American College of Cardiology and the American Heart Association for investigation of cardiac disease for non-cardiac surgery do not support the use of additional investigations in most patients.⁴¹

4

- C** Older people with hip fracture do not require routine additional cardiac investigation such as echocardiography before surgery.
- C** Additional cardiac investigation may be considered in patients with clinical suspicion of perioperative cardiac risk.
- Systems should be established to ensure that additional cardiac investigations, when required, do not delay surgery.

5.2.5 EFFECT OF DELAY ON PATIENT OUTCOMES

The volume of evidence for the efficacy of early surgery (within 48 hours) in patients with osteoporotic hip fracture is low and confined to cohort studies.^{43,44} The quality of studies is limited due to complex case mixes, the varying structures and pressures of trauma care, and the high variability of relevant care inputs (for example, orthogeriatrician presence).

There is no consistent evidence of an improvement in mortality from early surgery for hip fracture. There is evidence of reduced length of stay and of patients being highly dependent or in severe or very severe pain for a shorter time.^{44,45}

Some consistency exists when other variables, largely case mix, are taken into account in the published analyses. The biggest differences can be accounted for by case mix differences and seem to arise most commonly from the interactive relationship of medical instability and preoperative delay.⁴³⁻⁴⁷

Surgery should be performed as soon as the medical condition of the patient allows, provided that appropriate staffing and facilities are available.⁴⁸⁻⁵⁰

The SHFA found that 23% of patients were deemed unfit at first assessment. Some of these patients still made it to theatre within the 24 safe hours target.²⁸ The percentage of medically fit patients going to theatre within 24 safe operating hours of ward admission had been around 86%. By December 2007 this had risen to 97% across Scotland, representing an improvement in the quality of care for this frail elderly population. The SHFA National Waiting Times Unit (NWTU) time to theatre compliance figures are available from www.shfa.scot.nhs.uk/NWTUmain.htm

- C Services and resources should be organised to:**
- maximise the proportion of medically fit patients receiving surgery as soon as possible, within safe operating hours (*including weekends*), after presenting to hospital with hip fracture
 - reduce the duration of pain and dependency
 - reduce hospital length of stay.

2+
2-
2+

5.3 PREOPERATIVE TRACTION

A Cochrane review examined the use of traction (both skin and skeletal) applied to the injured leg from the time of admission until surgery.⁵¹ 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.

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*) is not recommended prior to surgery for a hip fracture.

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

1+

5.4 REDUCING INFECTION

5.4.1 PROPHYLAXIS AGAINST INFECTION

A meta-analysis found that compared to placebo, antibiotic prophylaxis significantly reduced the overall wound infection, deep wound and superficial wound infection after hip fracture repair.⁵² Antibiotic use was also associated with a significant reduction in urinary tract infection but not mortality.

1++

Recommendations on dosage and regimen are available from SIGN 104: Antibiotic prophylaxis in surgery.⁵³

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

Patients with hip fractures are also at risk of infections of the chest and urinary tract.⁵⁴ 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.⁵⁵

5.4.2 METICILLIN RESISTANT STAPHYLOCOCCUS AUREUS

No evidence was identified to show whether carriage of multiresistant organisms is associated with more frequent postoperative surgical site infection (SSI) than carriage of sensitive strains.

In medical patients, carriage of meticillin resistant *Staphylococcus aureus* (MRSA) is strongly predictive of subsequent MRSA infection in the short or long term.⁵⁶⁻⁵⁹ | 2+
3

Extrapolation of these data to surgical patients suggests that MRSA carriage may be a risk factor for SSI in hip fracture patients. Preoperative care and choice of prophylactic antibiotic may need to be modified where patients are colonised with MRSA.⁵³

Carriage of multiresistant organisms should be recognised as a potential risk factor for surgical site infection during hip fracture surgery.

For patients with suspected multiresistance carriage undergoing hip fracture surgery preoperative care should include:

- screening for relevant organisms
- changing the antibiotic of choice for prophylaxis.

Infected or colonised patients should be isolated in accordance with hospital infection control guidelines and in consultation with the infection control team.

Where antibiotic prophylaxis is indicated, patients undergoing high risk surgery who are MRSA positive should receive a suitable antibiotic active against local strains of MRSA.

A Health Technology Assessment report from NHS QIS on the clinical and cost effectiveness of screening for MRSA is available.⁶⁰

5.5 REDUCING THE RISK OF VENOUS THROMBOEMBOLISM

Hip fracture surgery carries a high risk of venous thromboembolism (VTE) including asymptomatic deep vein thrombosis (DVT), symptomatic DVT and symptomatic pulmonary embolism (PE). The incidence of symptomatic VTE is 1.34% in patients given pharmacological thromboprophylaxis.^{61,62} | 4

Mechanical prophylaxis may reduce the incidence of thrombosis (see section 5.5.5), but can be labour intensive, expensive and poorly tolerated. Pharmacological prophylaxis reduces the incidence of DVT and PE (see sections 5.5.1-5.5.3), but carries a small risk of bleeding complications.⁶¹

There is no evidence for superiority of pharmacological prophylaxis over mechanical prophylaxis but this may relate to the paucity of comparative studies.⁶³ | 1++

The overall balance of risks and benefits is complex in hip fracture patients and an approach to perioperative care that ensures early surgery and immediate postoperative mobilisation, and avoids prolonged operations may help to reduce the incidence of clinical thrombosis.

5.5.1 ASPIRIN

Aspirin reduces the risk of thromboembolism. In a large RCT the beneficial effect of aspirin was seen in all major subgroups of patients including those receiving heparin.⁶⁴ Aspirin reduced the risk of any VTE by 36% which represents an absolute reduction in VTE of nine per thousand. However in this study the investigators were allowed to use any other form of thromboprophylaxis required. Large numbers of patients used mechanical methods of prophylaxis and/or heparin (30% and 26%) in addition to aspirin. This undermines the value of the study as it is likely that only those at lowest thrombosis risk used aspirin alone. Furthermore, the data suggest that the main effect of aspirin was seen after the first postoperative week when conventional pharmacological prophylaxis has been discontinued suggesting that the duration of therapy may be responsible for the major effect. Finally, there has been concern around the reporting of the haemorrhagic risk associated with the use of aspirin. Overall there was an excess of any postoperative bleeding which required transfusion in those assigned aspirin (2.9% compared to 2.4%) which represents an excess of six bleeds per 1,000 patients treated.

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These data indicate that aspirin has a protective effect against VTE in patients with hip fracture undergoing surgery. They do not do give a clear indication that this is the optimal way of preventing VTE in this group.

5.5.2 HEPARIN

No studies were identified comparing heparin with aspirin for reducing the risk of thromboembolism. The studies available show no significant effect of unfractionated heparin (UFH) or low molecular weight heparin (LMWH) on fatal PE or mortality.

Heparins reduce the risk of DVT following hip fracture surgery. A systematic review showed that both UFH and LMWH reduced the risk of DVT compared to placebo by 41% and 36% respectively.⁶³

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Although there is no evidence of superior efficacy of LMWH over UFH it is widely recognised that the adverse effect profile of LMWH is superior to UFH especially in relation to the development of heparin induced thrombocytopenia which is more commonly seen after major orthopaedic surgery than in any other clinical group.⁶⁵

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5.5.3 FONDAPARINUX

Fondaparinux is a synthetic pentasaccharide anticoagulant that inhibits coagulation by a similar mechanism to heparin.

In a large RCT, fondaparinux administered either 12 hours before delayed hip surgery (24-48 hours post admission) or six hours after prompt surgery (within 24 hours of admission) reduced the risk of thromboembolism compared to the LMWH enoxaparin during the period of thromboprophylaxis. The relative risk reduction associated with the use of fondaparinux compared with enoxaparin was as follows; all VTE 56%, all DVT 58%, proximal DVT 79% and distal DVT 55%. There was no difference in the risk of symptomatic VTE, symptomatic DVT, non-fatal or fatal PE. This represents an absolute risk reduction of 10.8% for all VTE. There was no difference in the incidence of major bleeding between the two treatments. The number of patients who required re-operation due to bleeding was 3/831 for fondaparinux and 2/842 for enoxaparin. Based on this the number needed to treat (NNT) for benefit is 10 whilst the number needed to harm (NNH) is 817.⁶⁶

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In a post hoc analysis of the data the crude odds reduction in events was 73.1%, 61.7% and 61.6% using criteria recommended by the ACCP, the European Committee for Proprietary Medical Products and the initial criteria respectively (the raw data for patients with hip fracture were not given in this paper but the overall absolute risk reduction in favour of fondaparinux was 1.8%.¹⁶² Based on this the number needed to harm (NNH) for benefit is 55 versus a NNH of 817).

Further data from the extended arm of this study indicate that prolongation of thromboprophylaxis with fondaparinux for a further 19-23 days reduced the risk of thrombosis from 35% to 1.4% compared with placebo.⁶⁷ There was also a significant reduction in the incidence of symptomatic DVT in favour of fondaparinux.

- A** Heparin (*UFH* or *LMWH*) or fondaparinux may be used for pharmacological thromboprophylaxis in hip fracture surgery.
- A** Patients without a contraindication should receive thromboprophylaxis using fondaparinux for 28 days starting six hours after surgery.
- Fondaparinux should not be used before surgery because of the increased potential for spinal haematoma after spinal or epidural anaesthesia.
 - If surgery is delayed patients should receive thromboprophylaxis with heparin (*UFH* or *LMWH*).
 - Fondaparinux should be considered for all patients after surgery, unless contraindicated.
- D** Aspirin monotherapy is not recommended as appropriate pharmacological prophylaxis for patients after hip fracture surgery.

5.5.4 COST EFFECTIVENESS OF PHARMACOLOGICAL PROPHYLAXIS

In patients with osteoporotic hip fractures, fondaparinux as pharmacological prophylaxis in reducing the risk of postoperative thromboembolism is cost effective when compared with enoxaparin.⁶⁸⁻⁷²

No evidence was identified on the cost effectiveness of aspirin in reducing the risk of postoperative thromboembolism.

5.5.5 MECHANICAL PROPHYLAXIS

A high quality systematic review of RCTs comparing mechanical thromboprophylaxis with no treatment or leg elevation suggests a likely benefit for mechanical pumping devices in preventing DVT after hip fracture surgery.⁶³ Physical devices, which included cyclic sequential compression and arterial venous (A-V) foot impulse systems, reduced the risk of DVT by 69% compared to control. The effect of mechanical devices on the development of non-fatal and fatal PE is not conclusive. The use of physical devices was not associated with an increased risk of bleeding complications or transfusion requirements. Difficulties with compliance with the foot pump were noted due to blisters, unacceptability and dorsal foot sores. Design modification in the two relevant studies prevented subsequent problems.⁶³

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There is no good evidence that the use of graduated compression stockings prevents venous thromboembolism in patients with hip fracture.⁶³

1++

- A** Mechanical prophylaxis should be considered in suitable patients to reduce the risk of DVT after hip fracture.

5.6 FLUID AND ELECTROLYTE BALANCE

Fluid and electrolyte balance problems are common in the course of hip fracture management in older people. Awareness of these risks is part of preoperative assessment. At particular risk are older, frailer patients, and those in whom identification of hip fracture and hence admission has been delayed.⁷³

4

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

5.7 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.^{74,75}

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

6 Anaesthetic management

NHS QIS has developed national standards for before, during and after anaesthesia.⁷⁶

6.1 ANAESTHETIC EXPERIENCE

Patient outcomes are better when perioperative management is undertaken by experienced anaesthetic personnel.^{26,77} The SHFA has shown variations in practice in the anaesthetic management of hip fracture patients.⁷⁸

3

D Anaesthesia should be carried out, or closely supervised, by an anaesthetist experienced in anaesthesia in older people.

6.2 GENERAL VERSUS SPINAL/EPIDURAL ANAESTHESIA

A systematic review found no robust evidence that spinal/epidural anaesthesia confers any benefit over general anaesthesia with regards to overall mortality at three, six and 12 months following surgical repair of hip fracture in older people (6.9% versus 10%; relative risk, RR 0.69; confidence interval, CI 0.5 to 0.95).⁷⁹ The studies identified were of poor quality and did not reflect current clinical practice. There were no differences in the lengths and rates of hospital stay, pneumonia, stroke, cardiac failure or renal failure when comparing spinal/epidural anaesthesia with general anaesthesia. Spinal/epidural anaesthesia demonstrated a small but significant reduction in the incidence of acute confusional state postoperatively compared to general anaesthesia.

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Data on the use of anaesthesia collected by the SHFA in 2005 included 4,426 hip fracture patients from 13 centres. This represented 72% of hip fractures reported in Scotland that year.⁷⁸ Of these patients around 40% received a general anaesthetic and 60% spinal/epidural anaesthesia. Although individual hospitals have varied their practice, this balance has remained unchanged for the last 10-15 years with no appreciable effect on outcomes.

Spinal/epidural anaesthesia should be considered for all patients undergoing hip fracture repair, unless contraindicated.

6.2.1 ANTIPLATELET THERAPY

There is little or no evidence that aspirin alone or clopidogrel alone increases the risk of vertebral canal haematoma in patients receiving spinal or epidural anaesthesia,^{32,33,37,80} although interactions with other agents such as heparins or warfarin may occur.⁸¹ The literature suggests that spinal or epidural anaesthesia should be avoided in patients taking dual antiplatelet therapy, as the risk of developing spinal haematoma is considered to increase.^{32,33,37}

4

6.2.2 HEPARIN

The use of spinal/epidural anaesthesia in patients who have received unfractionated low-dose heparin (LDH) and LMWH carries the risk of developing a vertebral canal haematoma. Anti-Xa activity after LMWH peaks three to four hours after injection and falls to 50% only after 12 hours.⁸²

4

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

6.2.3 FONDAPARINUX

As fondaparinux is usually commenced six hours after surgery there are few concerns about an increased risk of spinal haematoma as a consequence of spinal/epidural anaesthesia administration (see section 5.5.3). Caution should be exercised when removing neuraxial or peripheral nerve catheters in patients receiving fondaparinux; an interval of at least 24 hours from the most recent administration is advised.⁸³

6.3 PERIPHERAL NERVE BLOCKS

A systematic review of the use of nerve block for pain relief before and/or after surgery for fractured neck of femur identified seven studies on the use of nerve block and one study on epidural analgesia. All eight studies had methodological flaws and small patient numbers.²³ The use of peripheral nerve blocks as part of a multimodal approach to pain management following surgical repair of hip fracture, reduced parenteral analgesic requirement in the initial 24 hour following surgery. Reduction in parenteral analgesic requirements was not translated into a reduction in complications associated with parenteral therapy. None of the studies reported on mental function, functional status or return to previous residence, indicating that apart from reduced parenteral therapy requirement in the first 24 hours, no other clinical benefit for the patient was reported.

2+

Peripheral nerve blocks require administration by experienced personnel.

- The use of perioperative peripheral nerve blockade may be considered as part of the multimodal management of pain following surgery in hip fractures.

6.4 BLOOD TRANSFUSION

There is a paucity of evidence regarding blood transfusion for patients with hip fracture.

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.⁸⁴ However, several smaller studies have suggested that patients with known cardiac disease may benefit from transfusion at higher haemoglobin levels.⁸⁵⁻⁸⁷ For further information see the SIGN guideline on perioperative blood transfusion.⁸⁸

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.

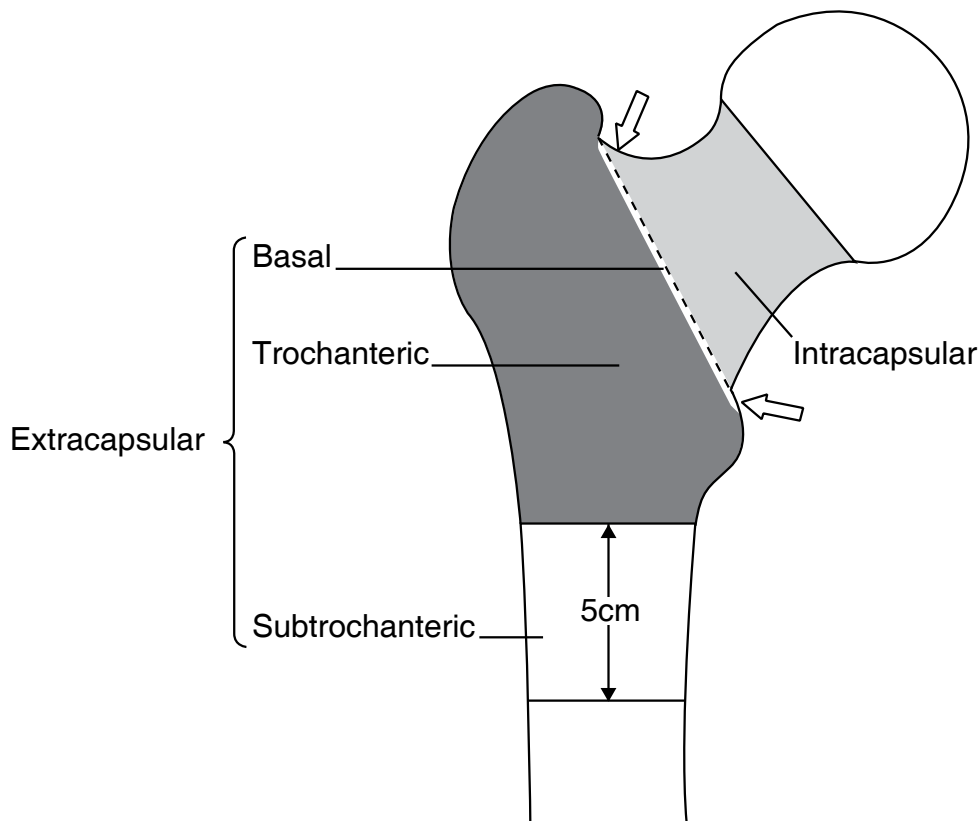
7.1 SURGICAL EXPERIENCE

Evidence suggests that the best results are obtained when hip fracture operations are undertaken by an experienced surgeon.^{11,77} The SHFA has shown considerable variation in the grade of surgeon performing hip fracture surgery. 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.^{48,89}

7.2 TYPES OF FRACTURE

Hip fractures are classified as intracapsular or extracapsular 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.

Early surgery has been advocated to reduce the incidence of fracture non-union and avascular necrosis of the femoral head, but a meta-analysis of the complications after intracapsular hip fractures in young adults (564 fractures) found no significant difference in the incidence of either of these complications whether the fracture was operated on early (< 12 hours) or late (> 12 hours).⁹⁰

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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.^{91,92} 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.^{16,93}

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.⁹³

1⁺

D Patients with undisplaced intracapsular hip fracture should have internal fixation.

Arthroplasty should be considered in the biologically less fit.

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.⁹⁴ A randomised trial indicated 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.^{95,96}

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 (THR) may be better than those for hemiarthroplasty after three years, but a higher incidence of early dislocation is reported.⁹⁷⁻¹⁰⁰ Results of secondary (THR) following failure of fixation are better than the results of hemiarthroplasty after a number of years from the initial injury.¹⁰¹ Therefore many factors other than the type of fracture must 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 (eg presence of arthritis).⁹³

2⁺⁺

A well conducted meta-analysis of 2,289 patients concluded that primary arthroplasty is better than internal fixation for displaced intracapsular hip fractures. In general, "younger", active, fit patients should be considered for fracture reduction and internal fixation. "Older", less mobile patients with a shorter life expectancy should be treated with arthroplasty, the majority using a hemiarthroplasty. The role of total hip replacement is considered in section 7.3.4.¹⁰²

1⁺⁺

A Assessment prior to surgery must consider the patient's:

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

Bed or chair bound patients may be treated conservatively.

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.¹⁰³

The complications from internal fixation are dependent upon the quality of the reduction.^{101,104,107} A meta-analysis of 106 papers showed a re-operation rate of 20-36% after internal fixation compared with 6-18% after hemiarthroplasty.⁹⁴ The re-operation rates are higher for older patients and female patients.^{99,108,109} A rigorous analysis of the Scottish Hip Fracture Audit unitary database of over 12,000 hip fractures has shown a re-operation rate of 17% after internal fixation, compared to 5% after hemiarthroplasty in over 3,300 displaced intracapsular fractures (all age groups).¹⁰³

Surgical techniques for internal fixation

A Cochrane review considered surgical techniques for the internal fixation of intracapsular fractures.¹¹⁰ 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.⁹³

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1+

- A** In patients with displaced intracapsular hip fracture consider:
 - closed reduction and internal fixation in “young” fit patients
 - arthroplasty in “older” biologically less fit patients.

7.3.3 TYPES OF HEMIARTHROPLASTY

Hemiarthroplasties may be either unipolar (eg Thompson and Austin Moore) or bipolar (eg Hastings, Exeter bipolar). Either type may be uncemented or cemented into the femur.

Four good quality systematic reviews found no evidence of superiority of bipolar implants; increasing support for THR; and better function of cemented implants over uncemented.^{96,102,111,112}

1++

The use of bone cement has been associated with intraoperative morbidity. This can be reduced by intramedullary lavage and modern cementing techniques.^{113,114} Uncemented stems are associated with more thigh pain and poorer overall function.¹¹⁵⁻¹¹⁷

2+

- C** Cement should be used when undertaking hemiarthroplasty, unless there are cardiorespiratory complications, particularly in frail older patients.

Radiological studies have suggested that, in many patients, bipolar prostheses move almost entirely at the outer articulation,¹¹⁸ 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.¹¹⁹

2++

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

The common surgical approaches for hemiarthroplasty for intracapsular hip fractures are anterolateral or posterior. Dislocation and thrombosis are more common with the posterior approach, but increased operative time, blood loss and infection are more common with the anterior approach.¹²⁰⁻¹²³

2+

While the trend is in favour of the anterior approach, the use of an approach with which the surgeon is familiar is most likely to lead to lower complications.

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

7.3.4 THE ROLE OF TOTAL HIP REPLACEMENT

There is an increasing body of evidence to support THR over hemiarthroplasty in selected patients.^{102,124,125} In one meta-analysis THR is recommended for active patients aged less than 75-80 years, rather than hemiarthroplasty due to acetabular wear and inferior function with the latter.¹⁰² THR, however, is unsuitable for patients with dementia due to their higher dislocation rate. A systematic review found longer surgical times but better functional outcome scores for THR compared to hemiarthroplasty (cemented or uncemented).⁹⁶

1++

THR as a secondary procedure after failed internal fixation performs better than hemiarthroplasty.¹⁰¹ The results of THR after failed hemiarthroplasty are similar to the results after revision for primary THR, although there is a higher complication rate.¹²⁶

A Patients with pre-existing joint disease, medium/high activity levels and a reasonable life expectancy, should have THR rather than hemiarthroplasty 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 older 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).⁹¹ A systematic review did not identify 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.⁵¹

1+
3

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 (eg, sliding screw and plate) or intramedullary (eg, Gamma nail).

7.4.1 EXTRAMEDULLARY VERSUS INTRAMEDULLARY FIXATION/ IMPLANTS

The evidence supports the use of sliding hip screws (SHS) for the vast majority of patients with extracapsular hip fractures.^{127,128} No evidence of superiority of intramedullary (IM) nails over SHS was identified. There is some evidence that SHS are easier to use and reduce the duration of surgery. IM nails have higher complication rates, specifically intra- and postoperative fractures, but may be better in selected patients (such as those with subtrochanteric, low transverse and reverse oblique intertrochanteric fractures).

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A Sliding hip screws are recommended for the fixation of extracapsular hip fractures, except in certain circumstances (eg reverse oblique, transverse or subtrochanteric fractures) where an intramedullary device may be considered.

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. A systematic review 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.^{110,129,130}

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

7.4.3 COMPRESSION

There is limited and poor quality evidence to support the application of compression across the fracture site of a trochanteric fracture during sliding hip screw fixation.^{110,131}

8 Early postoperative management

A SIGN guideline on the postoperative management of adults is available, covering:¹³²

- early identification of at-risk patients
- monitoring in the postoperative period
- early recognition, investigation, and management of clinical deterioration
- identification of key physiological requirements in the postoperative period
- referral to expert care
- nutrition in the postoperative period.

8.1 PAIN RELIEF

There are many drugs that can be used for pain relief and many 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, gastrointestinal morbidity and delirium. 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 additional clinical benefits as a result of this reduction.²³

2+

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 older patient remains a major challenge.

Clinical standards from NHS QIS recommend that all patients should be assessed frequently both at rest and during activity to ensure optimal analgesia and should receive effective acute pain management.⁷⁶

4

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

- Pain management in older people 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.^{74,75}

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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.¹³³ 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.¹³⁴ Providing supplementary oxygen increases the mean oxygen saturation, but does not completely prevent episodic desaturation/hypoxaemia in the postoperative period.¹³⁵

2+

NB Patients can be hypoxaemic despite apparently adequate oxygen saturation levels, eg patients with anaemia.

C 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 and reflect the limited renal reserve of these patients.¹³⁶

1+

The situation may be made worse by diuretics and inappropriate composition of maintenance intravenous fluids. Fluid management in older people is often poor¹¹ and older women appear particularly at risk of developing hyponatraemia in the perioperative period.⁷³

4

B Fluid and electrolyte management in older people should be monitored regularly.

D Fluid and electrolyte management should begin in the emergency department.

8.4 DELIRIUM

Delirium or acute confusional state often occurs following a hip fracture. It is associated with increases in length of stay, proportion of nursing home placement and mortality. Attention to oxygen saturation, blood pressure, fluid and electrolyte balance, pain control, medication, bowel and bladder function, nutritional intake, early mobilisation, and detection and treatment of intercurrent illness will prevent some episodes and minimise the severity of others.

8.5 EARLY MOBILISATION

Early mobilisation may prevent complications such as pressure damage and deep vein thrombosis.^{16, 137} Early mobilisation in combination with pre- and postoperative physiotherapy may be of value in reducing pulmonary complications.¹³⁸

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, unless there is concern about quality of the hip fracture repair (eg *poor bone stock* or *comminuted fracture*).

8.6 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:¹³⁹

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

Steps should be taken to avoid constipation.

8.7 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 disappointing. Factors such as complexity of case mix, service context, details of service organisation and multidisciplinary inputs, and even healthcare reimbursement systems, can add greatly to the problems normally associated with the organisation of large-scale clinical trials involving older patients.¹⁴⁰⁻¹⁴²

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.^{143,144} 2+

Pre-morbid 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.¹⁴⁵⁻¹⁴⁸ 2++

B A corroborated history should be taken, including:

- **pre-morbid function and mobility**
- **available social support** (*including whether the patient already has a carer or whether someone is willing and able to provide such 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 (see section 9.3). 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.¹⁴⁵⁻¹⁴⁹ 2++

B Patients with comorbidity, poor functional ability and low mental test scores prior to admission should undergo rehabilitation in a geriatric orthopaedic rehabilitation unit.

Maintaining balance during daily activities is a useful predictor of subsequent hospitalisation, care home placement and mortality.¹⁵⁰

9.2 REHABILITATION

9.2.1 NUTRITION

Older people 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.¹⁴⁰

The SHFA found that 76% of all patients who received rehabilitation services had a nutritional assessment (74% of these were conducted in orthopaedics, 26% conducted post orthopaedics). Approximately 55% of patients discharged directly from orthopaedics received a nutritional assessment regardless of whether their destination was a care home or their own home.¹⁵¹

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.¹⁴⁰ 1++

The studies were unclear regarding how long supplementation should continue; the duration varying from study to study.

The SHFA found that the median time from admission until nutritional assessment was one day, ranging from 0 to 12 days across Scotland. Nutritional assessment was mainly carried out by ward nurses with assessment by a dietitian in only around 10% of patients.¹⁵¹

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 effective in the delivery of hip fracture rehabilitation. The professions, grades and inter-relationships 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.^{143,144,152-154} Rehabilitation should be commenced early to promote independent mobility and function. The initial emphasis should be on walking and activities of daily living (ADL), for example, transferring, washing, dressing, and toileting. Balance and gait are essential components of mobility and are useful predictors in the assessment of functional independence.^{145,150}

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.^{152,154-158}

2++

B A multidisciplinary team should be used to facilitate the rehabilitation process.

9.3 DISCHARGE

9.3.1 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 general practitioner (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 coordinated inpatient rehabilitation.^{141,142} The observed trends favour GORU over conventional management, with a reduction in deaths and an increase in functional improvement.¹⁴¹ 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.¹⁴² 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.¹⁴⁶ 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.¹⁴¹

9.3.2 PATIENTS ADMITTED FROM INSTITUTIONAL CARE WITH FRACTURED HIP

Data from the Scottish Hip Fracture Audit published in 2002 revealed that in the previous five years over one third of female hip fracture patients were admitted from institutional care.¹⁰³ 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%.

9.3.3 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.^{143,153,159,160} 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,^{145,148,153,159} 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^{148,153,159} and increase the overall proportion of patients discharged home.¹⁵³

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.^{143,144,148,153,159,160} These costings do not include informal support from carers.

2++

Carers require resources as partners in providing care to the patient and to support them to care safely and without detriment to their own health and well-being.

Local circumstances will dictate the nature of local arrangements between hospital and community health and social services.¹⁵⁴

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

9.4 DISCHARGE MANAGEMENT

Multidisciplinary discharge management, involving community and hospital nurses, hospital doctors and GPs, physiotherapists, occupational therapists, social workers and family^{143,148,153,154,159} 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.^{144,149,159}

- ☑
 - The patient should be central to discharge planning, and their needs and appropriate 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 post-discharge 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.
 - General practitioners have an important role to play in post-discharge 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 Provision of information

10.1 PROVIDING INFORMATION AND SUPPORT

This section reflects the issues likely to be of most concern to patients and their carers. These points are provided for use by health professionals when discussing hip fracture with patients and carers and in guiding the production of locally produced information materials.

In this guideline the term carers is used to describe those who provide unpaid care by looking after an ill, frail or disabled family member, friend or partner. Often there is confusion over the term carer as it is sometimes used to refer to paid care workers.

10.1.1 COMBATING HEALTHCARE ASSOCIATED INFECTION IN HOSPITAL

The top five tips to combat healthcare associated infection in hospital were issued by the Chief Medical Officer in 2004 as advice for hospital visitors.¹⁶¹

- Think about keeping patients safe before you visit. If you or someone at home has a cold or are feeling unwell, especially if it's diarrhoea, stay away until you're better.
- Think about what you take in to patients. Food is a treat best saved until they get home. Don't sit on the bed and keep the number of visitors to a minimum at any one time.
- The most important thing you can do is to wash and dry your hands before visiting the ward, particularly after going to the toilet. If there is alcohol hand gel provided at the ward door or at the bedside, use it.
- Never touch dressings, drips, or other equipment around the bed.
- Don't be afraid to raise concerns with members of staff in your hospital. Busy hospital staff can sometimes forget simple things like cleaning hands before examining a patient. No NHS worker should take offence at a gentle and polite reminder.

10.2 SOURCES OF FURTHER INFORMATION

The internet contains a vast range of information. Patients should be advised to act cautiously as the accuracy or reliability of a website can be difficult to determine. Patients should be guided to appropriate sites and encouraged to discuss any information found on the internet with a healthcare professional.

10.2.1 NATIONAL ORGANISATIONS

Age Concern Scotland

Causewayside House, 160 Causewayside, Edinburgh, EH9 1PR
 Tel: 0845 833 0200 • Fax: 0845 833 0759
 Freephone: 0800 00 99 66 (7am-7pm, 7 days a week)
www.ageconcernscotland.org.uk • Email: enquiries@acscot.org.uk

Supports all people over 50 in the UK. Provides essential services such as day care and information on issues like age discrimination and pensions.

Alzheimer Scotland

22 Drumsheugh Gardens, Edinburgh, EH3 7RN
 Tel: 0131 243 1453 • 24 hour free helpline: 0808 808 3000
www.alzscot.org.uk • E-mail: alzheimer@alzscot.org

Alzheimer Scotland provides patients, carers and families with information and practical advice.

Carers Scotland

The Cottage, 21 Pearce Street, Glasgow, G51 3UT
 Tel: 0141 445 3070 • Fax: 0141 445 3096
www.carerscotland.org • Email: info@carerscotland.org

Carers Scotland provides information and advice to carers on all aspects of caring.

Crossroads Scotland

24 George Square, Glasgow, G2 1EN
 Tel: 0141 226 3793
 www.crossroads-scotland.co.uk

Crossroads provides practical support to carers.

National Osteoporosis Society

Mannors Farm, Skinner’s Hill, Camerton, Bath, BA2 0PJ
 Tel: 01761 471 771 • Helpline: 0845 450 0230
 www.nos.org.uk • Email: info@nos.org.uk

The National Osteoporosis Society provides support to osteoporosis sufferers and their carers.

The Princess Royal Trust for Carers

Scotland Office, Charles Oakley House, 125 West Regent Street, Glasgow, G2 2SD
 Tel: 0141 221 5066 • Fax: 0141 221 4623
 www.carers.org • Email: infoscotland@carers.org

The Princess Royal Trust for Carers provides information, advice and support to Scotland’s carers and young carers.

10.2.2 USEFUL PUBLICATIONS FOR PATIENTS AND CARERS

Coping with a broken hip

National Osteoporosis Society

This booklet explains the rehabilitation process within the hospital and the home. It explains how diet and changes in the home can play a central role in recovery. Available from the National Osteoporosis Society (see section 10.2.1)

New to caring: Information for people who provide unpaid care by looking after an ill, frail or disabled family member, friend or partner.

Carers Scotland

This booklet looks at the emotional, practical and financial impact of being a carer. Available from Carers Scotland (see section 10.2.1).

Looking after someone: A guide to carers benefits and support

Carers UK

This booklet explains what rights carers have and how they can get financial help, practical help and help with combining work and caring.

Finding the Balance: Promoting Positive Health

Carers Scotland

“A Carers Resource Guide to Health and Wellbeing”

This free booklet is designed to encourage carers to take positive and practical steps to promote and safeguard their own health and includes information on diet, back care, sleep, exercise and emotional health as well as information on sources of support. Available free of charge from Carers Scotland (see section 10.2.1).

Taking positive steps to avoid trips and falls

This booklet looks at ways of preventing falls, including care of eyesight and feet, activity and coordination, balance and strength, creating a safer home, what to do if you fall, and where to get help.

Available from NHS Health Scotland
 Woodburn House, Canaan Lane, Edinburgh, EH10 4SG
 Tel: 0131 536 5500 • Text phone: 0131 536 5503 • Fax: 0131 536 5501
 Elphinstone House, 65 West Regent Street, Glasgow, G2 2AF
 Tel: 0141 354 2900 • Fax: 0141 354 2901
 www.healthscotland.com • Email: publications@health.scot.nhs.uk

10.3 CHECKLIST FOR PROVISION OF INFORMATION

This section gives examples of the information patients/carers may find helpful at the key stages of the patient journey. The checklist was designed by members of the guideline development group based on their experience and their understanding of the evidence base. The checklist is neither exhaustive nor exclusive.

<p>Admission</p> <ul style="list-style-type: none"> ▪ After admission, the following should be discussed with patients and carers: <ul style="list-style-type: none"> - history of falls - how the hip fracture will be managed - how long patients are likely to wait for an operation - what support is available at home – is there a carer who is willing and able to support the patient upon discharge - how the patient will be mobilised - the likelihood of bruising around the site of their operation, which may be extensive - whether or not a blood transfusion may be needed - how long the patient is expected to stay in hospital. ▪ Discuss how the patient may feel, for example, acknowledge that patient may feel anxious. ▪ Advise patients and carers whom they can ask for information within and outwith the hospital setting. ▪ Ensure families and carers are aware of their responsibilities regarding infection control. ▪ Make patients and carers aware of the hospital chaplaincy service.
<p>Early mobilisation</p> <ul style="list-style-type: none"> ▪ The importance of early mobilisation following a hip fracture operation should be emphasised: <ul style="list-style-type: none"> - let patients know in advance that it is likely that they will be encouraged to move with the help of a physiotherapist or other member of the healthcare team within 24 hours of their operation. - acknowledge that starting to walk again is a challenge and will be uncomfortable. ▪ Encourage patients to be as independent as possible.
<p>Pain control</p> <ul style="list-style-type: none"> ▪ 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 moving around with the walking frame. ▪ Encourage patients to ask for painkillers if uncomfortable at any time. ▪ Discuss the side effects of medication with patients and carers. ▪ Emphasise the importance of continuing with medication once the patient is home.
<p>Rehabilitation</p> <ul style="list-style-type: none"> ▪ 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 healthcare 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. Advise patients and carers that an occupational therapy home assessment may be carried out as part of their discharge planning and ensure they are aware of what this will involve.

Discharge
<ul style="list-style-type: none"> ▪ Hospital nurses should communicate with the multidisciplinary team and ensure that patients and carers are involved in discharge planning. ▪ Acknowledge the concerns associated with going home. ▪ Hospital staff should establish whether there is a carer who is willing and able to provide support to the patient upon discharge. ▪ Advise patients and carers about social services, acknowledging that there may be a cost involved for some home support services. ▪ Advise patients and carers (including care homes) of possible discharge dates. ▪ Discuss the possibility of further rehabilitation settings, for example, GORU. ▪ Ensure the patient agrees to sharing of assessment results between services. ▪ Advise patients and carers that a discharge letter will be sent to their GP. ▪ Provide patients and carers with written information on medication, mobility and useful sources of information.
Follow up
<ul style="list-style-type: none"> ▪ Advise patients and carers of how they will be followed up, for example, by telephone calls from a liaison nurse, or appointments with their GP. ▪ Discuss with patients who are on anticoagulant therapy how this treatment will continue in the community. ▪ Encourage carers to inform their GP if they are having difficulty in maintaining the caring role. ▪ Highlight that carers are entitled to their own assessment for practical and financial support.
Prevention
<ul style="list-style-type: none"> ▪ Patients should be encouraged to be active – a history of immobility is a significant risk factor for fracture. ▪ Falls prevention – identify any factors that might reduce the risk of the patient falling, for example: <ul style="list-style-type: none"> - hazards in the home environment – loose rugs, trailing flexes, poor lighting, stairs etc - have the patient’s eyesight and hearing been tested recently? - would the use of walking aids be beneficial, or could their use be optimised? - is there other equipment that might help at home, for example, additional rails, bath equipment, higher chair, trolley etc?

11 Implementing the guideline

This section provides advice on the resource implications associated with implementing the clinical recommendations, and advice on audit as a tool to aid implementation.

Implementation of national clinical guidelines is the responsibility of each NHS Board and is an essential part of clinical governance. Mechanisms should be in place to review care provided against the guideline recommendations. The reasons for any differences should be assessed and addressed where appropriate. Local arrangements should then be made to implement the national guideline in individual hospitals, units and practices.

11.1 RESOURCE IMPLICATIONS

A clinical and resource impact report and an associated spreadsheet have been developed to provide each NHS board with resource and cost information to support the implementation of the recommendations judged to have a material impact on resources (see *Table 1*). These documents are available from the NHS QIS website: www.nhshealthquality.org and the SIGN website www.sign.ac.uk

The total costs of implementing these recommendations across NHSScotland are estimated to be £1,728,000 per year. This includes the additional cost of fondaparinux of £1,159,000 less savings on heparin and aspirin of £111,000; plus £680,000 for 28,000 extra home visits by a nurse for patients needing injections after discharge.

£173,000 in hospital costs would be saved by the risk reduction in the incidence of symptomatic DVT from 2.7% to 0.3%, benefiting 149 patients. There would be further savings post-discharge but these have not been quantified or costed.

Implementation of other recommendations, in particular those relating to multidisciplinary team working and supported discharge schemes, should reduce acute hospital stay as well as leading to other patient and clinical benefits. These benefits have not been quantified or costed.

For a full description of the assumed parameters and sensitivity analyses, see the clinical and resource impact report.

Table 1 Recommendations costed in the clinical and resource impact report

Recommendation	Section
A Heparin (UFH or LMWH) or fondaparinux may be used for pharmacological thromboprophylaxis in hip fracture surgery.	5.5.3
A Patients without a contraindication should receive thromboprophylaxis using fondaparinux for 28 days starting six hours after surgery	5.5.3

11.1.1 ADVICE TO NHSSCOTLAND FROM NHS QUALITY IMPROVEMENT SCOTLAND AND THE SCOTTISH MEDICINES CONSORTIUM

In October 2002, the Scottish Medicines Consortium advised that fondaparinux, licensed for prevention of venous thromboembolic events in patients undergoing major orthopaedic surgery of the lower limbs such as hip fracture, major knee or hip replacement surgery, is appropriate for use in NHSScotland.

Compared with enoxaparin, fondaparinux has been shown to be associated with fewer thrombo-embolic events and a generally similar incidence of major bleeding. It is licensed for postoperative initiation, and this represents an advantage where regional anaesthesia and/or catheterisation are planned. It is predicted to be a cost effective alternative to enoxaparin in a robust economic model.

It may be considered for patients for whom antithrombotic therapy is appropriate, recognising that other antithrombotic agents and other approaches to prophylaxis may be more suitable in some situations: www.scottishmedicines.org.uk

11.2 AUDITING CURRENT PRACTICE

A first step in implementing a clinical practice guideline is to gain an understanding of current clinical practice. Audit tools designed around guideline recommendations can assist in this process. Audit tools should be comprehensive but not time consuming to use. Successful implementation and audit of guideline recommendations requires good communication between staff and multidisciplinary team working.

11.2.1 SYNERGY OF AUDIT AND GUIDELINES IN HIP FRACTURE CARE

The Scottish Hip Fracture Audit was originally based on "Rikshoft", the Swedish multicentre hip fracture study. It began in the Royal Infirmary of Edinburgh and Borders General Hospital in 1993 expanding over the intervening years with additional local and central funding. Since April 2006 direct funding from the National Waiting Times Unit has allowed the audit to achieve 100% coverage of acute hip fracture data from all 21 units on mainland Scotland. The SHFA 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 process and allow national and international comparison of hip fracture care.

In 2005 the SHFA decided to focus resources on a series of time-limited audits of specific aspects of hip fracture care while continuing to collect a core data set. The first of these time-limited audits in 2006 looked at the rehabilitation phase of care in particular the processes of care highlighted by SIGN, namely cognitive, nutritional, falls and bone health assessment. In 2007 the audit concentrated on medical reasons for delay to theatre. The results of these time-limited audits and the annual audit reports can be viewed online at www.shfa.scot.nhs.uk

Data are collected at each unit by a dedicated local audit coordinator, and following dual entry the data are validated and standardised. The core data set includes age, sex of patient, previous mobility and living circumstances (used for case mix adjustment), time in the emergency department, time to theatre and length of stay. Mobility, residence and levels of pain are recorded as outcomes at 120 days.

An evidence based guideline identifies what ought to happen in hip fracture care. A robust national audit documents what is happening. Guidelines and audit working together allow comparisons in detail across the patient's journey of care. Having a national guideline for hip fracture care and a national hip fracture audit 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.

11.2.2 KEY POINTS FOR AUDIT

The guideline development group has identified the following as key points to audit to assist with the implementation of this guideline:

Hip fracture audit should include details of case mix, processes of care and outcome.³ The Scottish Hip Fracture Audit collects a core data set (www.shfa.scot.nhs.uk):

- basic demographics
- time spent in the emergency department
- pre-fracture residence
- pre-fracture mobility
- previous low impact fracture
- previous falls in past six months
- time to theatre
- reason for delay to theatre (if more than 24 hours of safe operating time)
- date investigations requested and date carried out (eg echocardiogram or MR imaging)
- length of stay in acute orthopaedic ward
- outcomes at four months.

Many participating centres collect further data on matters of local clinical and research interest by means of the local project boxes on the data collection forms. Current and past proforma are available on the SHFA website: www.shfa.scot.nhs.uk.

12 The evidence base

12.1 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 a SIGN Information Officer. Databases searched include Medline, Embase, CINAHL, and the Cochrane Library. The year range covered was 2002-2007. The main searches were supplemented by material identified by individual members of the development group. Each of the selected papers was evaluated by two members of the group using standard SIGN methodological checklists before conclusions were considered as evidence.

12.1.1 LITERATURE SEARCH FOR ECONOMIC ISSUES

A SIGN Information Officer conducted a literature search of the NHS Economics Evaluations Database (NEED) for studies that highlighted economic issues related to prevention and management of hip fracture in older people.

12.1.2 LITERATURE SEARCH FOR PATIENT ISSUES

At the start of the guideline development process, a SIGN Information Officer conducted a literature search for qualitative and quantitative studies that addressed patient issues of relevance to prevention and management of hip fracture in older people. Databases searched include Medline, Embase, CINAHL and PsycINFO, and the results were summarised and presented to the guideline development group. A copy of the Medline version of the patient search strategy is available on the SIGN website.

12.2 RECOMMENDATIONS FOR RESEARCH

The guideline development group was not able to identify sufficient evidence to answer all of the key questions asked in this guideline. The following areas for further research have been identified:

- large scale hip fracture audits to assist with the challenge of providing systematic, objective evidence of benefit from geriatrician input, and the best mode of ensuring its delivery, including the nature and extent of geriatrician input
- large, detailed and reliable audits, preferably with case mix adjustment, to evaluate further the impact of administrative (non-medical) delay on cohorts of hip fracture patients
- comparison of aspirin with heparin and/or fondaparinux and their effectiveness in combination or pharmacological prophylaxis combined with mechanical prophylaxis
- large RCT on the use of dabigatran to show any significant benefits over aspirin, LMWH or fondaparinux.
- large case mix audit to establish which groups of patients would benefit most from the alternative anaesthetics available
- the effectiveness and cost effectiveness of discharge planning and rehabilitation after hip fracture
- the efficacy of supplemental peripheral nerve block for patients undergoing surgery for hip fracture
- interventions to reduce further fragility fractures
- assessment and intervention for delirium
- impact of warfarin reversal
- transfusion support and outcomes
- value of echocardiography preoperatively for hip fracture
- the increased use of THR for intracapsular fractures to determine which patients are best suited for a THR
- the role of high dependency units postoperatively in hip fracture care

- current reviews of national audits
- peripheral nerve block before surgery (preoperative analgesia)
- critical evaluation of emerging anaesthetic techniques – TCI, inhalations and comparison with spinal
- nutritional support perioperatively
- evaluation of early discharge
- follow up and rehabilitation of patients
- best type of supportive discharge.

12.3 REVIEW AND UPDATING

This guideline was issued in 2009 and will be considered for review in three years. Any updates to the guideline in the interim period will be noted on the SIGN website: www.sign.ac.uk

13 Development of the guideline

13.1 INTRODUCTION

SIGN is a collaborative network of clinicians, other healthcare professionals and patient organisations and is part of NHS Quality Improvement Scotland. SIGN guidelines are developed by multidisciplinary groups of practising clinicians 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

13.2 THE GUIDELINE DEVELOPMENT GROUP

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Ms Lisa Wilson	<i>Health Economist, NHS Quality Improvement Scotland, Glasgow</i>

The membership of the guideline development group was confirmed following consultation with the member organisations of SIGN. All members of the guideline development group made declarations of interest and further details of these are available on request from the SIGN Executive.

Guideline development and literature review expertise, support and facilitation were provided by the SIGN Executive.

13.2.1 ACKNOWLEDGEMENTS

SIGN would like to acknowledge the guideline development group responsible for the development of SIGN 56: Prevention and management of hip fracture in older people, on which this guideline is based.

13.2.2 PATIENT INVOLVEMENT

In addition to the identification of relevant patient issues from a broad literature search, SIGN involves patients and carers throughout the guideline development process in several ways. SIGN recruits a minimum of two patient representatives to guideline development groups by inviting nominations from the relevant “umbrella”, national and/or local patient focused organisations in Scotland. Where organisations are unable to nominate, patient representatives are sought via other means, for example, from consultation with health board public involvement staff.

Further patient and public participation in guideline development was achieved by inviting patients, carers and voluntary organisations to take part in the peer review stage of the guideline and specific guidance for lay reviewers was circulated. Members of the SIGN patient network were also invited to comment on the draft guideline section on provision of information.

13.3 CONSULTATION AND PEER REVIEW

13.3.1 PUBLIC CONSULTATION

The draft guideline was available on the SIGN website for a month to allow all interested parties to comment.

13.3.2 SPECIALIST REVIEW

This guideline was also reviewed in draft form by the following 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. The guideline group addresses every comment made by an external reviewer, and must justify any disagreement with the reviewers’ comments.

SIGN is very grateful to all of these experts for their contribution to the guideline.

Dr Janice Allister	<i>General Practitioner, Brinnington Health Centre, Stockport</i>
Professor Claire Ballinger	<i>Professor of Occupational Therapy, Glasgow Caledonian University</i>
Mr Ivan Brenkel	<i>Consultant Orthopaedic Surgeon, Queen Margaret Hospital, Dunfermline</i>
Dr Rodney Burnham	<i>Registrar, Royal College of Physicians, London</i>
Miss Kathleen Duncan	<i>National Clinical Co-ordinator, Hairmyres Hospital, East Kilbride</i>
Dr Sigurður Helgason	<i>Editor of Clinical Guidelines, Iceland</i>
Dr Gary Heyburn	<i>Associate Specialist Orthogeriatrician, Royal Victoria Hospital, Belfast</i>
Dr Graham MacKenzie	<i>Consultant in Public Health, Deaconess House, Edinburgh</i>
Miss Heather McDowell	<i>Chair, College of Occupational Therapists, Stanmore, Middlesex</i>
Mr Gordon McFarlane	<i>Consultant Surgeon, Gilbert Bain Hospital, Shetland</i>
Professor Marion McMurdo	<i>Physician in Medicine for the Elderly, Ninewells Hospital and Medical School, Dundee</i>
Mrs Eileen Moir	<i>Director of Nursing and Practice Development, NHS Quality Improvement Scotland, Edinburgh</i>
Miss Elaine Murray	<i>Clinical Specialist Occupational Therapist – Orthopaedics, Queen Margaret Hospital, Dunfermline</i>
Mr Martyn Parker	<i>Consultant Orthopaedic Surgeon, Peterborough District Hospital</i>
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Dr Opinder Sahota	<i>Consultant Physician, Nottingham University Hospital</i>
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13.3.3 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 to ensure that the specialist reviewers' comments have been addressed adequately and that any risk of bias in the guideline development process as a whole has been minimised. The editorial group for this guideline was as follows.

Dr Keith Brown	<i>Chair of SIGN; Co-Editor</i>
Mr Andrew de Beaux	<i>Royal College of Surgeons of Edinburgh</i>
Professor John Kinsella	<i>Royal College of Anaesthetists</i>
Dr Graham Leese	<i>Royal College of Physicians of Edinburgh</i>
Dr Moray Nairn	<i>SIGN Programme Manager</i>
Dr Vijay Sonthalia	<i>Scottish General Practice Committee</i>
Dr Sara Twaddle	<i>Director of SIGN; Co-Editor</i>
Dr Christine Walker	<i>Royal College of Radiologists</i>

Abbreviations

ACCP	American College of Chest Physicians
ADL	activities of daily living
A-V	arterial venous
BNF	British National Formulary
CI	confidence interval
DVT	deep vein thrombosis
ECG	electrocardiogram
ED	emergency department
ESD	early supported discharge
FFP	fresh-frozen plasma
GORU	geriatric orthopaedic rehabilitation unit
GP	general practitioner
HDU	high dependency unit
IM	intramedullary
INR	international normalised ratio
IV	intravenous
LDH	low-dose heparin
LMWH	low molecular weight heparin
MR	magnetic resonance
MRSA	meticillin resistant <i>Staphylococcus aureus</i>
MTA	multiple technology appraisals
NEED	NHS Economics Evaluations Database
NHS QIS	NHS Quality Improvement Scotland
NICE	National Institute for Health and Clinical Excellence
NNH	number needed to harm
NNT	number needed to treat
NS	non-significant
NWTU	National Waiting Times Unit
OR	odds ratio
PE	pulmonary embolism
QALY	quality adjusted life year
RCT	randomised controlled trial
RR	relative risk
SHFA	Scottish Hip Fracture Audit
SHS	sliding hip screws
SIGN	Scottish Intercollegiate Guidelines Network

SMC	Scottish Medicines Consortium
SSI	surgical site infection
THR	total hip replacement
UFH	unfractionated heparin
VTE	venous thromboembolism

Annex

Key questions addressed in this update

The guideline is based on a series of structured key questions that, where possible, define the *population* concerned, the *intervention* (or diagnostic test, etc) under investigation, the type of *comparison* used, and the *outcomes* used to measure the effectiveness of the interventions. These questions form the basis of the systematic literature search.

THE KEY QUESTIONS USED TO DEVELOP THE GUIDELINE

All questions apply to a population aged 65 and over.

PREOPERATIVE CARE	
Key question	See guideline section
1. What is the effectiveness of early physician or orthogeriatrician input into the care of a patient presenting with hip fracture during acute admission, in reducing length of hospital stay and mortality?	5.1 5.2.5
2. In patients with osteoporotic hip fracture, does early surgery (within 48 hours) reduce the incidence of complications such as pneumonia, pressure sores, cognitive dysfunction, increased length of hospital stay and mortality?	5.2.5
3. What is the optimum preoperative management of reversal of anticoagulation in a patient with osteoporotic hip fracture on warfarin anticoagulation. Consider: vitamin K, risks and benefits	5.2.2
4. How should cardiac murmur be assessed preoperatively in patients with osteoporotic hip fracture? Consider: echocardiogram	5.2.4
5. In patients with osteoporotic hip fracture what is the effectiveness of pharmacological prophylaxis in reducing the risk of postoperative thromboembolism?	5.5
6. In patients with osteoporotic hip fracture what is the cost-effectiveness of pharmacological prophylaxis in reducing the risk of postoperative thromboembolism?	5.5.4
7. In patients with osteoporotic hip fracture what is the effectiveness of mechanical devices in reducing the risk of post operative thromboembolism? Consider: cyclic leg compressions devices, foot pumps, graduated stockings.	5.5.5

SURGERY	
Key question	See guideline section
8. In patients undergoing extracapsular hip fracture repair, is the use of extramedullary sliding hip screws more effective than intramedullary nails in reducing the risk of further fractures during and after the operation?	7.4.1
9. In patients undergoing surgery for intracapsular hip fracture what is the effectiveness of arthroplasty or hemiarthroplasty compared to fixation in reducing complications (further surgery, blood loss, infection, mortality)?	7.3
10. In patients undergoing surgery for intracapsular hip fracture which arthroplasty is most effective in reducing complications (further surgery, blood loss, infection, mortality)?	7.3
11. In patients undergoing hip fracture repair, is regional (spinal/epidural) anaesthesia more effective than general anaesthesia, or should both be used during and/or after surgery, to reduce the incidence of mortality or the following morbidities: <ul style="list-style-type: none"> ▪ deep vein thrombosis ▪ pulmonary thromboembolism ▪ hypoxaemia ▪ hypotension ▪ cognitive dysfunction ▪ ambulation ▪ postoperative respiratory morbidity ▪ perioperative blood loss ▪ myocardial infarction ▪ congestive cardiac failure ▪ renal failure ▪ cerebrovascular accident ▪ length of hospital stay ▪ mortality. 	6.2
12. Does placement of patients in high dependency care after hip fracture repair improve morbidity and mortality compared to ward care?	
13. In patients who have undergone hip fracture repair does femoral nerve block provide adequate pain relief? (include preoperative pain)	6.3
REHABILITATION	
Key question	See guideline section
14. What is the effectiveness of early discharge compared to in-hospital rehabilitation for patients who have undergone surgical repair for hip fracture? <i>Consider: Intermediate care, hospital at home, home care, supported discharge</i>	9.3
15. What is the cost effectiveness of early discharge compared to in-hospital rehabilitation for patients who have undergone surgical repair for hip fracture?	

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